Overview of the Individual Profile: Sensory & Motor Development

- **Regulation of Behavior** – reflects the child’s neurobiological state in response to stimuli from his own body, from the environment and in the course of social interaction with others. Regulation of behavior entails the child’s physiological and emotional response to his sense of touch, his sense of movement or muscle and joint action, his awareness of where he is in space as well as his response to the sights and sounds of the world, his sense of smell and taste.
Overview of the Individual Profile: Sensory & Motor Development

- **Motor Control** – is defined as the ability to regulate or direct the mechanisms essential to movement.
  Motor control then supports postural control which develops in the context of the rhythms of interaction with an available and responsive caregiver, who responds to the intent of the infant and developing child.
  Motor control encompasses the wonderful evolution of the body as the infant and child develop a body map, a sense of the relationship of the body parts to one another and response to their base of support.
  **All this is refined as the child’s intentionality becomes stronger and he experiences a sense of success.**

Overview of the Individual Profile: Sensory & Motor Development

- **Praxis** – encompasses ideation and motor planning and sequencing, motor execution and adaptability.
  Ideation requires the ability to think and to conceive of an idea with clear goals and purpose (executive function);
  Motor planning is the ability to plan and organize the sequence of the steps necessary to successfully execute the idea (executive function).
  Both ideation and planning are dependent on connecting all information from the body and the environment, including vision, sound, touch, and muscles and joint information.
  Motor execution requires the ability to initiate and co-ordinate the motor actions related to the idea and motor plan.
  Adaptation is constantly occurring as one compares feedback from the body with the initial plan and enables the child to adapt throughout the ongoing process.
  As a child’s develops ideas and intentions in co-regulated interactions with others the child becomes more adaptable across a wider range of experiences and environments.
There is no such thing as an Infant

Donald Winnicott, 1940
Regulation of Behavior - The Balance Between Self and Co-regulation

Arousal

Attention

Sensory - Affective Modulation

Action

Visual

Gustatory

Auditory

Olfactory

Tactile

Limbic

Proprioceptive

Vestibular

Sensory - Affective Modulation; The Interconnectivity of the Systems
Sensory Integration

**Theory**
- Process related to multimodal processing that supports formation and retrieval of multisensory perceptions in the central nervous system. (AOTA - Understanding Ayres Sensory Integration - Smith Roley et al, 2007)
- Refers to a particular way of viewing the neural organization of sensory information for functional behavior.
- Originated by A. Jean Ayres, OTR, PhD an Occupational Therapist and an Educational Psychologist, who described it as: “…the organizing and processing of sensory information from the different sensory channels and the ability to relate input from one channel to that of another in order to emit an adaptive response” (Ayres,1972).

**Frame of Reference**
- Clinical frame of reference for the assessment and treatment of people who have functional disorders in sensory processing.
Sensory Systems

- Proprioceptive - muscles & joints,
- Tactile - sense of touch, the body's ear,
- Vestibular - movement in space & relationship to gravity,
- Auditory - sound
- Visual - vision
- Gustatory - taste,
- Olfactory - smell

We Have to Consider
Both Proximal & Distal Sensory Processing

and

The interconnectivity of each system within the sensory corticies

and

of the LIMBIC System

SIMULTANEOUSLY

Sensory Processing

- Generic term used to describe the way in which sensation is detected, transduced and transmitted through the nervous system. (AOTA - Understanding Ayres Sensory Integration - Smith Roley et al, 2007)

- The brain is constantly receiving information about its current state, both from the senses concerning events in the environment, and from internal messages about the position of the body, its level of arousal, the activities of the various organs and the chemical and nutritive state of the blood (Ratey, 2002 p.54)
Parallel Processing

• Same sensory signal is processed simultaneously in different parts of the central nervous system (e.g., a same signal will be processed in the basal ganglia and the cerebellum simultaneously before sending it back to the motor cortex for action)

• Simultaneously sensory information about the same event will be processed from different sensory channels (visual, proprioceptive, vestibular) leading to each system processing different bits of information allowing one to develop a perception of the whole.

• The same information can be processed in two separate pathways leading to redundancy but also providing a balance of the perception of the same sensory experience (e.g., tickle, pain)

Hierarchical Processing

• Higher brain centers integrate inputs from many senses and interpret incoming sensory information.

• The higher centers abstract, interpret and integrate.

• Movement at higher levels involves motor plans and strategies for action

• Movement at lower levels - input is monitored and regulated so that movement is appropriate for the context

• Cognition systems overlap with perception and action systems, involving high level processing for both perception and action.
Synchrony of Sensory Processing

- No sensory system functions alone; Sensory input occurs simultaneously
- Sensory systems communicate & contribute to perceptions
- Sensations are connected in meaningful ways in concert with the emotional texture and affective tone that occurs with the sensory experience

THE OUTCOME OF THIS IS UNIQUE TO EACH INDIVIDUAL’S EXPERIENCE & NEUROBIOLOGICAL PROFILE

Sensory Modulation Continuum - Synchrony of Sensory Processing

<table>
<thead>
<tr>
<th>Shutdown/ withdrawal</th>
<th>Lack of Attention</th>
<th>Habituate</th>
<th>Orient</th>
<th>Attend</th>
<th>Hyperfocus</th>
<th>Escalated</th>
<th>Approach/Avoid</th>
<th>Fight/Flight</th>
<th>Shutdown/ withdrawal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure to orient</td>
<td>Lack of Synchrony</td>
<td>Delay in Sensory Processing, Sensory Association, Interconnectivity, Limbic Response Subtle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- Failure to orient
- Lack of attention
- Shutdown or withdraw

<> Homeostasis <> Over Orientation

<> Synchrony<> Robust Interconnectivity

Lack of Synchrony Delay in Sensory Processing, Sensory Association, Interconnectivity, Limbic Response Overt-> Either “imploding” or “exploding”
- Escalation
- Approach, Avoidant, Protective
- Fight or fright
- Flight or freeze
- Shutdown or withdraw

Remember No Sensory System Functions Alone We have to think about how Sensory Systems Relate to One Another And Give Meaning to Every Experience
Sensory Perception

- Perception: The ability to become aware of something through the senses, The state of being or process of becoming aware of something in such a way… (New Oxford American Dictionary)

- Perception is the integration of sensory impressions into psychologically meaningful information. (Shumway Cook and Walcott, 2002)

- The sensations that come in from the environment are fitted into categories or constructs that we have learned. We are constantly priming our perceptions, matching the world to what we expect to sense, and this making it what we perceive it to be. (Ratey, 2002)

- Perception requires a form of expectation, of knowing what is about to confront us and preparing for it. (Ratey 2002)
Affect / Emotion

• Affect is a formal psychological term that refers to an observed emotional state. *(New Oxford American Dictionary)*

• Emotion is a natural instinctive state of mind deriving from one's circumstances, mood, or relationships with others...often involves a physical as well as a mental response. *(New Oxford American Dictionary)*

• Emotion is an experience of bodily tension occurring as a result of a perception

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• Sensory experiences are dual coded for Affect
• Affective experiences are perceived as sensations
• Neither experience occurs without the other
• Affect impacts the child's ability to draw meaning from sensory experiences
• Affect underlies Intentionality, Orientation, and Perception
Regulation reflects the infant's ability to *modulate*, on a neurological level, the intensity of multi-sensory stimuli, and to *regulate* his behavior, while interested in the full range of sensations.

Self regulation is a co-constructed function that arises from co-regulating interactions between parents and infant.

The Intense Mutual Gaze affords “a mutual regulatory system of arousal in which both (caregiver and infant) move together from a state of neutral affect and low arousal to one of heightened positive emotion and high, yet modulated, arousal.

(Schore, A., 1996)

Affect Cueing is the ability to express, through subtle vocal and motor acts, what ones intentions are, and simultaneously to read the vocal and motor cues given by the other as to his/her state and intentionality.
Characteristics of Sensation and of Co-Regulation

- Amount (a little – a lot)
- Intensity (weak – strong)
- Duration (how long)
- Frequency (how often)
- Speed (slow – fast)
- Rhythm (rhythmic – random)
- Symmetry (unilateral – bilateral)
- Location in Space (close – far)
- Focus (specific – diffuse)
Timing and rhythm are basic organizing principles of all communication, and rhythm underlies all behavior (Lenneberg, 1967).

The repetitions of vocal and/or kinesic patterns with minor variations are ideally suited to create expectancies, avoid habituation, maintain the infant’s attention, and create subtle nuances for the infant’s affective experience (Jaffe at all, 2001).

The match between temporal ranges of infant auditory discrimination (0.4-1.6 s) and sound-silence durations of adult-infant interaction (largely less than 1 s) – reflects a coherent perceptual-motor system (Jaffe at all, 2001).
Arousal:
- Deep sleep
- Light sleep
- Drowsy
- Quiet alert
- Active alert
- Crying

Attention

Sensory - Affective Modulation

Action
Shared Attention in the Intimacy First Relationships

• The Experience of being the object of attention, being gazed at in an attuned way, and reacting to that experience by gazing back, forms the basis for Attention – both attending to an object (the other) and calling attention to an object (the self).

• The self then becomes the first object through which attention is experienced.

• This ability requires the attuned adult to modulate the intensity of his gaze, and adjust it to the infant's delicate sensory system.
Joint Attention

• ". . . requires that two people be knowingly attending to a common object. . . " (Reddy, 2008)

• Infants turn their head to the direction of the adult’s head only if before that they felt the adult’s gaze at them.

• The first object around which a baby and her parent shares attention is another another person. This means that the move from Dyadic to Triadic situations supports the move from shared attention to joint attention.
Shifting Attention

<table>
<thead>
<tr>
<th>Age</th>
<th>Objects of Attention</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-4 months</td>
<td>The self</td>
</tr>
<tr>
<td>3-5 months</td>
<td>Other persons</td>
</tr>
<tr>
<td>4-7 months</td>
<td>Nearby targets and objects-in-other’s-hands</td>
</tr>
<tr>
<td>7-10 months</td>
<td>Acts by self</td>
</tr>
<tr>
<td>8-11 months</td>
<td>Objects in own hand</td>
</tr>
<tr>
<td>12-14 months</td>
<td>Distal objects</td>
</tr>
<tr>
<td>15-2 months</td>
<td>“Objects” over time and nonvisible objects</td>
</tr>
</tbody>
</table>

Reddy, 2008

The Dynamic Flow of the Emerging Joint Attention – Sensory Affective Emotional Engagement

The child is responsive to -
As the caregiver joins the child affectively showing interest in the child’s focus of interest. (eg. The caregiver uses sound, vocalization, verbal comment, body gesture, body movement toward the object with a affective tone indicating interest)
- Shared Gaze to the object of interest
As the flow continues the infant begins to anticipate the caregiver’s affective gestures as they focus on an object of interest such as a rattle or toy. The infant is processing and responding to the sensory affective and emotional environment
- change in tone indicating that the infant senses something is going to happen
As the flow continues over time the infant begins to anticipate what is going to happen as the caregiver joins
- anticipatory change in tone indicating the child is predicting what is going to happen
- Facial Gaze to the Play Partner, with a “Gleam in their Eye”

Shared Social Referencing with Shared Focus of Attention
The Dynamic Flow of the Emerging Joint Attention – Sensory Affective Emotional Engagement

The child *initiates* joint attention with play partner to invite them to share attention around their focus of interest with an

- Alternating Gaze
- Gesture (eg, facial expression, sound, point
- Verbal Cuing

Social Interaction

- Social Interaction is a continuous flow of both responding, initiating and responding of shared social referencing and shared attention through a full range of emotion.
Sensory Integration in Development

• The developing child begins to attach meaning to the stream of sensations experienced.

• The child becomes increasingly adept at shifting attention to what he or she perceives as meaningful, tuning out what is irrelevant to current needs and interests.

• The child can organize behavior for increasing lengths of time and gain control in the regulation of sensations and emotions.

• The child can sustain this level of regulation as the complexity of his system, the complexity of the environment, and the complexity of the tasks increase.
Sensory Integration in Development

- Stage 1 >>> affords shared attention
- Stage 2 >>> sustains engagement while experiencing a host of sensory affective states
- Stage 3 >>> allows for reciprocity while involved in intentional rhythms of perception and action
- Stage 4 >>> scaffolds the emerging sense of self and the capacity to be a problem solver
- Stage 5 >>> underlies the ability to represent
- Stage 6 >>> supports the establishment of logical connections and abstract thinking
Arousal

Action:

Sensory
Affective
Modulation

Attention