Sensory Contributions to Young Children’s Social-Emotional Development

Marie Anzalone, ScD, OTR/L, FAOTA
Occupational Therapist in Practice
San Diego, CA
meanzalone@gmail.com

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Objectives

- Introduce the process of sensory integration that occurs in all individuals;
- Understand the contributions of sensory integration and sensory processing disorder to social-emotional development and self and co-regulation;
- Introduce different types of sensory processing disorders;
- Begin to help families understand sensory contributions to behaviors and use that understanding to create better goodness of fit.

What is Sensory Integration

- Developed by A Jean Ayres in ’70s
- If SI is the organization of sensory information for use...
  - A process that occurs in all of us
  - A way of understanding individual differences and dysfunction (SPD)
  - A method of intervention
- A Brain Behavior Theory

SI is a Brain-Behavior Theory

- Developmental Neuroplasticity
- Neurophysiology
- Top-Down vs Bottom Up

Developmental Neuroplasticity
- Neurophysiology
- Top-Down vs Bottom Up

The Process of Sensory Integration ... We all do it

Intake
- Sensory Registration and Modulation
- Problems: Over-Under Responsivity, Sensory Seeking

Attention
- Selective attention, focus, activity level
- Problems: poor attention to details, unable to switch focus, activity

Interpretation
- Discrimination and Emotional Response
- Problems: Extreme emotional reactions, lack of awareness

Using Input
- Organizing and doing action, motor
- Problems: Poor play skills, clumsiness, using motor skills flexibility
**Physical Environment**

**Social Environment**

**Child**

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**SI as an emergent property**

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**SI and Individual Differences**

- We all take in and experience sensation when interacting with our environments
- SI is temperament-related (reactivity)
  - Changeable
- Registration is subjective and complex
  - Modality, intensity, duration
  - Preferences and triggers

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**Modalities**

- More than 5

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**Sensory Processing Disorder**

(Modeled from 2007, AJOT – Miller, Anzalone, Cermak, Lane)

**SENSORY PROCESSING DISORDER**

- Problem in Registration: Sensory Modulation Disorder (SMD)
- Problem Using Sensory-Based Motor Disorder (SRMD)
- Problem in Interpreting Sensory Discrimination Disorder (SDD)

- Visual
- Auditory
- Tactile
- Taste/Smell
- Position/Motion

**SOR = Sensory Over-Responsivity**

**SUR = Sensory Under-Responsivity**

**SS = Sensory Seeking/Craving**

**SA = Sensory Avoidant**

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**Sensory Link to Social Emotional Development: my perspective**

- Babies are, by nature, social creatures
  - But also somatic
- Individual differences are an integral component of babies' functioning
  - Both infant and parents
  - Multiple dimensions in infant (e.g., temperament, motor, cognition, vulnerabilities, etc)
  - Meaning making
- Every individual exists in a particular context that affects function
- Wellness: The brain is CONSTRUCTED based on experiences (developmental plasticity)
I MH is developing the capacity to:
- Experience, regulate, and express emotions
- Form close and secure interpersonal relationships
- Explore the environment and learn

So where does Sensory Processing fit in?

Experience Regulate and Express Emotions
- Experience full range of emotions
- Self regulation:
  - Effortful control
  - From reliance on adult to reliance on self
  - “by the self, not just of the self” (Vohs & Baumeister, 2004)
  - Accommodation to expectation or norm

Self Regulation
- Development
- What is ‘regulated’?
- How influenced by Sensory Input?

Developmental sequence of Self Regulation (Kopp, 1982)
- Neurophysiological modulation (birth-3m)
  - Physiology and Arousal
- Sensorimotor modulation (3-9+m)
  - Attention and Motor
- Control (12-18m)
  - Emotion
- Self-Control (24+m)
  - Relationships

Sensory-Based Self-Regulation is expressed through:
- Arousal
- Attention
- Affect
- Action

Arousal
- Infant States
  - Availability, and transitions
  - From deep sleep through crying
  - Typical and atypical
- Physiological vs. behavioral arousal
  - Or...what you see is not necessarily what you get
- State influences sensory processing
  - [and vice versa]
  - Importance of sleep to function
- Optimal learning and social interaction occurs in quiet alert
Attention

- Attention is multi-dimensional
  - Alertness
  - Selection
  - Allocation
- Developmental expectations
- Socially mediated attention – not just object
- Sensory preferences

Affect

- Self regulation of sensation on a continuum with self regulation of affect
- Temperament, Attachment, Attunement
- Defensiveness (SMD) defined as affective response to sensation
- Stress and anxiety and SPD (SMD and praxis)
- Kid Power
- Social relationships are influenced by SPD (peer and attachment)
- Parental concerns with SPD

Axis V : Functional Emotional Developmental Levels

- Shared attention
- Engagement
- Two-way purposeful interactions with gestures
- Two-way purposeful problem-solving interactions
- Elaborating ideas
- Building bridges between ideas (emotional thinking)

Action

- Action vs Motor
  - They aren’t the same
  - Goal directed behavior
- Communicative cuing and self regulation attempts as actions
- Praxis and play
  - Ideation
  - Motor planning
  - Execution

Yoli:

a case study looking at the 4 A’s and Goodness-of-Fit

Goodness of Fit

SI emerges from the interaction of the child and the environment
Sensory Modulation

The ability to grade responsivity and reactivity to sensation
Response is consistent with perceived intensity of stimulus

Sensory Threshold

- Think about it as a central process (not specific to each modality)
- Sensation is summed (accumulation over time)
- Rate, intensity, and recovery
- Inconsistency is expected (and can help us)
- Interacts with arousal curve and arousability to produce modulation

Sensory modulations relates to:
- Sensory input vs. Sensation
- Sensory threshold
- Arousability
- Behavioral regulation or coping
- Context (dynamic)

Sensory Threshold is on a continuum

High threshold (Under Reactive)
(Do I HAVE feet?)

Low threshold (Over Reactive)
Ouch, my socks hurt!

Sensory Threshold Interacts with Arousal Curve

Increasing Organization
Behavioral disorganization
Threshold

Increasing Sensory Input

Sensory Threshold

(Increased Sensitivity) (Decreased Sensitivity)

<table>
<thead>
<tr>
<th>Acts in accordance with threshold</th>
<th>Hyperreactive (SOR)</th>
<th>Hyporeactive (SUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attempts to compensate threshold</td>
<td>Sensory Avoider</td>
<td>Sensory Seeker (SS)</td>
</tr>
</tbody>
</table>

(Adapted from W. Dunn, Ph.D., OTR; Department of Occupational Therapy, University of Kansas Medical Center)
Hyper-Reactive or Sensory Over-Responsive
- High Arousal (over the zone of optimal organization)
- Inability to focus attention (everything is equally important)
- Negative affect
- Action appears impulsive (action is reactive)

Sensory Avoiders
(Low threshold – active coping)
- Able to modulate arousal (when successful at avoiding)
- Attention is hyper-vigilant (scanning for threats)
- Affect is fearful or anxious
- Action is constrained

Hypo-Reactive or Sensory Under-responsive
- Arousal decreased – seem sleepy
- Latency to attention
- Affect restricted or flat
- Action passive

Sensory Seekers
- Arousal heightened, but labile (if meet sensory threshold needs)
- Attention is poorly modulated and focused on sensory yield
- Affect is variable, limited empathy
- Action to increase sensory input, may appear impulsive and often risky

Case Studies
Christopher Neal Twins

Zone of Optimal Engagement (ZOE) (Green)
- There is an upper limit of organized behavior as well as the lower or threshold level.
  - Above that zone is behavioral disorganization
- Zone of Optimal Organization is also important
- Most of us have wide zone of optimal arousal to enable function
- Children with sensory modulation problems (especially those with autism) may have too narrow a zone
Baseline

Threshold

Zone of Optimal Engagement

Inattentive

Behavioral Disorganization

Threshold of Aversion

Threshold of Orientation

Behavioral Disorganization

Zone of Optimal Engagement

State of arousal
Previous sensory experiences
Sensory processing disorder (SPD)
HEDDS etc.

Antecedent

Behavior

Consequence

Narrowed ZOE

Optimal Engagement Band

(Baranek, 2009)

Up- and Down- Regulation
Foster the Green, Avoid the Red

Assess current status –
it is changeable

Behavioral Disorganization

Zone of Optimal Engagement

Threshold

Baseline
Zones from a Sensory Perspective

**RED**
- Over stimulated, disorganized, shut down
- Need calming sensory input

**Yellow**
- Transition - may go up to Red, down to Green
- Need alerting experiences to promote alertness
- Reduce calming input

**Green**
- This is the Zone of Optimal Engagement and goodness of fit – available for interaction and learning – quiet alert state
- Introduce motivating learning, play or social activities. Goal is to sustain this state

**Blue**
- Calm, engaged, alert, in control
- Introduce alerting experiences within the child's tolerance
- Make sure child is engaged

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Sensory Based Motor Disorder

**Dyspraxia**
Postural Disorder of Vestibular/Proprioception

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Praxis

- Motor vs. action
- Plan and sequence unfamiliar actions
- Praxis as an emergent property between child and environment
- Three components
  - Ideation
  - Motor planning
  - Execution

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Sensory Based Postural Disorder

- Think Proprioception/Vestibular/Visual

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Assessment & Intervention Framework

- Physical Environment
- Social Environment
- Child

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SI Intervention

- Helping Families Understand
  - Demystifying behavior
  - Individualized
  - Begin to anticipate

- Facilitate Goodness-of-Fit
  - Sensory Diet
  - Environmental Modifications
  - Managing SPD

- OT Treatment
  - Individualized
  - Sensory and Play Based
  - Within the context of relationship
  - Changing SPD

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Help Parents Understand

- Help to reframe/explain child’s behavior
  - Demystify
- Validate observations
  - Recognize child’s cues about sensation
  - Observe style and fit with social partners
- Build routines to support organization learning readiness (DIR)
- Understand developmental needs and expectations
- Help parents to help others understand
- By building understanding – begin to anticipate (rather than react to) difficult situations

Strategies

- Information – helping parents understand their child as you see them
- And listen as they help you understand their child
- Modeling
- Reinforcing attempts at interaction and transactions
- Build on overtures
- Scaffolding
- Video analysis
- Foster underlying capacities of parent as a parent

Coaching as a method of intervention for conditional track

- Working through the parents
- Collaboration /partnering/consulting with parents
  - Built on mutual respect
  - Identifying needs
  - Working towards solutions
- Based on adult learning principles
- Components of process
  - Initiation
  - Observation
  - Action
  - Reflection
  - Evaluation

Listen and link
Managing SPD vs Changing SPD
Understanding the dynamic interaction between child and environment
Where are they now and how can I get them back into the Zone?

Sensory Integration provides a way of UNDERSTANDING Behaviors
State of arousal
Previous sensory experiences
Sensory processing disorder
Habits
Emotions that drive or result etc.

Antecedent Behavior Consequence
Child’s Emotions Reactions of others

Changing what the child experiences
- Environmental modification
- Changing routines
- Preparing all children for transitions
- Modifying events
  - Helping care providers/teachers to think about novelty rather than just increasing intensity as a way of gaining attention
  - Using the ‘rheostat’ (up and DOWN)

Traditional Learning Theories
Antecedent Behavior Consequence

A dynamic understanding of sensory threshold and sensory needs: not a static sensory diet

Where the child currently is in relation to ZOE
Behavioral Disorganization
Threshold of Aversion

Zone of Optimal Engagement
Threshold of Orientation
Baseline

Environmental modification
Changing routines
Preparing all children for transitions
Modifying events
So what can we do about SMD?
- Act PROACTIVELY and REFLECTIVELY
- Modify Environment and ask about current state
- Prepare the CNS based on current needs– Goodness of Fit
  - Understand regulatory function of stereotypies
  - Sensory prep activities
  - Breaks – cool down space/time
- Look for cues
  - Milton: Eyes
  - Andre: escape
  - Walter: Scream/head banging
  - Fisher: Twirling
  - Christine: Scream, escape, throw,

Try to Understand Behaviors
- ? Regulator Function
- ? Communicative Function
- Habit
- ?
- Carr (Functional Communication)
- If you are not getting at the root cause – mole behavior

Based on Current assessment...
- Up or Down Regulate -- sometimes alternating depending on response
- NOT a static “Sensory Diet”
- UP regulate
  - Arousing activities
  - But not over stimulating
- DOWN regulate
  - Calming and or organizing inputs
  - Make sure input is USED

Sensory Input can help Up or Down Regulate

<table>
<thead>
<tr>
<th>To Organize or Calm</th>
<th>Modality</th>
<th>To Alert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dim natural light</td>
<td>Visual</td>
<td>Strobe</td>
</tr>
<tr>
<td>Rhythmic</td>
<td>Auditory</td>
<td>Dissonant/loud</td>
</tr>
<tr>
<td>“Heavy Work”</td>
<td>Proprioception</td>
<td>“heavy work”</td>
</tr>
<tr>
<td>Slow Rocking</td>
<td>Vestibular</td>
<td>Spinning</td>
</tr>
<tr>
<td>Pressure Touch</td>
<td>Touch</td>
<td>Light Touch</td>
</tr>
<tr>
<td>Sucking, chewing</td>
<td>Oral or Taste</td>
<td>Crunchy, sour</td>
</tr>
<tr>
<td>Deep, slow, count</td>
<td>Breathing</td>
<td>Blow, suck</td>
</tr>
</tbody>
</table>

Environmental Modification: Goodness of Fit
- Collaboration to redesign routines and Sensory Diet
- Goal: reduce immediate stress in recurring situations
- Consideration to each child’s SI profile and where they are in terms of ZOE of any particular time
- Outcome is short-term change
  - MANAGEMENT of ZOE, not necessarily long term CHANGE

To create a better G of F we can change...
- What the child experiences
- Where the child is in relation to ZOE
- How the experience is subjectively perceived
Up- and Down- Regulation  
Foster the solid, Avoid the broken

Behavioral Disorganization

Zone of Optimal Engagement

Threshold

Baseline

Assess current status –  
it is changeable

Yellow Zone
Green Zone
Blue Zone
Red Zone

Zone of Optimal Engagement –  
Creating a better G of F

Behavioral Disorganization  
Distractibility, with Over-Responsivity

Inattentive, Low Arousal and Attention  
with Under-Responsivity

Threshold for Aversion

Threshold for Orientation

Intervention

Direct Tx

• Individualized
• Sensory and Play Based
• Within the context of relationship
• Goal: Changing SPD

Direct Intervention in EI

• In the home/community, not a sensory gym
• Multi disciplinary/multi approach
  › SI is NOT the only approach used
• SI as prep
• Play-based
• Relationship based
• ‘homeopathic’ – less is more

Models of Fidelity to Ayres SI

• Step SI  [Miller, L. J., Wilberger, J., Stackhouse, T., Trunnell, S.,  
  (2002). Use of clinical reasoning in occupational therapy: The STEP-SI  
  model of intervention of sensory modulation dysfunction. In: A.  
  Bundy, S. J. Lane, & E. A. Murray (Eds), Practice (2nd ed.). Philadelphia: Davis. ]

• Fidelity Measure  [Parham, L. D., Cahn, E. S., Spitzet, S.,  