

Sensory Processing, Social Participation, and Anxiety: Considerations for Enabling Occupational Participation of Children

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Disclosures

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Pre-test



1. T or F. Research has not detected any neurological differences in nervous system structure and/or function in individuals with sensory processing differences



2. T or F. There is no research evidence that there is a relationship between sensory processing and function in social situations?



3. T or F. At the neural level, the response to repeated, consecutive stimuli is always identical to the response of the initial stimulus.



Objectives

Participants will:

1. Examine research findings related to behavioral and neurologic indicators underlying sensory processing
2. Review the results of literature and research studies that examined the relationship between sensory processing, social participation, and anxiety.
3. Identify a minimum of 3 examples of sensory strategies or supports that could be used to enhance occupational participation of school-age children.
4. Engage in collaborative case-based problem solving and share treatment ideas.
5. Discuss the concept of sensory health for all!

Case Study

Bill is an 8-year-old, 3rd grader who has a diagnosis of ADHD. He just moved to your school district. Academic skills are at grade level with the exception of reading and written communication.

On a prior OT report, he scored in the *definite difference range on the SPM in the domains of body awareness, planning-ideas, and social participation*. He scored in the *probable difference on touch, vision, and hearing*.

His teacher reports Bill is energetic and has a good demeanor but is impulsive and has trouble regulating his behavior such as waiting for his turn. He demonstrates frustration with writing sentences and seems “wiped out” by the end of the day.

Current teacher/parent report and OT observation:

- Avoids or plays “rough” with peers on the playground.
- Chews on small items or bites on his pencil at times which appears to calm him.
- Insistent on washing his hands immediately after touching a non-preferred substance
- Quickly gets frustrated especially with tasks requiring motor planning and exhibits emotional outbursts with difficulty calming after outbursts.
- Feeling tense and fidgety, and uses the toilet often
- Paces around the room, jumps in place, and can stand sit on the floor longer than he can sit in a regular chair (although he prefers to lay on the floor!).
- Trouble planning movements needed to approach certain tasks including games with peers



Case Study Debrief

- Sensory Observations:
 - Does Bill appear to demonstrate hyperresponsiveness or hypo responsiveness to any type of sensory input? If yes, what sensory domain?
 - Does he appear to avoid or seek any type of sensory information?
- Does he demonstrate any signs of anxiety?
- [Jamboard for Case Study Debrief](#)

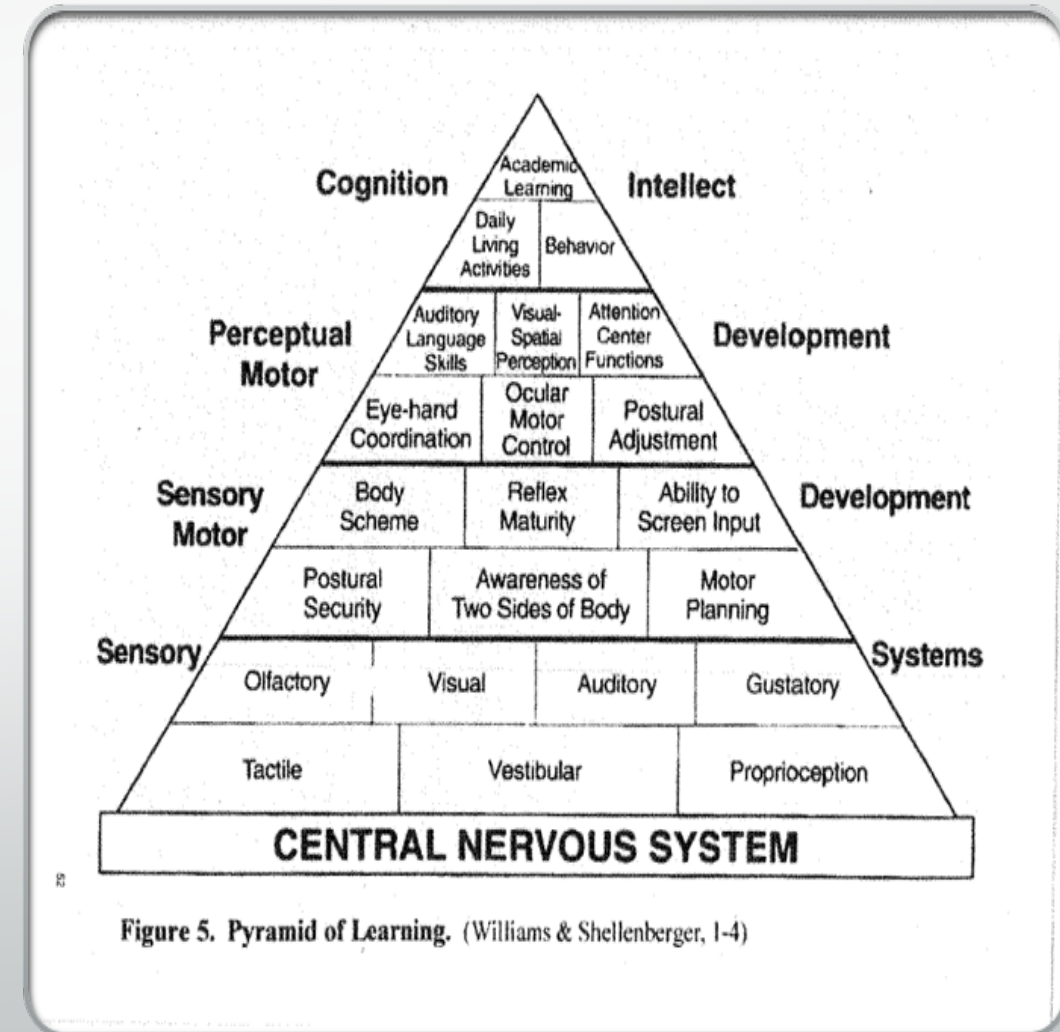




Terminology

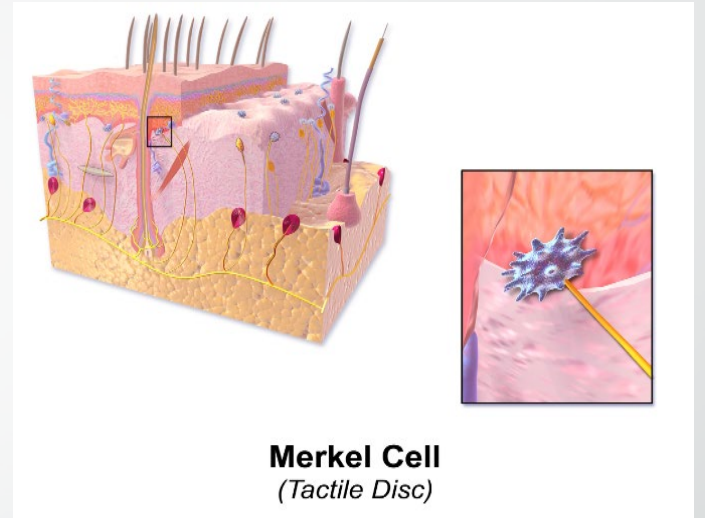
Sensory Processing

- We spend our lives navigating in a sea of stimuli.
- The nervous system is responsible for accurately and efficiently registering, processing, interpreting, and responding to these signals for adaptive behavior to occur.
- Our body has millions of sensory receptors which can be activated simultaneously, consecutively, or differentially etc.. to adequately and efficiently process information from the environment and from our body.
- **"The brain must select, enhance, inhibit, compare, and associate sensory information in a flexible, constantly changing pattern; in other words, the brain must *integrate* it. (Ayres, 1972)**



Sensory Processing

- Sensory Receptors can be classified as:
 - Exteroreceptors detect stimuli from the external environment such as light, sound, touch.
 - Interoreceptors detect stimuli from the internal environment such as heart rate, blood pressure, hunger
 - Proprioceptors detect joint and muscle position and movement
- Sensory input is converted into electrical signals that must be received via sensory receptors, processed, and interpreted for use.



By BruceBlaus. Blausen.com staff (2014). "Medical gallery of Blausen Medical 2014". WikiJournal of Medicine 1 (2). DOI:10.15347/wjm/2014.010. ISSN 2002-4436. - Own work, CC BY 3.0,

The image shows two axial MRI brain scans. The top scan is a smaller, more detailed view with technical data overlaid, including '5cm', 'R', 'TP 0', 'SP H23.5', 'SL 5.0', 'FoV 199*220', '296*512', 'W 128', 'C 66', 'Tra>Cor(6.1)', 'Chilam', 'Harmoni', '4VA12', 'HES', and '+LPT'. The bottom scan is a larger, more detailed view of a brain slice. Technical data for the bottom scan includes 'AF', '180', and '400'.

Sensory Modulation

- "Sensory modulation occurs as the central nervous system regulates the neural messages about sensory stimuli." (Miller et al., 2007).
- "Sensory modulation is considered **a twofold** process. It originates in the central nervous system as the neurological ability to regulate and process sensory stimuli; this subsequently offers the individual an opportunity to respond behaviorally to the stimulus." (Brown et al., 2018)

Sensory Modulation

The ability to regulate incoming neural messages by facilitating or inhibiting responses to sensory stimuli. Filtering (dampening and heightening) the senses, such as sound, sight and touch, is essential for self regulation.



move . play . grow



In functional terms, sensory modulation is the ability of the brain to filter and interpret sensory input and form a response that results in an appropriate level of alertness and readiness for occupational participation.



Self-Regulation

- The process of **applying strategies** with the end goal of recognizing physical sensations related to different activity levels or emotions and to respond using preselected sensory strategies to help modify sensory processes and *management of emotions and behavior* (Dunn, 2014; Martini et al., 2016)
- Early life antecedents of social competence include a child's:
 - temperament,
 - communication skills,
 - emotional understanding,
 - social information processing, and
 - **self-regulation skills** (Fabes et al., 2006)

Types of Self-Regulation

- The processes involved in self-regulation can be divided into three broad areas: **sensory regulation**, **emotional regulation** and **cognitive regulation**.
- *By organizing sensations, the child gains control over his emotions. A. Jean Ayres, 1979*





3 Constructs of Self-Regulation

- **Sensory Regulation**--the body's ability to organize sensory input including taste, sight, smell, hearing, touch, movement, gravity, and position for proper use to formulate an adaptive response to input (Ayres, 1979).
- **Emotional Regulation**--occurs when individuals, including children, recognize which emotions they are experiencing, when they have them, and how they are conveyed, to produce an acceptable emotional response given the current situation or environment (Carthy et al., 2010; Schneider et al., 2018; Thompson, 1994).
- **Cognitive Regulation**--the development of a set of constructive behaviors that affect one's use of cognitive abilities to integrate learning processes. These processes are planned and adapted to support the pursuit of personal goals in changing environments. It involves the control of various mental strategies for better cognitive performance (Santosh et al., 2015).

Examples:



Sensory Regulation: A person might move to a quiet room while reading a book as a means of reducing auditory input to increase concentration.



Emotional Regulation: A toddler who is able to suppress the emotion of wanting to scream when told that it is time to leave a preferred activity such as playing at the park



Cognitive Regulation: A child who uses realizes the need to stop playing in order to take the time needed to study for tomorrow's test (being thoughtful and planning)

Self- Regulation

- [Self Regulation Video](#)
- When a child has sensory processing challenges, we may see a sensory melt-down, or dysregulation
- When a child can his/her recognize own needs, including sensory needs, they may have the ability to better self-regulate in cognitive and emotional regulation areas
- Therapists may need to be a sensory detective to help children learn more optimal self-regulation strategies



Sensory Processing Disorders

- A condition in which the brain has trouble receiving and responding to information that comes in through the senses.
- Refers to the disruption in the internal processing of the stimulation by causing motor, emotional, and other reactions that seem extreme and/or inappropriate (Bowyer & Cahill, 2009)
- As stated in the diagnostic manual for infancy and early childhood, "SPD is diagnosed based on the presence of difficulties in detecting, modulating, interpreting, or organizing sensory stimuli to an extent that these deficits impair daily functioning and participation" (Miller et al., 2005)



Social Participation and Social Competence

- Social participation refers to activities that involve social interaction with others, including family, friends, peers, and community members, and that support social interdependence (Boop et al., 2020).
- Social Participation is needed to develop social competence
- Social Competence:
 - Efficacy in interpersonal interactions (Dryburgh et al., 2020)
 - Links social skills and social outcomes
 - Social skills are behaviors that contribute to interpersonal efficacy
 - Efficacy predicts social success
- Social competence is measured with respect to key social tasks, such as responding to peer teasing or managing conflict with friends

Anxiety

Anxiety

- An emotional reaction that typically serves as a maladaptive mechanism for coping with challenging and stressful situations (Qin et al., 2014).

Anxiety disorders

- A group of disorders that include features of both excessive fear and anxiety and related behavioral disturbances.
- An emotional response to real or perceived threats is fear whereas anxiety relates to anticipation of future threats.
- Anxiety is closely associated to muscle tension and vigilance in anticipation of future danger and cautious or avoidant behaviors (American Psychiatric Association, 2013).

Sensory Processing and Anxiety

Maladaptive sensory processing has been observed among individuals with persistent heightened anxiety

Childhood SPD symptoms significantly associated with a higher likelihood of a lifetime anxiety disorder diagnosis (McMahon et al., 2019)

Difficulties with emotion regulation fully mediated the relationship between childhood SPD and any anxiety disorder in adulthood and, specifically current generalized anxiety disorder (GAD)

Some studies conducted with *healthy populations have found associations between self-reported anxiety and over-responsivity to sensory stimuli* (Kinnealey and Fuiiek, 1999; Kinnealey et al., 2011) as well as *under-responsivity* (Engel-Yeger and Dunn, 2011).

Sensory Processing and Emotional Regulation

- A person who exhibits sensory processing *sensitivity* is more prone to sensory overload leading to disrupted mood states, including both depression and anxiety (Brindle et al., 2015).
- A child that feels *overwhelmed* by sensory input when their threshold is met can demonstrate inconsistent emotional and behavioral responses (Benarous et al., 2020).
- A child with sensory processing *difficulties* may have fewer friends and peer relations, which is the context in which socio-emotional abilities develop, giving fewer opportunities for the development of social and emotional skills (Benarous et al., 2020).
- A child with sensory processing disorders may exhibit difficulties with emotional regulation (McMahon et al., 2019)
- Vestibular stimulation can promote emotional well-being and decreased stress levels, vestibular input also plays a salient role with overall well-being and arousal level (Rajagopalan et al., 2017).

Sensory Health

- The experience of being human is embedded in the sensory event of everyday life." (Dunn, 2001)
- Comfort level we have “living in our own skin”.....impacts our physical and emotional health
- Sensory health is the bridge that connects the concepts of sensory processing and integration, self-regulation, and well-being (Cavaliere, 2021)





Sensory Profiles Across the Population

- Dean et al., (2022) found that 13% (n= 8) of autistic children, 32% (n= 28) of children with ADHD and 53% (n= 565) of children in the general population group had all 4 of their sensory processing pattern scores in the expected range (e.g., *47% of neurotypical children do not have all 4 of their sensory processing pattern scores within the expected range*).
- Additionally, 34% (n= 21) of autistic children, 22% (n= 18) of children with ADHD and **8% (n= 85) of children in the general population group had all of their sensory processing pattern scores in the “more than others” range.**
- Fewer children had all 4 scores in the “less than others” range; 2% (n= 1) autistic children, 2% (n= 2) children with ADHD and 5% (n= 52) children in the general population.

The Senses

- [Adult Lived Experience with Sensory Processing Disorder](#)
- Jennifer Allison TED talk: Adult experience of sensory processing disorder
- From 1:11-4:10

Remember
Bill?

Are you concerned with
Bill's self-regulation?
Why or why not?

Are you concerned with
Bill's sensory
modulation?

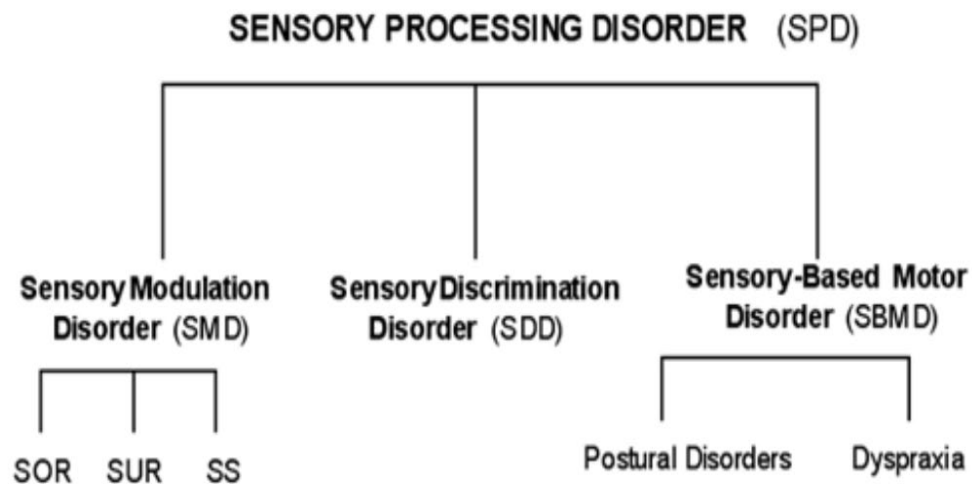


Sensory Processing Frameworks and Concepts

Sensory Differences and Needs

- Most of us can respond to sensory information in an adaptive way.
- If functional performance is limited, and sensory processing disruptions are suspected, a sensory assessment in addition to clinical observations may identify differences in sensory processing. *Differences* may be determined based on normative data.
- When a deviation from the norm occurs, experts in the field use terms such as disorders, preferences, and/or differences to describe the findings
- The literature is not uniform regarding sensory frameworks and sensory terminology although the foundational concepts are relatively similar between researchers; continuing research is necessary and ongoing
- ***A disorder is typically reserved for sensory symptoms that result in occupational limitations*** although “differences” and/or “needs” may result in avoidances, seeking behaviors, or strategies to optimize wellness and “person-environment fit”

Miller's Model of Sensory Processing Disorder



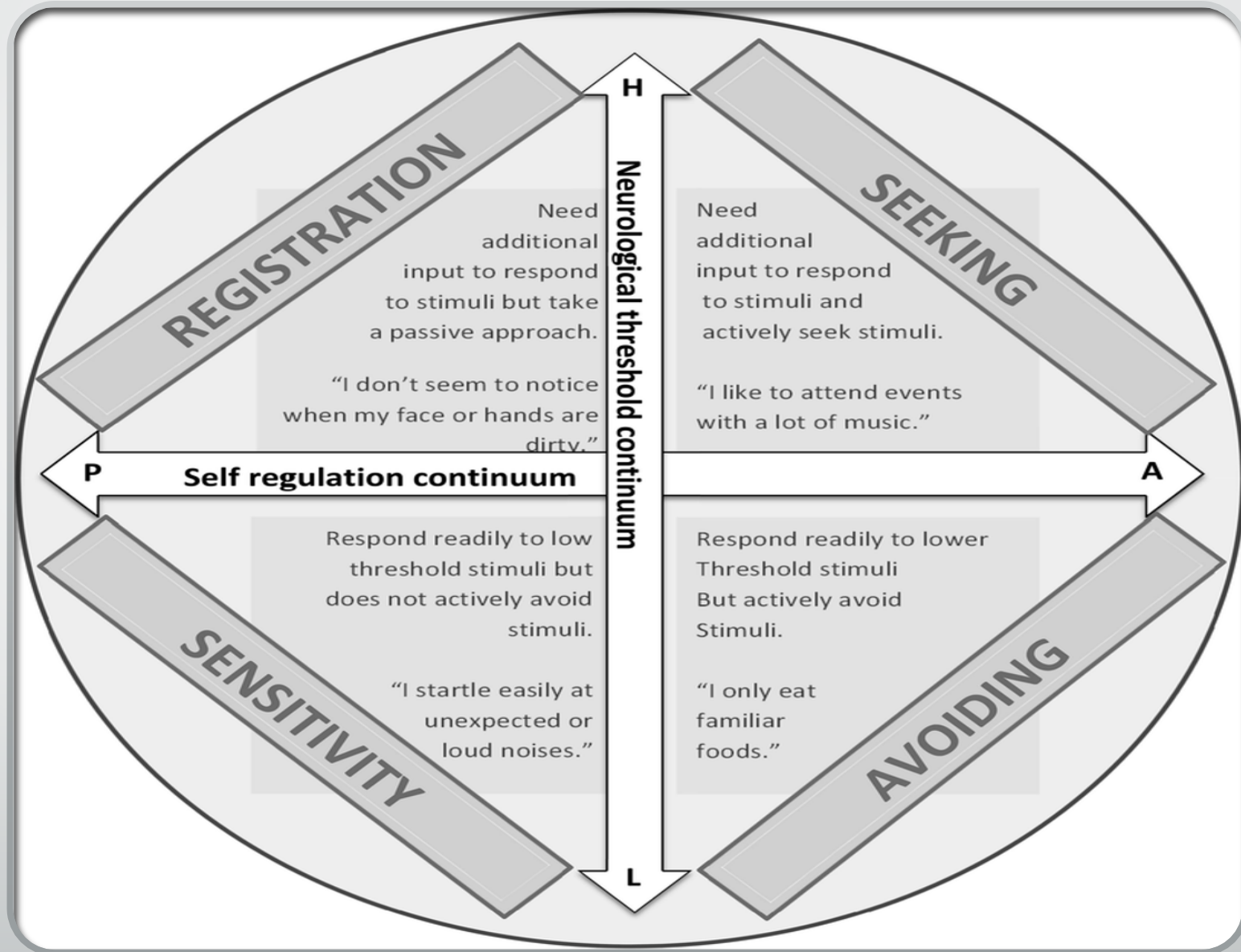
SOR = Sensory Over -Responsivity
SUR= Sensory Under -Responsivity
SS= Sensory Seeking / Craving

- Miller et al., has a 3-tiered classification system including:
 - 1. sensory modulation disorders including under-or over-responsivity and sensory seeking
 - 2. sensory discrimination problems
 - 3. or sensory based motor disorders

(Miller et al., 2007)

Dunn's Model of Sensory Processing

- Winnie Dunn, OTR/L, FAOTA (Dunn, 1997; Dunn, 2014)



Check in

The next slide includes Sensory Profile 2 test results from Gloria, a 7 year old child with no known diagnosis. The mom sought an outpatient OT evaluation due to teacher reports of the child's "impulsiveness", failure to follow directions at times, and "sloppy" schoolwork. At a recent parent-teacher meeting, the teacher stated that Gloria repeatedly ignores her request to line up after recess and often continues to swing on the playground swing. Gloria is keeping up academically although needs repeated directions to "sit" and "do her work". Mom states that Gloria has a "sweet disposition" but is always "on the go". She notes that it is a struggle to get her to do her homework. The therapist completed several assessments, one of which was the SP2.


Questions to ponder:

1. How do Gloria's results compare with Dean et al., (2022) who examined Sensory Profile scores of neurotypical children?
2. Are Gloria's school behaviors surprising given her SP 2 results?
3. Given Gloria's SP 2 results, would you be concerned for potential challenges in occupational areas such as social participation?
4. Other considerations?

			◀ Less Than Others		Just Like the Majority of Others	More Than Others ▶		
Quadrants		Raw Score Total	Percentile Range ^a	Much Less Than Others	Less Than Others		More Than Others	Much More Than Others
	Seeking/Seeker	58 /95	85-97	0-----6	7-----19	20-----47	48---X-60	61-----95
	Avoiding/Avoider	35 /100	8-86	0-----7	8-----20	21---X-46	47-----59	60-----100
	Sensitivity/Sensor	34 /95	9-86	0-----6	7-----17	18---X-42	43-----53	54-----95
	Registration/Bystander	38 /110	9-86	0-----6	7-----18	19---X-43	44-----55	56-----110
Sensory Sections	Auditory	22 /40	12-85	0-----2	3-----9	10---X-24	25-----31	32-----40
	Visual	10 /30	11-82	0-----4	5-----8	9X-17	18-----21	22-----30
	Touch	22 /55	83-96	0	1-----7	8-----21	X-----28	29-----55
	Movement	30 /40	97-99	0-----1	2-----6	7-----18	19-----24	25---X-40
	Body Position	13 /40	10-89	0	1-----4	5---X-15	16-----19	20-----40
	Oral	14 /50	8-87	**	0-----7	8---X-24	25-----32	33-----50
Behavioral Sections	Conduct	30 /45	97-99	0-----1	2-----8	9-----22	23-----29	X-----45
	Social Emotional	22 /70	9-85	0-----2	3-----12	13---X-31	32-----41	42-----70
	Attentional	15 /50	7-84	0	1-----8	9---X-24	25-----31	32-----50


^a For percentile ranges, see Appendix A in the Sensory Profile 2 User's Manual.

** No scores are available for this range.

Quadrant Definitions	
 Seeking/Seeker	The degree to which a child <i>obtains</i> sensory input. A child with a Much More Than Others score in this pattern seeks sensory input at a higher rate than others.
Avoiding/Avoider	The degree to which a child is <i>bothered</i> by sensory input. A child with a Much More Than Others score in this pattern moves away from sensory input at a higher rate than others.
Sensitivity/Sensor	The degree to which a child <i>detects</i> sensory input. A child with a Much More Than Others score in this pattern notices sensory input at a higher rate than others.
Registration/Bystander	The degree to which a child <i>misses</i> sensory input. A child with a Much More Than Others score in this pattern misses sensory input at a higher rate than others.

Sensory Processing and Social Participation

- Be overly fearful of swings and playground equipment and refrain from games with movement or body motion OR never give anyone a turn on the swing (Gloria)
- Crave fast, spinning and/or intense movement even when a game or activity would be better played with slow and less intense movement thus drawing negative attention of others (Gloria)
- Not understanding personal space even when kids the same age are old enough to understand it
- Have a constant need to touch people or textures, even when it's not socially acceptable (Gloria)
- Avoid touch and exploration of materials and objects
- Pushing in line if a child due to fear of being touched or bumped into
- Bumping into people or things or jumping or crashing into other kids (Gloria)
- Children who rock in seat, tip sit, or "fidget" in chair and distract or bother other children (Gloria)
- "Melt-downs" during assemblies or when there is a lot of movement in environment or loud noise
- Children being "picked on" due to differences or exhibiting social withdrawal behaviors



Sensory Processing Disorders, Diagnostic Groups, and Neurotypical Children

Autism Spectrum Disorders

- "Recent studies have found that children with ASD exhibit reduced parasympathetic functioning at rest compared with their peers.
- "Children with ASD have also been found to exhibit an unusual facilitation or suppression of parasympathetic or sympathetic activity upon processing sensory information. Autonomic activity is an important mediator of responses in stressful or challenging situations.
- "From a physiological perspective, suboptimal autonomic functioning may contribute to the maladaptive responses of children with ASD to daily life scenarios.
- "Therefore, it may be useful to simultaneously evaluate self-regulation behaviors and sensory information processing during activities of daily living. "
- Lai et al., 2019



Healthy Full-term and Pre-term Preschoolers

- Two groups of preschool children, 37 full-term children and 37 pre-term children (gestational age < 37 weeks), were recruited. Significant differences between the groups were found on several subsections and factors of the Sensory Processing and Self-Regulation Checklist (SPSRC-IT).
- Differences were found in the Physiological Conditions section, in the Gustatory and Olfactory Sense section, in the Vestibular Sense section, and in the Proprioceptive Sense section, with lower scores in the preschoolers who were healthy but preterm. (Prevatali et al., 2023)

An ECG (heart rate) monitor background graphic is visible on the left side of the slide, showing a grid with orange dots and a black line representing a heart rate trace. The grid is partially obscured by a blue and grey geometric shape that frames the text area.

Mental Health

- "Individuals with psychiatric disorders and low parasympathetic nervous system activity expressed higher sensory processing quadrant of sensory avoiding. Ultimately, this was associated with reduced social participation." (Hattori et al., 2023)
- Consequently, these factors (social isolation) reduce life expectancy because of an increased risk for cardiovascular and metabolic disorders (Plana-Ripoll et al., 2019).

Neurotypical Children

138 teachers of neurotypical children in South Africa completed the Sensory Profile and Conner's Behavior Rating Scale

- 81.62% of participants had **total** scores in the "typical" range on the Sensory Profile
- 14.71% of participants had total sensory system scores in the "some problems" area and 3.68% had overall total score in "definitive problems"
- 3 sensory processing systems demonstrated the highest frequencies of challenges, namely SOC, PLA and BAL . Regarding sensory responsivity, ***sensory seeking behaviors were observed more*** than other categories
- More than 25% met the criteria for atypical presentation in generalized Hyperactivity/Impulsivity and Peer Relation difficulty. Almost 50%, had one or more atypical anxiety behaviors; and one or more depressive behaviors.
- Moderate positive correlations were found to exist between sensory processing and behavior profiles, particularly SOC and PLA sensory processing systems in relation to externalizing behaviors such as Inattention, Hyperactivity, Learning Problems and Executive Functioning, and general behavior. (Paulsen, 2020)

Neurotypical Development & Sensory Concerns

- Hunter 5th grade
- Neurotypical but referred due to potential sensory based feeding concerns.
- Sensory Profile 2 completed
 - Definite Difference: avoiding, oral
 - All other sections: Just like the majority of others
- Attends middle school in general education classes

- Will only eat pizza in New Jersey
- Eat grandmother's eggs only at the beach
- Will not drink milk, but will dip Oreos
- Will only eat mega, double or golden Oreos
- No spaghetti/lasagna
- Only the middle of garlic breadsticks
- Only homemade chicken nuggets, but cooked a certain way (air fryer, not too crispy)
- Will eat the individual cups of macaroni and cheese, no shells only paw patrol noodles
- Will eat watermelon
- Will eat apples if they do not have skin on them
- Does not eat steak, pork chops, shredded chicken, hot dogs, hamburgers
- Will eat string mozzarella cheese
- Breastfed until 2; would not drink milk
- Will eat pancakes
- If he thinks he must eat something non preferred, he gets worked up, cries and gags
- Does not eat cake
- Mom made him a "birthday cake" of mozzarella string cheese



Characteristics of Hunter's Feeding Concerns

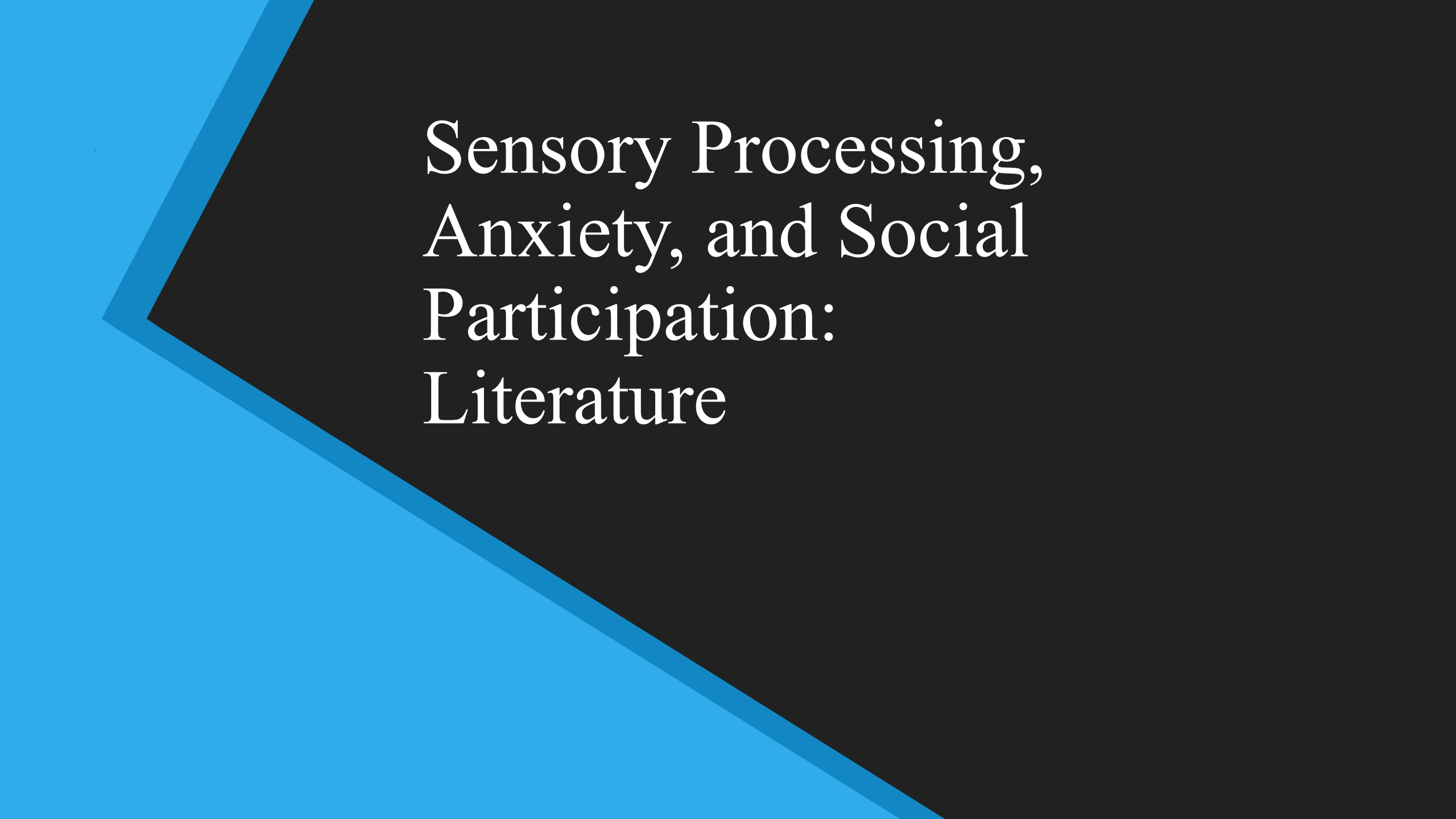
What is going on with Hunter?

Does his sensory feeding concerns impact his social participation? YES or NO

How might his sensory concerns impact his social participation?

What is important developmentally during the middle school years?

Is he showing signs of anxiety? And if so, what are they and how might they further impact his social competence?



Sensory Processing,
Anxiety, and Social
Participation:
Literature

Playground Behaviors of Children With and Without Sensory Processing Disorders (Cosbey et al., 2012)

- Play of children with SPD differs from their typically developing peers, with children with SPD engaging in less complex and more solitary play than their peers and having their play characterized by more conflict
- Children with SPD may benefit from interventions to address issues related to sensitivity to and awareness of others and interventions to develop more complex play skills, including strategies to participate in group activities

Sensory Processing Disorder and Social Participation (Cosbey et al., 2010)

Children with SPD showed greater enjoyment with play/games with less structure and less formal rules such as pretend play, crafts, drawing or coloring

Less participation in team sports

Less diverse social network for social activities, with the same or less diversity in their social networks than their peers

Social activities took place with immediate family or alone, unlike their peers, who reported more involvement with extended family and friends.

Sensory Sensitivity/Avoiding and Child Behavior Checklist

- Children demonstrating more frequent Sensory Sensitivity and Sensory Avoiding had significantly lower competence scores on the Child Behavior checklist than children with fewer behaviors in these domains, suggesting that *sensory responsiveness may impact the ability to participate successfully* (Reynolds et al., 2011).



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Tomchek and Dunn (2007) reported that over 24% of children scored above the norm on a tactile assessment (associated with sensory sensitivities).



Sensory sensitivity has been linked to feelings of distress with emotional regulation difficulties as a mediator (Brindle et al., 2015).



Self-regulation delays and tactile abnormalities were found to be related in children with autism on the Sense and Self-Regulation Checklist, a parent report (Silva & Schalock, 2013).

Sensory
sensitivity,
Feelings
of distress,
and
emotional
regulation

Sensory Over-Responsivity and Adaptive Social Behaviors

- Ben-Sasson, Carter, and Briggs-Gowan (2009) investigated Sensory Over-Responsivity (SOR) in a sample of elementary school-aged children ($n=925$, ages 7–11 years) .
- *Sixteen percent of parents reported that at least four tactile or auditory sensations bothered their children.*
- *Parents of children **with elevated SOR** reported higher frequencies of early and co-occurring internalizing, externalizing, and dysregulation problems, and **lower levels of concurrent adaptive social behaviors.***
- They concluded that Children with **specific sensory sensitivities** may experience anxiety and distress, or become distracted by the specific sensation, causing children to withdraw from peers and social situations, **becoming a risk factor for social-emotional problems.**

Sensory Processing and Anxiety in the Literature

Kinnealey et al. (2011)

- Sensory over responsiveness significantly correlated to anxiety, negatively related to social supports
- Sensory avoiding, sensory sensitivity, low registration negatively correlated to health quality of life
- 28 adults 18-60 years of age

Cervin (2023)

- Found that clients with OCD and/or anxiety experience more difficulties with sensory processing
- 213 children ages 7-18

Engel-Yeger and Dunn (2011)

- Strong correlation between sensory avoiding and symptoms of anxiety
- Adult populations

Sensory Processing and Anxiety in the Literature

Conelea et al., (2014)

- Sensory Over responsiveness occur frequently in children with anxiety
- 88 children ages 4-17

Levit-Binnum et al. (2014)

- Found that anxiety was positively correlated to sensory sensitivity, sensory avoiding and low registration
- Sensory seeking was not found to be correlated to anxiety, different from this study
- 194 college students ages 20-36

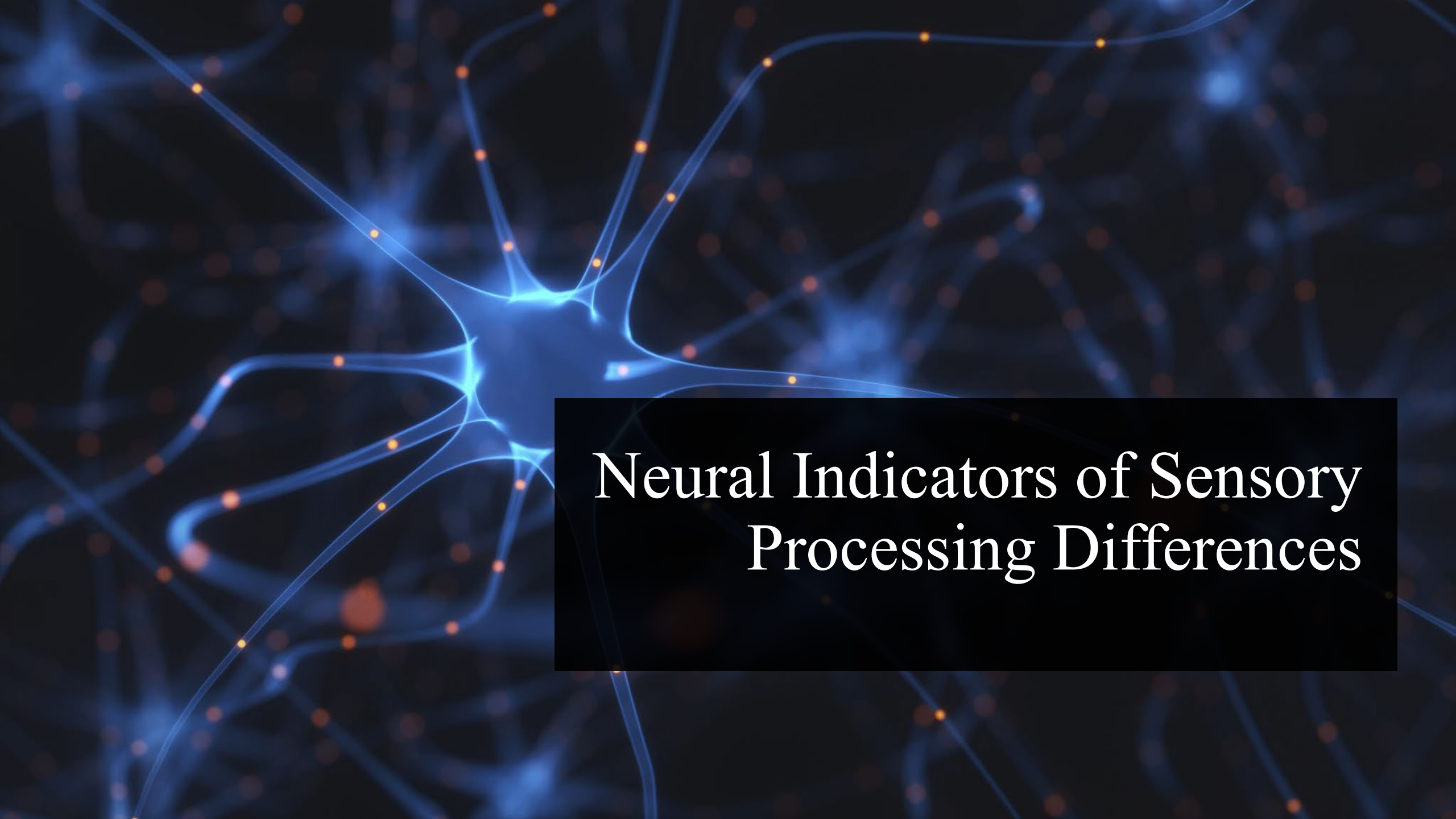
Bart et al. (2017)

- Atypical sensory responsiveness positive correlation to anxiety
- Also identified a strong relationship between sensory processing differences, anxiety and ritualistic behaviors
- 28 boys ages 5-9

Literature Review Key Take-Away's?

For Gloria? For Bill?

For your practice setting?

The background features a complex network of glowing blue lines and nodes, resembling a neural network or a data visualization. The lines are thin and translucent, with small orange and yellow dots at various points, suggesting active nodes or connections. The overall color palette is dark blue with highlights of orange and yellow.

Neural Indicators of Sensory Processing Differences

First, some information about sensory transduction

Sensory input is converted into electrical signals that our brain can interpret.

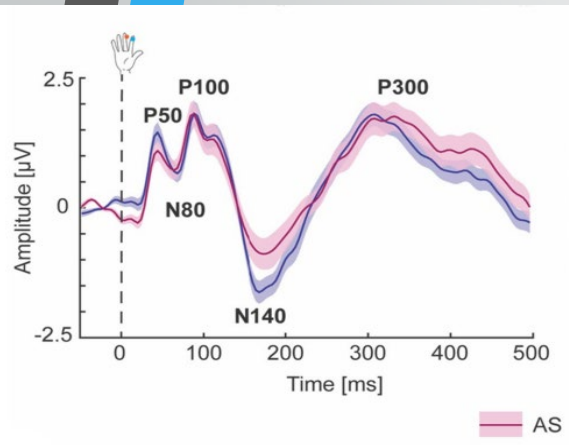
Evoked potentials can be used to determine neural response to stimulation

Both neural excitation and neural inhibition is important for adaptive function

Somatosensory evoked potentials are time-locked potentials that can be measured to determine how neurons in the somatosensory cortex respond to sensory stimuli.

Buzsaki notes “one of the key pathological changes in schizophrenia is the functional loss of inhibitory neurons expressing a protein called parvalbumin.” (Wnuk, 2021).

Some have found differences in the response properties of neurons in children with SPD (and autism among other conditions) and research is ongoing.



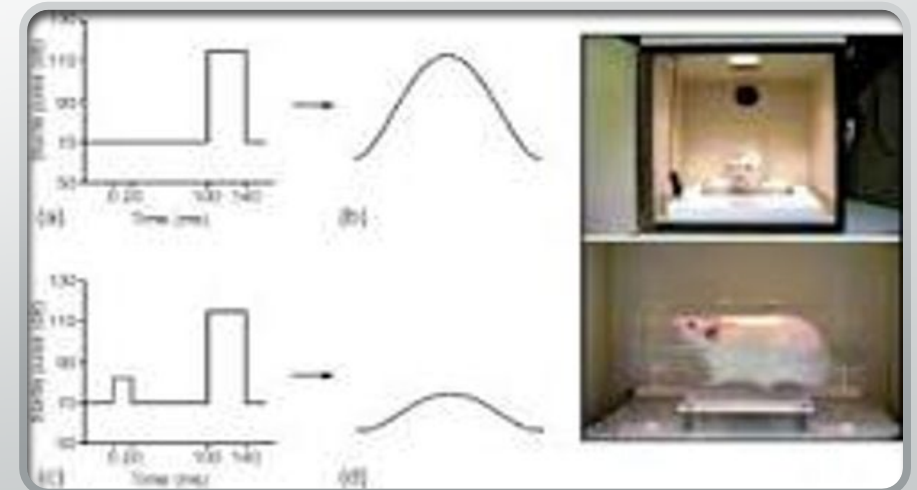
Sensory gating

- Sensory gating is a phenomenon in which the brain shows reduced evoked response to repeated stimuli

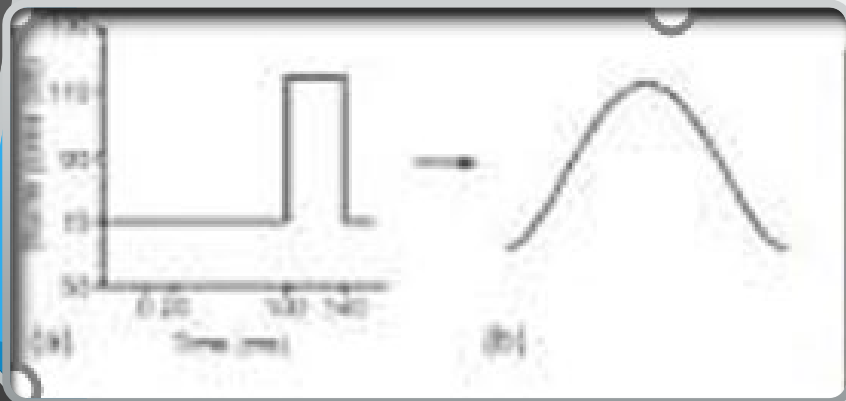
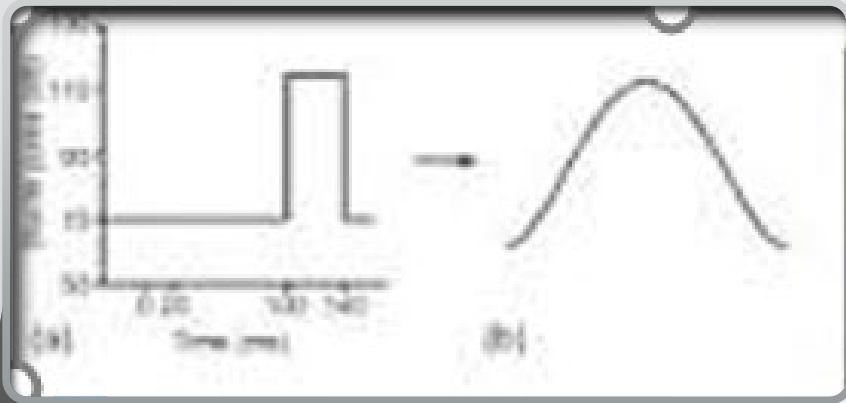
Ex: Paired-click paradigm

For normal sensory gating, if a person hears a pair of clicks within 500 ms of one another, **the person will gate out the second click because it is perceived as being redundant.**

- Evidence of the gating can be seen in the P50 wave, occurring in the brain 50 ms after the click.
- Jones et al., (2008)



Gating and Impaired Gating in Individuals with Schizophrenia



- A key cognitive symptom in patients with schizophrenia is impaired sensory gating, defined as **reduced ability to suppress processing of irrelevant and uninformative sensory input**.
- An individual responds to the repeated stimulus in the same manner as the initial presentation of the stimulus reflecting reduced suppression of sensory input
- (Frohlich, 2016)

Research continues to determine neural mechanisms underlying atypical sensory processing

“The neural mechanisms underlying atypical sensory processing function represent a fundamental unresolved question”.

Some evidence indicates that children with SPD compared to typically developing children show:

- autonomic nervous system dysregulation observed as lower vagal tone
- altered electrodermal response
- **less efficient sensory gating**

(Davies et al., 2009; Lane, 2020; Miller et al., 2021; Schneider et al., 2019)

Other indicators of impaired neural processing

- Boys (age 7–11 years) with and without autism were presented with tactile stimuli and cortical response was measured. Sensory behavior was also quantified using the Sensory Profile SP)
- Tactile behavior (measured by the Sensory Profile) directly correlated with the amplitude of cortical response
- “Boys with autism show *reduced somatosensory evoked field (SEF) amplitudes to slow stimuli* during the right-hand paradigms as early as 40ms. This finding was evident in the slow condition but not the fast stimulus presentation suggesting a rate dependent neural mechanism.
- Abnormalities in neuronal architecture are implicated in the primary sensory cortices (Casanova, Buxhoeveden, & Brown, 2002).
- This sensory processing difference may contribute to disrupted higher order processing and impact the way an individual interacts with their environment

Other results: Indicators of altered neural structure

- In a study comparing individuals with SPD and ASD, the SPD-only group showed trends for **reduced connectivity in all measured frontal tracts** (Chang et al., 2014) as well as extensive white matter reductions in most of the measured tracts.
- Reduced white matter correlated with parent report measures of atypical sensory behavior as well as with direct assessment of tactile and auditory processing (Chang et al., 2016).
- **“Striking decreases were shown in posterior-located sensory projection areas that connect the higher order and multimodal sensory regions** (Owen et al., 2013).
- UCSF brain connectivity in SPD video <https://www.youtube.com/watch?v=GrakvxuT9oc&t=29s>



Our Research

Tactile Processing and Self-Regulation

Tactile Processing and Self-Regulation in Preschoolers

Research Question:

Is there a relationship between Tactile Sensitivity (TIE) and Self-Regulation (PSRA)?

- Liotta-Kleinfeld et al., administered the TIE, a 26-item tactile self-report, and the PSRA, a direct assessment of self-regulation.
- The Pearson Correlation was used to determine relationships and the Mann-Whitney was used to determine differences.
- *Thirty nine percent of children reported tactile symptoms that fell more than one standard deviation above the mean.*
- A statistically significant relationship was found between the TIE and one subtest of the PSRA ($r=-.417$, $p=.01$).
- There were statistically significant differences on three of four tasks of the PSRA for children with and without a SPD.



Sensory Processing and Social Participation

Social Behavior (HCSBS) and Sensory Processing (SPM)

Research Questions:

1. Is there a statistically significant relationship between sensory processing and social participation?
2. Are there any statistically significant associations between specific sensory processing domains and specific social competencies or antisocial behaviors?



SPM and HCSBS

The SPM Home and Main Classroom Forms yield eight parallel standard scores:

- Social Participation
- Vision
- Hearing
- Touch
- Body Awareness (Proprioception)
- Balance and Motion (vestibular function)
- Planning and Ideas (praxis)
- Total Sensory Systems

Scores for each scale fall into one of three interpretive ranges: *Typical*, *Some Problems*, or *Definite Dysfunction*

Note: The SPM is for ages 5-12. The SPM-P is for ages 2-5.

Home and Community Social Behavior Scale: HCSBS

- Two overall scores are reported: One for social competence and one for antisocial behavior.
- There are four subscales:
 1. Peer relations
 2. Self-management/Compliance
 3. Defiant/Disruptive
 4. Anti-social/Aggressive

Demographics and Statistics

- 20 total participants in 2022 (12 male, 8 female).
- 6 participants had received prior OT services. One participant has been diagnosed with SPD.
- A Spearman correlation was used to determine the degree of correlation between the SPM and HCSBS.
- A value between 0 and 0.3 (0 and -0.3) was used to indicate a weak relationship, between 0.3 and 0.7 (-0.3 and -0.7) indicates a moderate relationship, and between 0.7 and 1.0 (-0.7 and -1.0) will indicate a strong relationship.

Correlation between total score on SPM and total score on HCSBS Social Competence and Antisocial Behavior: Statistically significant moderate relationship

			HCSBS: Social Competence (A) [Min=32, Max =160]	HCSBS: Antisocial Behavior (B) [Min=32, Max =160]
Spearman's rho	SPM Total (T-score)	Correlation Coefficient	-.607**	.542*
		Sig (2-tailed)	0.005	0.014

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
c. Listwise N = 20

SPM and HCSBS: our results

		HCSBS: Peer Relations (PR) [Min=17, Max=85]	HCSBS: Self Mngmt/Compliance (SMC) [Min=15, Max=75]	HCSBS: Defiant/Disruptive (DD) [Min=15, Max=75]	HCSBS: Antisocial/Aggressive (AA) [Min=17, Max=85]
Social Participation (T-score)	Correlation Coefficient Sig. (2-tailed)	-0.701** <.001	-0.765** <.001	0.718** <.001	0.694** <.001
Vision (T-score)	Correlation Coefficient Sig. (2-tailed)	-0.522* -0.18	-0.684** <.001	0.595** 0.006	0.536* 0.015
Hearing (T-score)	Correlation Coefficient Sig. (2-tailed)	-0.214 0.365	-0.484* 0.031	0.488* 0.029	0.185 0.436
Touch (T-score)	Correlation Coefficient Sig. (2-tailed)	-0.498* 0.025	-0.565** 0.009	0.541* 0.014	0.425 0.062
Body Awareness (T-score)	Correlation Coefficient Sig. (2-tailed)	-0.680** <.001	-0.750** <.001	0.691** <.001	0.658** 0.002
Balance-Motion (T-score)	Correlation Coefficient Sig. (2-tailed)	-0.486* 0.03	-0.621** 0.003	0.467* 0.038	0.302 0.196
Planning-Ideas (T-score)	Correlation Coefficient Sig. (2-tailed)	-0.721** <.001	-0.791** <.001	0.656** 0.003	0.536* 0.015

**Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

c. Listwise N = 20

SPM and HCSBS, con't

HCSBS Peer Relations:

- strong correlation with social participation and planning-ideas,
- moderate correlation with vision, touch, body awareness, and balance-motion
- weak correlation that was not significant with hearing

HCSBS Self-Management and Compliance:

- strong correlation social participation, body awareness, and planning-ideas,
- moderate correlation with vision, hearing, touch, and balance-motion.

HCSBS Defiant and Disruptive:

- Strong, positive correlation with social participation,
- moderate, positive correlation with vision, hearing, touch, body awareness, balance-motion and planning-ideas.

HCSBS Antisocial and Aggressive:


- moderate, positive correlation with social participation, vision, body awareness, and planning-ideas
- moderate, positive correlation that was not significant with touch and balance-motion,
- weak, positive correlation that was not significant with hearing.

SPM and HCSBS research conclusion

- An increase in total score on the SPM, indicating a greater degree of sensory differences, was found to be associated with a lower score on social competence and an increased score on defiant or antisocial behaviors.
- In relation to specific domains of sensory function, Body awareness and Planning/ideas (praxis) were moderately to strongly associated with all areas of the HCSBS.
- **Summary:** *As challenges in body awareness and planning/ideas increased, the score on antisocial behaviors also increased whereas the score on social competence decreased.*



Examining the Relationship Between
Sensory Processing Differences and
Symptoms of Anxiety



**Sensory
Processing
Differences and
Anxiety
Research**

Everyone has a sensory system

Identified relationship in the clinical setting

Coping strategies are important in both sensory processing differences & anxiety

Both diagnoses may produce emotional dysregulation

Sensory Processing and Anxiety: Why is the connection important?

5-16% of school-aged children diagnosed with SPD

May cause difficulties with intellectual and social development

7.1% of children in the US diagnosed with anxiety

Anxiety the earliest occurring mental health disorder around the age of 6 leveling off at ~12

31% of adolescents meet the diagnostic criteria for anxiety disorder

Positive relationship between reported childhood symptoms of SPD and adult diagnosis of GAD



Sensory processing difficulties & occupational engagement

Symptoms of anxiety & occupational engagement

Children & adults experience sensory processing difficulties & anxiety

Sensory processing difficulties in childhood
& adult anxiety diagnoses

Sensory processing difficulties & anxiety &
emotional dysregulation.

Emotional dysregulation & meaningful
participation

Participants

Population children between the ages 8-12 without or without a diagnosis

Sample consisted of 59 males and females

Male ($n=37$) 55%

Female ($n=21$) 31%

1 participant chose to not answer question regarding gender

Description of Sample

Table 1			
Age Distribution			
Age (yrs)	n		%
8	12		17.9
9	14		20.9
10	6		9.0
11	16		23.9
12	11		16.4

Table 2			
Grade Level Distribution			
Grade	n		%
1 st	2		3.0
2 nd	8		11.9
3 rd	13		19.4
4 th	8		11.9
5 th	11		16.4
6 th	13		19.4
7 th	4		6.0

Race and Ethnicity Distribution

Table 3

Race/Ethnicity Distribution

Race/Ethnicity	n		%
African American	4		6.0
Asian	4		6.0
Caucasian	46		68.7
Hispanic	3		4.5
Other	1		1.5
Prefer Not to Answer	1		1.5

Description of Sample

Reported Sensory Processing Disorder
($n=44$) 55.2%

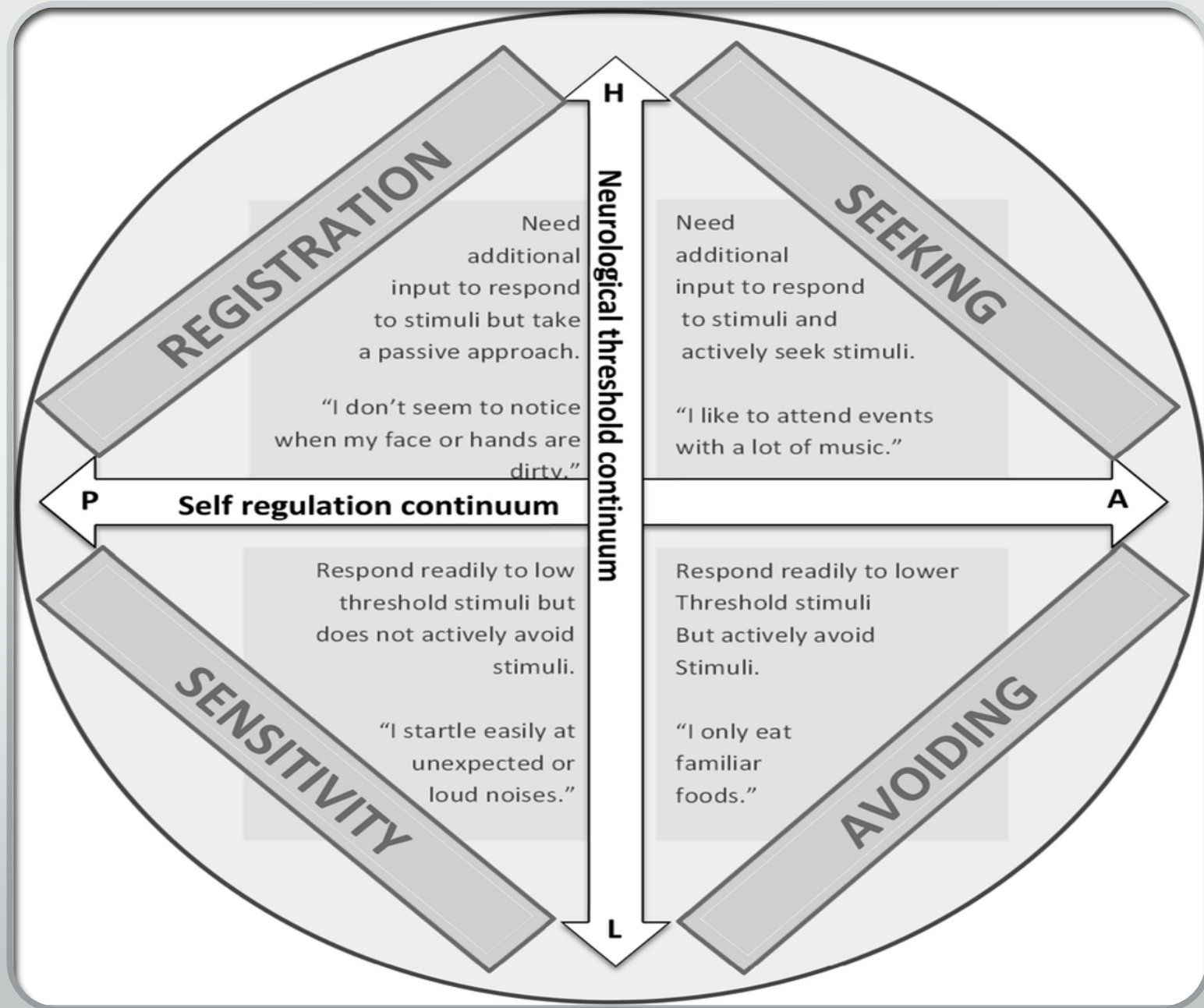
Reported Anxiety Diagnosis ($n=19$)
28.4%

Alternate Diagnosis ($n=24$) 35.8%

- Autism Spectrum Disorder
- Attention Deficit Hyperactivity
- Learning Disability
- Burnside Butlers Syndrome
- Developmental Delay
- Intellectual Disability
- Amblyopia
- Obsessive Compulsive Disorder
- Bipolar Disorder
- Vocal and Motor Tics
- Cerebral Palsy

Dunn's Model of Sensory Processing

- Winnie Dunn, OTR/L, FAOTA (Dunn, 1997; Dunn, 2014)



Sensory Seeking and Symptoms of Anxiety

- The comparison indicated that as sensory seeking behaviors increased, symptoms of anxiety increased.
- $r(57) = .43, p < .001$
- Moderate to strong correlation in the relationship.

Sensory Seeking and Anxiety Scores		
	M	SD
Sensory Seeking Score	3.31	0.97
Anxiety Score	45.73	13.23

Sensory Avoiding and Symptoms of Anxiety

- Positive strong relationship between the variables
- $r(57) = .58, p < .001$
- These findings show that as sensory avoiding behaviors increase so does the prevalence of symptoms of anxiety.

Sensory Avoiding and Anxiety Scores		
	M	SD
Sensory Avoiding Score	3.49	0.92
Anxiety Score	45.72	13.23

Registration and Symptoms of Anxiety

- The comparison analysis indicated that as registration scores increased, symptoms of anxiety increased.
- $r(57) = .38, p < .01$
- Moderate correlation in the relationship.

Registration Variants and Anxiety Scores

	M	SD
Registration Score	3.57	1.00
Anxiety Score	45.72	13.23

Sensory Sensitivity and Symptoms of Anxiety

- The comparison indicated that as sensory sensitivity behaviors increased, symptoms of anxiety increased.
- $r(57) = .46, p < .001$
- Moderate to strong correlation in the relationship.

Sensory Sensitivity and Anxiety Scores		
	M	SD
Sensory Sensitivity Score	3.56	0.98
Anxiety Score	45.73	13.23

Summary of Findings

- Significant relationships were found at the 0.05 significance level meaning that results were not found by chance
- Hypothesis partially supported
 - Sensory avoiding behaviors positively correlated to symptoms of anxiety
 - Sensory sensitivity positively correlated to symptoms of anxiety
 - Low registration positively correlated to symptoms of anxiety
 - Sensory seeking behaviors positively correlated to symptoms of anxiety, opposite of hypothesis
- Results indicate that individuals with sensory processing differences will also present with more symptoms of anxiety

A microscopic image of plant tissue, likely a cross-section of a stem or root, showing various cellular structures. The image is partially obscured by a blue and grey graphic element on the right side of the slide.

Summary of findings

- Few studies have examined the relationship in children
- Youth Anxiety Measure has not been utilized for type of correlation with sensory processing, correlates with DSM-5
- Findings supported by several studies although different age groups, all utilized the SP2

Implications for Practice

When addressing sensory processing differences also teach coping skills

Empower a child with insight into their sensory makeup including management of internalized symptoms

Children who do not have a diagnosis of sensory processing differences or anxiety need to be taught effective ways to regulate sensory input and symptoms of anxiety

Practitioners should be regularly teaching and implementing strategies that address both sensory processing skills and coping skills.

Conclusion

Sensory processing differences are related to symptoms of anxiety in children ages 8-12

Impact emotional regulation & non-social behaviors impacting a child's quality of life

May impact ability to engage in play

Play is the primary occupation of a child

Through play social skills, emotional regulation, sensory processing and motor skills develop

A child must be able to appropriately engage in play activities for growth and development to occur in a natural sequence



Research: Your turn!



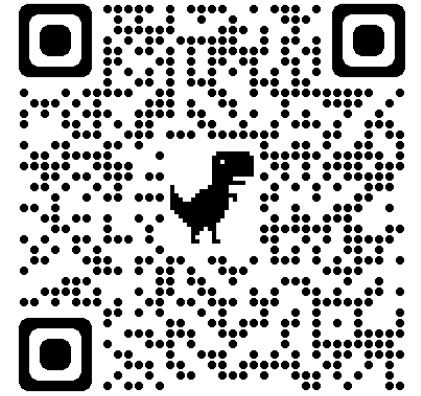
Assessment and Intervention: Evidence- Based Research

Assessing Sensory Processing



Evaluation In Ayres Sensory Integration

- <https://www.cl-asi.org/easi>
- 20 Standardized tests designed for children 3-12
- Measures comprehensive aspects of sensory integration
- Low costs-print your own test sheets and forms
- Online scoring and color-coded reports
- Tests core concepts of Ayres Sensory Integration
- Comprehensive, reliable, and valid assessment is essential for individually tailored, appropriate, and effective intervention planning and implementation



Sensory Processing Measure SPM-2

- The SPM examines sensory issues, praxis, and social participation of elementary school children aged 5 through 12.
- The SPM-P examines sensory processing in children ages 3-5
- The SPM - Home Form and SPM - Main Classroom Form were standardized on a sample of 1051 typically developing children aged between 5 and 12 years.
- SPM is a set of three integrated rating forms assessing sensory processing, praxis, and social participation at home, at school, and in the community. Raters of the SPM have to observe the child in the environment being rated for at least one month, but the child does not need to be present.

Sensory Profile-2

- Dunn's Model of Sensory Processing
- The Sensory Profile is a norm-referenced assessment used to identify sensory processing patterns and comprehend the impact of different sensory processing patterns on functional performance.
- 9 Domains: Auditory, Visual, Touch, Movement, Body Position, Oral Sensory, Conduct, Social Emotional, and Attentional
- Obtain scores in the quadrants: Registration, Seeking, Avoiding, Sensitivity
- Paper or electronic
- Infant, Toddler, Child, Adolescent/Adult
- Likert Scale: Much Less than Others, Less than Others, Like the Majority, More than Others, Much More Than Others



Sensory Processing and Self-Regulation Checklist (SPSRC)

SPSRC (Sample Items)

Part 1: Self-Regulation Ability

- A.Physiological
- (5) The child becomes nervous about minor issues
- (6) The child has difficulty with self-control, behaves impulsively
- (2) When playing games or doing homework, the child finds it difficult to reengage in the previous activity after being interrupted
- (7) When situated in a new environment or facing challenges, the child cries if left there or hurts himself/herself (e.g., head bumping, hand biting, and hair pulling)
- (9) When situated in a new environment or facing challenges, the child hides or turns his/her face away and does not try or participate in the activity

Part 2: Sensory Processing Ability

- (6) When hearing a sudden sound (e.g., announcement at a railway station, air dryer), the child becomes nervous or anxious, covers ears with hands or makes complaints
- (11) The child seeks auditory stimulation by making loud sounds (e.g., speaking loudly, banging toys heavily)
- (8) The child feels uncomfortable, becomes nervous or anxious, covers the eyes with hands, or makes complaints about flashing lights (e.g., neon lights, Christmas lights)
- (10) The child seeks visual stimulation by gazing at the lights for a long time
- (3) The child leans on the wall or furniture when standing
- (7) The child loves to perform activities that require pushing and pulling

BRIEF <https://www.parinc.com/products/pkey/24>

BRIEF®2 Self-Report Score Summary Table

Index/Scale	Raw score	T score	Percentile	90% C.I.
Inhibit	13	56	77	50-62
Self-Monitor	7	51	71	44-58
Behavior Regulation Index (BRI)	20	54	73	49-59
Shift	12	55	73	49-61
Emotional Control	10	59	85	52-66
Emotion Regulation Index (ERI)	22	57	78	52-62
Task-Completion	14	64	91	58-70
Working Memory	16	66	94	60-72
Plan/Organize	21	64	92	59-69
Cognitive Regulation Index (CRI)	51	66	93	63-69
Global Executive Composite (GEC)	93	62	84	59-65

Validity scale	Raw score	Percentile	Protocol classification
Negativity	0	≤ 98	Acceptable
Inconsistency	1	≤ 98	Acceptable
Infrequency	0	99	Acceptable

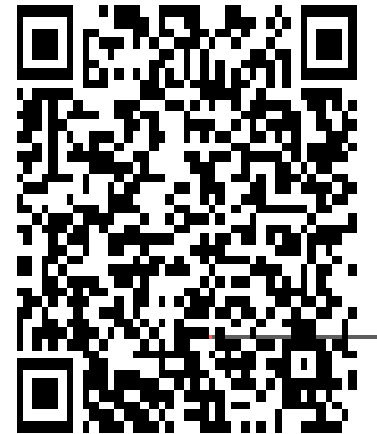
Note: Male, age-specific norms have been used to generate this profile.

For additional normative information, refer to Appendix C in the BRIEF®2 Professional Manual.

Check In

What assessments have you used, or do you currently use to assess sensory processing, self-regulation, and social participation ?

Do you assess any aspects of anxiety, and if so, what assessments do you perform or how do you do this?





Intervention

Moderate to Strong Evidence

- In a systematic review by Lane, 2020, *Journal of Child Psychology and Psychiatry* 61:9 (2020), pp 943–958, she reports moderate to strong evidence for:
 1. **Massage:** Qigong sensory treatment (QST), a massage protocol developed and studied by Silva and colleagues (Silva & Schalock, 2013; Silva et al., 2009, 2011, 2015) was found to have strong evidence for children with ASD. [Qigong Massage Example](#)
 2. **Environmental Modification for Dental Procedure:** provided adaptations to auditory and visual environments and use of deep pressure via a weighted wrap. Outcomes included significant improvements in child-reported measures of pain intensity and sensory discomfort for children with ASD and those who were typically developing.
 3. **Ayres Sensory Integration (ASI):** Mixed results for SI (fidelity has been an issue) has been found but the evidence for ASI is emerging as moderate to strong.

Ayres Sensory Integration

- "There is emerging evidence supporting the effectiveness of ASI for children with sensory symptoms.
- Systematic reviews that have focused exclusively on studies, where ASI has been provided in a manner consistent with the published fidelity guidelines, have concluded that strong evidence exists for the positive impact of ASI on functional performance (Schaaf et al., 2017; Schoen et al., 2019).
- Further, there is moderate-level evidence supporting the efficacy of ASI in reducing caregiver burden in relation to supporting children's self-care performance (Schaaf et al., 2017).
- The evidence supporting the impact of ASI on children's sensorimotor and social skills is, however, weak.

Lane, 2020, *Journal of Child Psychology and Psychiatry*, 61:9 (2020), pp 943–958

Ayres Sensory Integration

- Video? Start at 15.25-20:00 <https://www.youtube.com/watch?v=cyDjt-s7RUs>
- Not "passive" sensory stimulation
- What are examples of passive stimulation?
- What are examples of Ayres Sensory Integration?

Examples of Sensory Passive Activities vs. Ayres Sensory Integration

- **Sensory Passive Activities**

- Wearing noise canceling headphones
- Sensory brushing
- Turning down the lights

- **Ayres SI**

- Creating a train out of heavy wood boxes for a child to push (interest in trains)
- Completing an obstacle course having the child to suggest particular activities such as crash pads, swings etc (interest in ninja activities)
- Climbing rock walls and ladders while carrying heavy pack on back (interest in firemen)

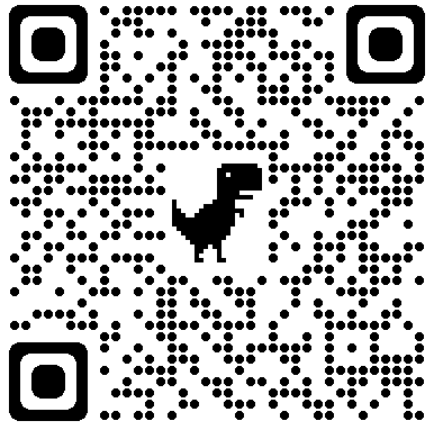
Other Interventions in Schools: Cognitive, Task-based, etc..

- There is **moderate-level evidence** to support the use of cognitive strategies such as the **Alert Program** and **Social Stories** to improve self-regulation skills in children and adolescents with sensory symptoms (Pfeiffer, Clark, & Arbesman, 2017) Alert program
- Promising evidence for iPad-based perceptual discrimination and visuomotor training, **EVOTM**, on parent and EEG measures of attention in children with both sensory and attention difficulties (Anguera et al., 2017)

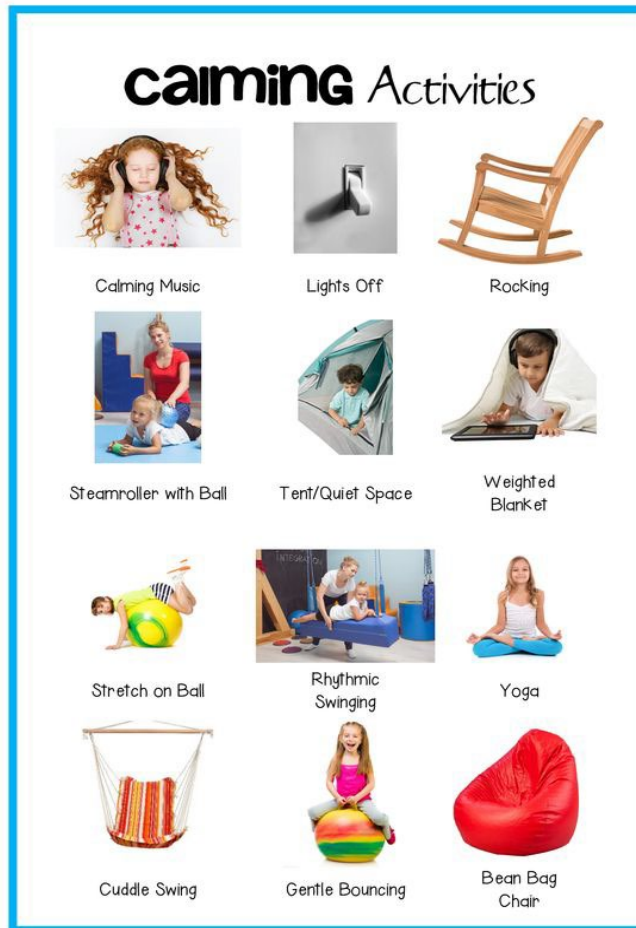
Alert program

Alert Program (Williams & Shellenberger, 1996)

“How Does your Engine Run”:
Children learn about self-regulation
when talking about their “engine”
going into high, low, or just right
gears



- Barnes et al. (2008) tested the effects of the ALERT program and showed slightly increased self-regulation in children with emotional disturbance.





Let's Get Alert

Alerting Activities

- Sour Candy
- Cold Drink
- Crunchy Chips

Calming Activities

- Sucking on hard candy
- Chewing on taffy
- Hot Drink

Social Stories: Benefits

- prosocial behavior
- social communication
- conversational skills
- on-task behavior
- out-of-seat behavior
- reciprocal interactions
- decreasing "socially inappropriate and undesirable behaviors
- acceptable verbal greeting initiations
- self-regulation
- overall social skills
- Social stories seem to be a promising practice that warrants future research. (Saad, 2016)

Social Story: Video Development

Students created a video in which they played the "actors" in a video about "thinking" before "talking" in relation to saying things that might hurt someone's feelings.

Scenario: Alessandra gets a gift from Serena that she doesn't like, she hurts Serena's feelings by telling her that. Alessandra needs to keep not-so-nice thoughts inside, so she doesn't upset other people. When she tries again, she pauses a second and wonders: Should I Think it or Say it?

- <https://www.youtube.com/watch?v=NLM2BuW73m4>



Some but Limited Evidence or Insufficient Evidence

- Weighted vests
- Wilbarger brushing protocol
- Sensory environmental modifications (although strong results for modification as conducted in dental environment study)
- Multi-sensory environment approaches (e.g., Snoezelen rooms)
- Slow linear swinging
- (Lane, 2020, *Journal of Child Psychology and Psychiatry*, 61:9 (2020), pp 943–958)

Self Regulation

- [Zones of Regulation](#) (Kuypers, 2011)
- Teaches self-regulation by categorizing ways one “feels” and states of alertness into four concrete zones
- Improved self-regulation skills in kindergartners, decreased behavioral referrals, increased time on task (Yack, 2015)



Sensory grounding/ Emotional regulation activity



5 things you can SEE

4 things you can HEAR

3 things you can TOUCH

2 things you can SMELL

1 emotion you FEEL

- From <https://www.teacherspayteachers.com/Product/5-4-3-2-1-Sensory-Regulation-9372128?st=f0d43a80ed3b0396096ce5cbcf44d00d>
- Mindfulness based activity connecting one with the here and now bringing your thoughts to the present moment

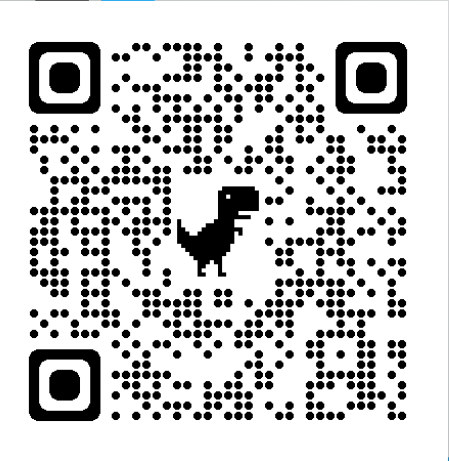
Yoga & Mindfulness

- Artchoudane (2019) found in a detailed systematic review of yoga improves attention, Pranayama practice enhances central processing ability; yoga improves sensory integration, motor imitations, communications, and their own thoughts and behaviors related to physical, social, and emotional well-being.
- Pfeiffer et al. (2017) identified one study that reported positive outcomes of yoga for emotion regulation and self-soothing for this group
- Yoga and other mindfulness techniques have ongoing interest although few studies, few studies have examined impact on individuals with sensory symptoms.



The School Yoga Project

Little Flower Yoga-<https://www.littlefloweryoga.com/the-school-yoga-project>





The process of being aware



Awareness of what is happening in the moment



Noticing and paying attention to thoughts, feelings, behaviors, and movements

Mindfulness
(Harper, 2014)



Benefits of Mindfulness (Harper, 2014)

- Better focus & concentration
- Increased sense of calm
- Skillful responses to difficult emotions
- Enhanced health
- Increased self-awareness
- Increased empathy and understanding of others
- Improved impulse control
- Decreased stress and anxiety
- Development of natural conflict resolutions skills

6 Simple MINDFULNESS Activities for your Classroom

BELLY BREATHING

Centervention has a complete lesson plan you can use on belly breathing. You will find everything from pre and post discussion questions to step-by-step directions. It is a wonderful activity for when students need to cool down and self-regulate.



CALMING CORNER

Calming corners can help reduce students' stress and provide calming visual, auditory, and tactile experiences for de-stressing. A calming corner can be a physical corner in your classroom or a virtual space.



BRAIN BREAKS

Brain breaks are activities, or short breaks, that promote learning and focus for students. These types of breaks involve students participating in activities like mindful breathing, mindful movements, and mindful yoga.



MINDFUL JOURNALING

Three Good Things: A Happiness Journal is a free app that can help students with mindful journaling by having students write down three good things that happen to them each day. As a result, their happiness and positivity increase.



BREATH, THINK, DO

The free **Breath, Think, Do** app through Sesame Street is great for introducing young children to calm through breathing. Children help an animated monster facing a frustrating situation calm down by taking long, deep breaths.



SMILING MIND

Smiling Mind is a free app that offers hundreds of mindfulness activities. In addition to breathing meditations, the app has sensory exercises, like listening to music. There are programs for kids in different age groups, as well as for schools, workplaces, and sports.





Let's Practice a Mindful
Activity

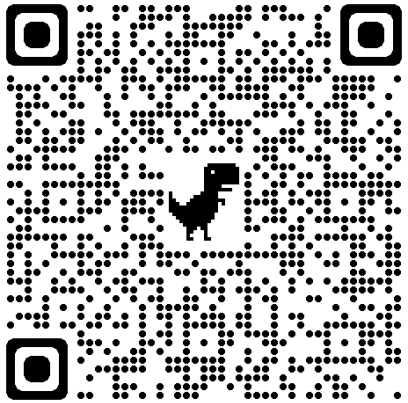


Teaching Self-Regulation with Cognitive Strategies and Modeling

<https://www.youtube.com/watch?v=UD9m5n-ZpB0>

100 Classroom Sensory Strategies

- https://sensoryprocessing101.com/wp-content/uploads/2017/12/100-Classroom-Sensory-Strategies.pdf?_s=ktjmzfbgez9owndq66fz
- What do you use in the classroom setting?



Jackson 1.11-year-old

- Sensory Profile 2 results on following slide
- Family from India
- No verbal communication; currently paying out of pocket for speech
- Was in daycare, but would not eat foods at daycare, daycare would not allow family to bring cultural food in, lost weight, took out of daycare
- Mom stays at home 3 days with him, brought dad's parents from India for 6 months to help care for him
- TV is never on until recently and only during mealtime and he eats better
- Parents do not want him to watch tv at all
- Taking Jackson to India for 2 months to receive therapy, US health care system difficult to navigate
- Daycare for socialization since he is an only child & no verbal language

Bringing mom's parents back for 6 months to help with childcare

Cried all day at daycare would not give him water, vomits when crying

Likes to throw toys

Does not pay attention to books

Unable to point to simple body parts

Difficulty with controlling emotions

Will touch grass/mud

Does not tolerate brushing teeth or trimming nails or hair cuts

Limited texture tolerate for foods will only eat 5 things without the tv on

Will tolerate rice, pasta, noodles, broccoli, and chicken with tv on

Will eat cheetos, crackers and chic fil a fries as well

Rolls balls and cars as preferred play

Putting it together:

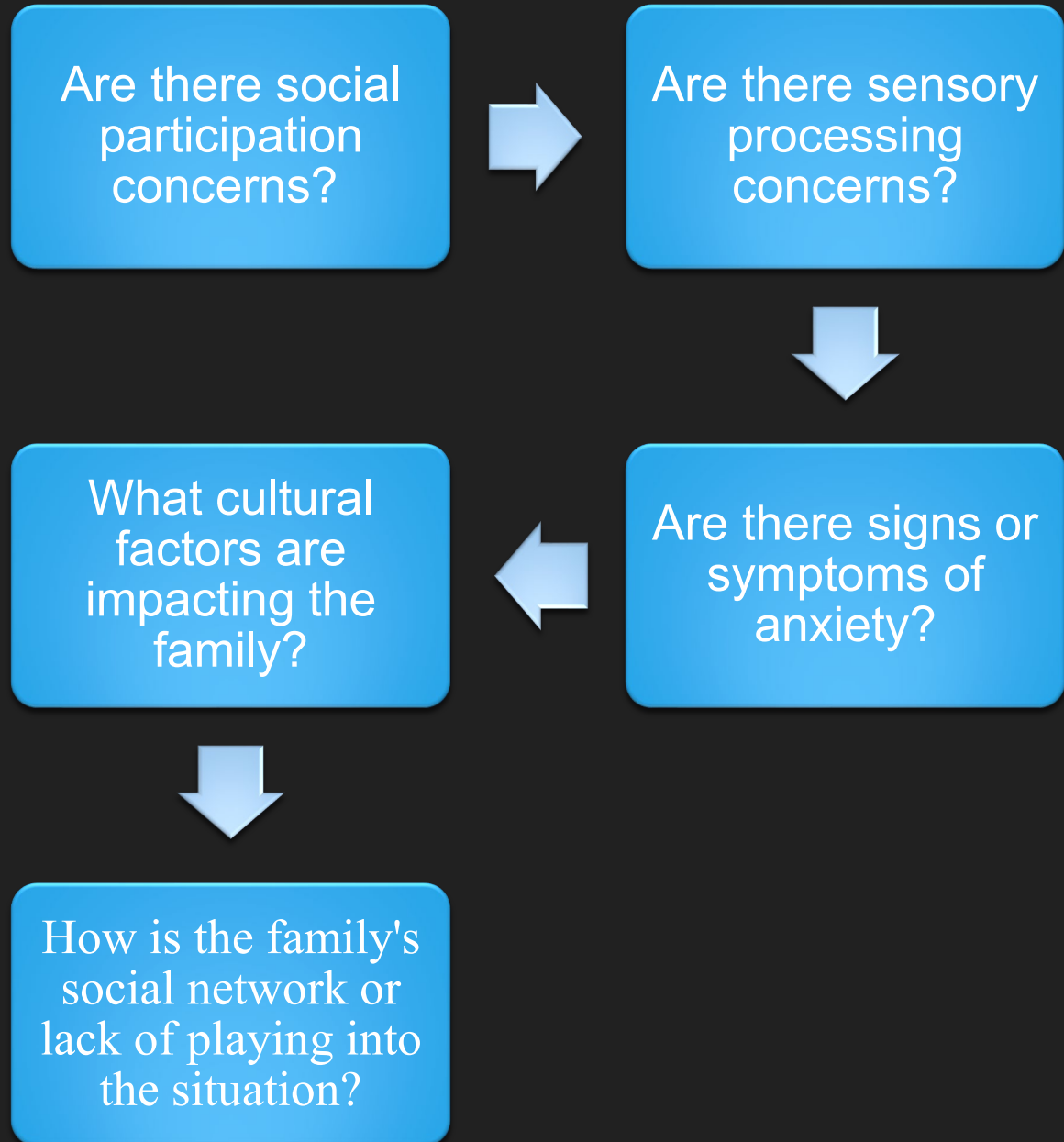
SCORE PROFILE

	Much less than others	Less than others	Just like the majority of others	More than others	Much more than others	
Quadrant						
Seeking/Seeker	0—17	18—22	23—33	34—35	**	██████ is just as interested in sensory experiences as the majority of others
Avoiding/Avoider	0—5	6—10	11—21	22—26	27—55	██████ is more likely to be overwhelmed by sensory experiences than others
Sensitivity/Sensor	0—6	7—12	13—27	28—34	35—65	██████ detects more sensory cues than others
Registration/Bystander	0—3	4—9	10—21	22—26	27—55	██████ misses many more sensory cues than others

** No scores are available for this range.

	Much less than others	Less than others	Just like the majority of others	More than others	Much more than others	
Sensory Section						
GENERAL Processing	0—5	6—10	11—22	23—27	28—50	██████ responds more than others to changes in routines and schedules
AUDITORY Processing	0—2	3—5	6—14	15—17	18—35	██████ responds much more to sounds than others
VISUAL Processing	0—5	6—10	11—19	20—24	25—30	██████ responds to sights just like the majority of others
TOUCH Processing	0—1	2—5	6—13	14—16	17—30	██████ responds more to touch than others
MOVEMENT Processing	0—9	10—12	13—20	21—23	24—25	██████ responds to movement just like the majority of others
ORAL SENSORY Processing	0—1	2—5	6—15	16—19	20—35	██████ responds more than others to items in or around the mouth
Behavioral Section						
BEHAVIORAL responses associated with sensory processing	0—3	4—6	7—14	15—17	18—30	██████ exhibits behaviors associated with sensory processing just like the majority of others

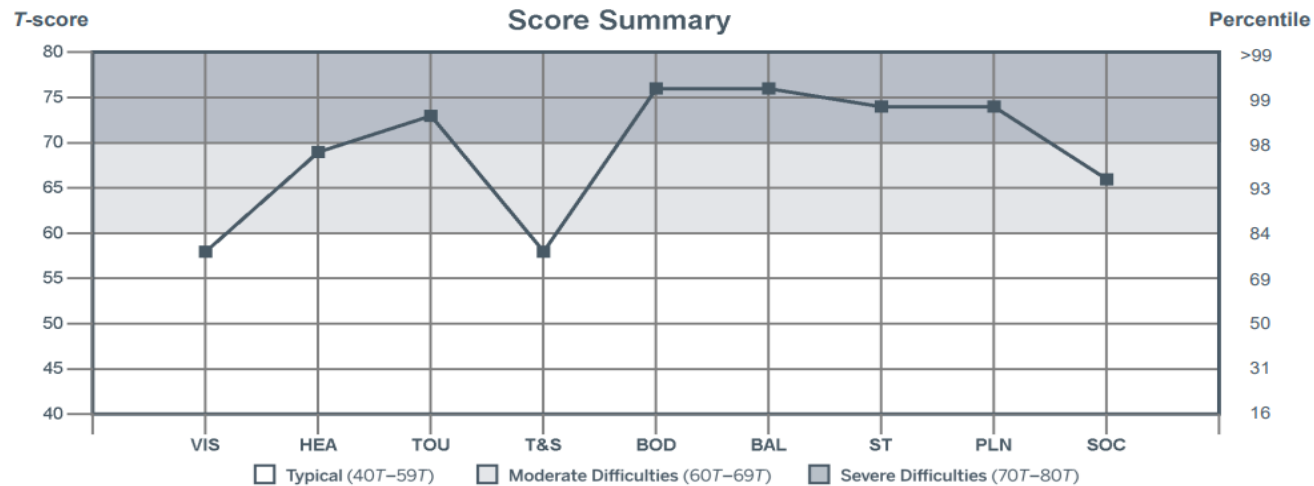
Putting it all Together



Name of child being evaluated	Gender	Date of birth	Date of testing	Age
Olivia Sample	Female	10/04/2016	03/15/2021	4 years 5 months
Preschool/Day care/Agency	Date of processing			
Sample School	06/24/2021			
Rater's name	Rater's relationship to child being evaluated			
Andrea	Mother			

	VIS	HEA	TOU	T&S	BOD	BAL	ST	PLN	SOC	
Raw score	19	29	34	16	39	28	165	36	29	Raw score
T-score	58	69	73	58	76	76	74	74	66	T-score
%ile	79	97	99	79	>99	>99	99	99	95	%ile
Interpretive range	Typical	Moderate Difficulties	Severe Difficulties	Typical	Severe Difficulties	Severe Difficulties	Severe Difficulties	Severe Difficulties	Moderate Difficulties	Interpretive range

VIS = Vision; HEA = Hearing; TOU = Touch; T&S = Taste and Smell; BOD = Body Awareness; BAL = Balance and Motion; ST = Sensory Total; PLN = Planning and Ideas; SOC = Social Participation



SPM-2 Quick Tips™

Diana A. Henry, MS, OT/L, FAOTA

Name of child being evaluated	Gender	Date of birth	Date of testing	Age
Olivia Sample	Female	10/04/2016	03/16/2021	4 years 5 months
Preschool/Day care	Date of processing			
Sample School	06/28/2021			
Rater's name	Rater's relationship to child being evaluated			
Ms. Wilson	Preschool Teacher			

SPM-2 scale	SPM-2 item number	SPM-2 item	Dimension	Objective	SPM-2 Quick Tip number	SPM-2 Quick Tip
Hearing	14	Hums, sings, or yells during class time.	Sensory seeking	2,4	2609	Determine if a rocker board, T-stool, Movin' Sit, "concentration cushion," peanut ball, or ball chair is helpful. Go over the rules with the child. (<i>Tool Chest</i>)
Touch	28	Enjoys squeezing body into small spaces.	Sensory seeking	1,2,6	2663	Provide frequent opportunities for maintained-touch pressure: big hugs; having the child lie under large beanbag chairs; playing the "Hot Dog Game" with the child wrapped in a towel and the adult spreading "mustard" or "ketchup" on top using long, firm strokes along the back. (<i>Tools for Students</i>)
Balance and Motion (movement, vestibular)	53	Is fearful of movement, such as riding swings or slides.	Over-reactivity	1,4	2376	Change activities slightly, such as changing position from standing to sitting, kneeling, or quadruped; changing surface type; or changing movement speed.
				1	2762	Encourage the child to run and climb while on the playground.
Planning and Ideas (praxis, motor planning)	61	Has trouble coming up with new ideas during play activities.	Ideation	1,6	0833	Develop an obstacle course, with each child completing one part of the course.
Planning and Ideas (praxis, motor planning)	62	Does familiar activities over and over, rather than trying new activities.	Ideation	1,6	2461	Play "Let's Pretend" and "Dress-Up" games.
				2,4	2784	Gradually expand on the games they currently play: <ul style="list-style-type: none"> • If they always play doctor, have them try playing veterinarian or firefighter. • If they always play with blocks, have them try building using pots and pans or pillows and cushions.

Treatment ideas: Sensory Supports for Social Participation in Schools

Considerations (a few):

- **Responsiveness** (may respond to stimuli that others barely seem to notice) or under-responsiveness (may need longer duration or intensity of input for response)
- **Triggers and timing** (what impacts child's arousal state in a negative manner? Consider strategies before, during, and/or after "triggering" activities to aid coping and function).
- **Preferences** and motivation (what are child's sensory preferences)
- **Safety** considerations
- **Provide** sensory opportunities and foster active involvement, especially in vestibular, tactile, prop domains
- **Strategies** to promote self-regulation
- [Essential Characteristics of OT Using Sensory Integration Intervention \(sensoryproject.org\)](https://sensoryproject.org)

Thank you for attending! Questions?

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