Understanding Children's Behaviors From a Sensory Processing Perspective

Sensory Processing Disorder

- Theory originated by A. Jean Ayers, PhD, in the 1960's
  - Neurological process by which the brain receives, registers, and organizes sensory information allowing one to meet demands from oneself, the environment, others
    - Sensory Integration Dysfunction
- Lucy Jane Miller, PhD, OTR, FAOTA is a leading research scientist currently studying in this field at the Sensory Therapies and Research (STAR) Center in Denver, Colorado
  - Sensory Processing Disorder
- The past ten years has seen an explosion of research into sensory processing, focusing on using objective measures such as electroencephalography (EEG) which registers cortical neuronal activity (Gavin et al., 2011) instead of observed behaviors alone

Basic Science Overview

- CNS - Made up of spinal cord and brain which monitors and regulates information
- Connected to areas outside the spinal cord and brain by the Peripheral nervous system (PNS)
  - PNS made up of two systems, the somatic nervous system (SNS) and Autonomic Nervous System (ANS).
    - SNS controls voluntary movements and reception of sensory stimuli (hearing, touch, vision, etc.) through sense organs.
    - ANS controls involuntary movements
      - Prepares body to deal with perceived threats
      - "Fight or Flight" response
      - Affects heart rate, digestion, respiratory rate, bowel & bladder control, pupil dilation, perspiration
      - ANS signs of distress – breathing fast & shallow, pupils dilate, heart rate increases, sweating, hiccups, face flushed

5 Common Senses

Vision
Registered by eyes

Hearing (Auditory)
Registered by ears

Smell (Olfactory)
Registered by nose

Five Common Senses

Vision
Registered by eyes
Five Common Senses

Taste
Registered by taste buds on tongue

Touch
Registered by two types of touch receptors.

Light Touch
Registered by hair follicles and skin
– Tends to be alerting
– Many find aversive

Deep Pressure Touch
Registered by Pacini’s Corpuscle deeper in tissue
– Tends to be calming

Two “Hidden Senses”
Vestibular
Registered in Inner Ear
Fluid moves through the semicircular canals, utricle, and saccule with both linear & rotary movements.

Provides sense of movement, gravitational security, muscle tone, balance, posture
Two “Hidden Senses”

**Proprioception**

Registered in muscles, ligaments, and joints

- Responsible for timing and force of movements
- Provides body awareness, grades and controls movements, postural control, motor plan, and emotional security

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**Neurological Pathways**

- Nerve cell at rest - Sensory input can activate or have no effect depending on child’s threshold for each sense
  - When small amount of input activates nerve cell, it is now called over-responsivity (hypersensitive)
  - When it takes a great deal of input to activate nerve cell, it is now called under-responsivity (hyposensitive)

- The system is dynamic
  - Amount of input needed to activate can vary
  - Each sense is independent

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**After sensory nerves are activated**

- Brain receives message
- Brain organizes and directs message
- Produces Behavior or Motor response
  - **If input is reliable, daily life runs smoothly**
    - The aroma of dinner cooking turns into the smell of something burning, parent automatically drops what he/she is doing and rushes to the kitchen
  - **If input is not sent or interpreted correctly, problem can occur**
    - When parent does not register the burning smell, dinner catches on fire. Parent only alerted when the smoke alarm is activated. Dinner is ruined

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**Sensory Processing Problems**

- Sensory signals do not get interpreted or organized into appropriate responses resulting in problems in daily routines and activities
  - **Scenario: Jack is standing in line at school when the student behind him accidentally bumps into Jack.**

Optimal Level of Arousal Needed to Learn

Oral Strategies
- **Fastest** way to calm
- Results shortest
  - sucking, blowing, chewing

Auditory Strategies
- Calming to decrease level of arousal
- Alerting to increase level of arousal
- Can cause increased emotions

Vestibular Strategies
- Rotary – spinning is alerting
- Linear – rocking is calming
- **Long lasting** effects on modulation
  - Swinging
  - Bouncing
  - Jumping
  - Running
  - Sliding
  - Dancing
  - Riding

Proprioceptive Strategies
- Cocoon in blanket, Pizza/taco/hotdog
- Push/pull against resistance
- Bear hug, tight clothes, weighted vest
- Hang, carry, climb, wrestle
- **Long lasting** effects on modulation

Tactile Strategies
- Squishy toys (stress balls)
- Soft/bumpy/rough fabric
- Vibrating toys
- Goo, Play-Doh
- Containers filled with dried beans/pasta/rice
- Ball pit, foam pit
- Sticky tape
- Foods

SPD now in 3 diagnostic classifications references:

- **Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood, Revised (DC: 0-3R)** (Zero to Three, 2005)
- **Diagnostic Manual for Infancy and Early Childhood of the Interdisciplinary council on Developmental and Learning Disorders (ICDL, 2005)**
- **Pschodynamic Diagnostic Manual (PDM Task Force, 2006)**

Miller et al., 2007

Pattern 1: Sensory Modulation Disorder

THREE TYPES:

- **SMD Subtype 1:** Sensory Overresponsivity (SOR)
- **SMD Subtype 2:** Sensory Underresponsivity (SUR)
- **SMD Subtype 3:** Sensory Seeking/Craving (SS)

5% of pediatric population have severe under or over responsiveness to sensory stimulation (Ahn, Miller, Milberger & McIntosh, 2004)

95% of children with Autism Spectrum Disorder (ASD) have atypical sensory processing (Baranek, David, Poe, Stone & Watson, 2006)

SMD Subtype 1: Sensory Overresponsivity (SOR)

- Tends to:
  - Respond quickly
  - Respond with more intensity
  - Respond for longer periods
  - One system or multiple systems
  - New situations and during transitions harder
  - Avoids or withdrawals – limits participation – ANS flight/flight
  - Rigid personal routines and/or rituals
  - Enjoys structure and routine
  - Hypervigilant and distractible
  - Low threshold to sensory input – SHOT GLASS

Sensory Over-responsivity Treatment Ideas

- Consistently use visual schedule and visual timer
- Keep routine as familiar as possible
- Introduce and practice “Change Card” on visual schedule when child is well regulated/modulated
- Limit Sensory Experiences that tend to alert (noise, tactile)
- Increase familiar Sensory Experiences that tend to calm (proprioceptive, oral)
- Add modifications to environment, such as “safe place – tent, box, bean-bag, etc.”
- Make room as quiet as possible when completing independent work
- Add modifications to take with child (Backpack with headphones, music, ear plugs, candies or food items, visual toys, etc.)
- Visit challenging places using sensory strategies (above backpack, time of day, visual check-list, shorten trip to increase success, read Social Story before entering, pick more appropriate store, i.e. WalMart Superstore vs. local grocery store)
SMD Subtype 2: Under-responsivity

- Tends to:
  - Respond slowly
  - Seem disinterested
  - Not notice what is going on around them
  - Not respond to pain or extreme temperatures
  - Poor tactile discrimination and clumsy
  - Others describe as “lazy,” “unmotivated,” “withdrawn,” “inattentive,” or “self-absorbed”
  - Often thought to be “good baby” or “easy child”
  - Need high intensity input to become involved
  - High threshold to sensory input – BIG GULP

Sensory Under-responsivity Treatment Ideas

- Three Important Variables to Sensory Input
  - Intensity
  - Frequency
  - Duration
- Build strategies into schedule as will not seek themselves (at home and school)
  - Chair ball or air cushion
  - Music
  - Something for mouth – sour
  - Movement breaks
  - Include as many different systems as possible

SMD Subtype 3: Sensory Seeking/Craving

- Tends to:
  - Insatiable need for sensory input
  - Energetically engage in all movement activities
  - In others’ space
  - Unsafe behaviors
  - Impulsive and careless
  - Disciplinary problems are common especially in environments that they are expected to be quiet
  - Interrupts attention – easily confused with ADHD
  - Enhances attention which improves learning
  - Loves changes in routine and unexpected situations
  - Benefits from increased intensity sensory input
  - High threshold to sensory input – BIG GULP

Sensory Seeking/Craving Treatment Ideas

- Three Important Variables to Sensory Input
  - Intensity
  - Frequency
  - Duration
- Social Stories (i.e. Space Invaders) to Improve Safety Awareness and Decrease Impulsivity
- Visual boundaries (i.e. carpet squares, masking tape around desk, hula hoop, etc.)
- Environmental Modifications (i.e. desk in back of room; allow to stand when working; seat cushion in chair

Pattern 2:
Sensory Discrimination Disorder (SDD)

- Tend to:
  - Unable to perceive similarities and differences in stimuli in any of the sensory areas
  - Can perceive stimuli is present, just can not tell type of stimuli (i.e. bladder full)
  - May occur in only one system or in multiple systems
  - Difficulty discriminating tactile, proprioceptive and vestibular input (Somatic Senses) can lead to poor graded movement and awkward movement patterns
  - Extra cognitive effort and processing time often required
  - Poor body awareness and dyspraxia can occur

Pattern 3:
Sensory-Based Motor Disorder (SBMD)

- Tend to have poor posture and movement patterns
- Two Types:
  - SBMD Type 1: Postural Disorder (PD)
  - SBMD Type 2: Dyspraxia
**SBMD Subtype 1: Postural Disorder**

- Tend to:
  - Have difficulty stabilizing body during movement, especially against gravity
  - Muscle tension poor (i.e. hypotonic or hypertonic)
  - Postural control poor in standing and sitting – tend to slump or lean
  - Antigravity positions hard to sustain
  - May be fearful in unstable positions – different than SOR that are fearful of the movement alone

**Treatment Strategies to Improve Postural Disorder**

- Graded core strengthening activities
- Anterior pelvic tilt air cushion wedge
- Use of chair ball at school and/or home
- Work on weight shifts and trunk rotation activities
- Improve equilibrium reactions
- Improve righting reflexes
- Improve balance

**SBMD Subtype 2: Dyspraxia**

- Difficulty understanding movement required to complete novel task
- Motor Planning (conceiving, planning, sequencing, or carrying out)
- Difficulty due to poor registration of sensory systems (1 or more)
- Tends to:
  - Inconsistencies seen
  - Movements often uncoordinated and/or clumsy
  - Requires numerous practice attempts to succeed
  - Requires greater effort than peers to complete work (e.g. gross motor [jumping jack] or fine motor [forming letters])
  - Can lead to decreased willingness to participate
  - Can lead to increased frustration
  - Can lead to poor self esteem
  - Can lead to difficulty interacting with peers (i.e. can not keep up or play same games)

**Treatment Strategies to Improve Dyspraxia**

- Gross motor and Fine motor
  - Grade movements from easiest to harder to help child be successful
    - Should increase willingness and decrease frustration
  - Use supports (model, visual cues, verbal cues, etc.)
  - Work on motor planning
    - Obstacle courses; Come up with ideas; do they work? If not, how can we change?
  - Work on sequencing
    - What level is child at in spontaneous play? One Step progressing to multiple steps
  - Work on timing
    - Multiple ways: Movement (jump rope); music, etc.

**Signs of Poor Sensory Processing in an Infant**

- Irritability or frequent crying without comfort
- Poor sleep/wake cycles
- Intolerance of being touched, held or cuddled
- Frequently startles
- Poor tolerance of position changes – especially dislikes being on belly
- Nauseated with movement (car rides)
- Poor eye contact
- Limited babbling
- Slow development – still typical

**Signs of Poor Sensory Processing in a Toddler**

- Frequent and intense tantrums
- Shut down when around peers (off to side)
- Aversive to sensory stimuli (sounds, textures, tastes, movement)
- Seeks intense sensory stimuli (bouncing, jumping, spinning, textures, visual)
- Difficulty tolerating transitions or changes
- Poor sleep/wake cycles
- Difficulty potty training
Signs of Poor Sensory Processing in the Preschool Years

- Short attention span
- Clumsiness
- Over or under reaction to slight injury
- Fear of playground equipment or other movement
- Overly sensitive to touching certain objects
- Very messy or picky eater
- Poor awareness of danger
- Difficulty transitioning or trying new activity
- Avoids playing with peers
- Startles or overly sensitive to noise
- Frequent, intense meltdowns

Blowing, sucking, and licking activities (bubbles, whistles, toys, stickers, and straws).

Start with short period of movement for children, such as playing rhythmic song before

Have child carry heavy toy or objects from around house, from car to shopping cart,

Provide visual timer or visual schedule to help child understand how long the activity will

Use visual timer to help child understand how long they must perform tasks or

Set up an aquarium – water and fish movements can be calming.

Blowing games, such using straws to blow cotton balls, feathers, etc. across floor

Provide quiet, time-out space within your home or classroom, such as pop-up tent

Can help give boundaries)

Before or during a transition provide a small, chewy piece of candy.

When possible, warn child of upcoming loud noise (bell, intercom, etc.)

Consistently use a visual/written schedule, with teacher or aide going over the schedule each morning. Let student know

Signal when an upcoming transition is required.

Play song, give verbal warning, and/or use visual timer to assist child’s understanding of time running out for smoother transition.

Before or during a transition provide a small, chewy piece of candy.

Blowing games, such using straws to blow cotton balls, feathers, etc. across floor

Signs of Poor Sensory Processing in Elementary School

- Hyperactivity – sensory seeking
- Impulsivity – Poor safety awareness
- Difficulty writing letters or using scissors; often refuses to participate
- Clumsy and/or frequently breaks toys
- Plays too rough and/or gets too close
- Reacts negatively to textures in clothing, food, activities
- Startles or overly sensitive to noise – can go into shut down
- Lethargic – overly sedentary
- Difficulty transitioning in home and school
- Numerous meltdowns – parents “walk on egg shells”
- Difficulty calming after meltdown
- After school frustration/anger
- Poor sleep patterns – going to sleep and/or
- Staying asleep
- Poor bowel and bladder control

Sensory Strategies

- Have child carry heavy toy or objects from around house, from car to shopping cart,
- Start with short period of movement for children, such as playing rhythmic song before
- Provide sensory toy breaks between work tasks. Although this may slow you down, it may help child stay better engaged.
- Take small snack breaks, such as chewy candy (Tootsie Rolls, Starbursts, etc.) or
- Crunchy foods (popcorn, pretzels, etc.). Before best challenging task, but during and
- After completing work can also be effective.
- Blowing, sucking, and licking activities (bubbles, whistles, toys, stickers, and straws). A fun activity to do is blowing soap bubbles. Provide child with a straw and small container with small amount of water and drop one or two squirts or dish detergent into water. Have child blow into the water and watch as the foam grows. Knock it down and blow again.

Use visual timer or visual schedule to help child understand how long the activity will last.

Use air filled cushions for chair or feet to allow movement while staying in seat.

Have children use their hands to bat balloons around the room as they remain seated (hula hoops or carpet squares can help give boundaries)

Final Suggestions...

- Provide quiet, time-out space within your home or classroom, such as pop-up tent
- Working within the space can be fun and works to calm and “reset” the frustration dial. I.E. place letters on the wall and child uses flashlight to spell words.
- When possible, warn child of upcoming loud noise (bell, intercom, etc.)
- Sit child who is bothered by noise away from loud hallway or open windows, if possible. Keep room door closed as much as possible.
- Play soft, gentle classical music during independent work time. Warning…this can
- Set up an aquarium – water and fish movements can be calming.
- Use visual timer to help child understand how long they must perform tasks or
- When an upcoming transition is required.
- Play song, give verbal warning, and/or use visual timer to assist child’s understanding of time running out for smoother transition.
- Before or during a transition provide a small, chewy piece of candy.
- Blowing games, such using straws to blow cotton balls, feathers, etc. across floor

Additional Suggestions...

- Isometric exercises (muscles stay the same length), such as pushing the wall down with
- Arms while feet are planted; prayer hands (palms together) with elbows bent and gently
- Push inwards; push down firmly on desktop; you and child face one another and push
- With both arms extended in front.

More Suggestions...

- Allow child to listen to music on headphones during loud times or when required to work independently on challenging task
- Allow child to wear earplugs during loud times (cafeteria) or when required to work independently on challenging task
- Use noise desensitization techniques to help increase child’s tolerance of noise interference. For example, gradually
- Increase room noise, such as turn on radio or television at low volume while child is performing tasks requiring
- Attention, like handwriting or repetitive/mandulat ion tasks. Attempt only when child is well regulated to begin with.

Environmental Modifications in the Classroom

- Audio hypersensitivity
- Remove visual and auditory teaching
- Eliminate as much background noise as possible
- Warn of approaching bells, fire alarms, or loudspeaker announcements
- Ask front office to send notes to classroom or office instead of unexpected loudspeaker announcements
- Arrange room to minimize distractions
- Study carrel in the classroom
- Preferential classroom seating close to the teacher where teacher can provide tactile and visual cues. However, away from
- Distractions
- Avoid unnecessary visual clutter on blackboard, walls, and from ceilings to reduce visual distracters.
- Color code sections in one binder rather than have several separate notebooks
- Study carrel in the classroom
- Natural light when possible, limit fluorescent. Can use varying intensities of light, such as dimmer to calm, brighter to alert
- Consistently use a visual schedule, with blonde or side going over the schedule each morning. Let student know
- When changes in routine are going to take place, as soon as possible, with frequent reminders as the time gets closer.
- For students who are over or under sensitive to noise, consider printing out a noise level chart, which can be kept
- Reference during independent work times.
Environmental Modifications Continued

- **Poor Body Awareness**
  - Help child understand personal space visibly, such as draw a chalk circle, masking tape square, or provide carpet square when child is sitting on the floor or around child’s desk.
  - Provide verbal and visual cues for child to stay an arm’s length away from peers.
  - Pre-teach motor activities one-on-one to allow child extra time to learn task, which will also improve self esteem (ex. PE class activity).  Showing parent the required activity so they can practice with child at home may also be beneficial.

- **Difficulty Transitioning**
  - Increase structure and routine, including use of sensory strategies
  - Keep classroom and school rules as simple as possible. Use concrete language instead of abstract, such as “If you hit, you sit.”
  - Use activities to assist transitions between activities, such as play a song, flicker lights, visual timer, verbal warnings, small piece of candy, etc.
  - Give child a transition object (toy, tactile fidget, etc.)
  - Before warning of upcoming transition, provide small candy or blow toy
  - Use a visual incentive chart (i am Working For… with two, three or four stars) and picture, drawing, or word of desired incentive such as computer time, a candy, or toy

**SUGGESTIONS TO HELP CHILD DURING A MELTDOWN**

- Choose your battles
- TRY to keep your voice, facial expression, and body language calm no matter how out of hand the child’s actions
- Express understanding of your child “You want …. You are angry…
- Decrease talking and the volume of your voice
- Stay calm and try not to personalize child’s negative behavior
- Oral (candy, chewing gum) Tactile toys or light toys
  - You use… put down nearby – may be thrown
- Dim lights, turn on soft music, etc. – watch child’s body language,
  - Avoid eye contact…turn your body away from child, keep child in peripheral vision for safety
- Model deep, slow breathing

Behavioral Strategies

- Reinforce positive behaviors by pointing out what your child is doing right.
- Set boundaries and give clear expectations.
- Use language such as “First __________, Then _____________” or
- Break chores or tasks into smaller, manageable parts that allow the child to be successful.
- Use positive reinforcement schedule to increase child’s participation in tasks not of their choosing

Internet Resources

Source of SI books & videos

- [www.sensory-processing-disorder.com](http://www.sensory-processing-disorder.com)
- [www.sinetwork.org](http://www.sinetwork.org)
- [www.sensoryresources.com](http://www.sensoryresources.com)
- [www.southpawenterprises.com](http://www.southpawenterprises.com)
- [www.aota.org](http://www.aota.org)
- [www.devdelay.org](http://www.devdelay.org)
- [www.zerotothree.org](http://www.zerotothree.org)
- [www.sensationalkidsokc.com](http://www.sensationalkidsokc.com)
- [www.sensory-processing-disorder.com](http://www.sensory-processing-disorder.com)

Recommended Reading for Caregivers, Parents, & Therapists


References

Thank you for your time and for considering another way to look at children’s behaviors

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