Making Sense of Sensory Processing
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Outline

• Sensory Preferences
• Sensory Processing Overview
• Components of Sensory Processing
• Power Sensations
• Brain Science
• The “New” Brain
• Sensory Diets
• Final Considerations

Sensory Diets

-What we do throughout the day to stay in that just right place for the activity?

-Natural routines that help us to stay “in the zone”

Move: Vestibular/Proprioceptive
- Rock in chair or standing
- Exercise (jogging, weight lifting, yoga)
- Cycle
- Stretching, shifting positions
- Cross legs, bounce legs, tap toes
- Ride bike, walk, hike, dance

Touch: Tactile
- Twist hair, play with keys
- Shower/bath
- Massage
- Pet animals
- Fidget (straw, paper clips, jewelry, nails)

Taste/Chew: Oral
- Thick drinks, hard candy, gum, crunchy, chewy
- Smoke
- Cold drinks, warm drinks
- Chew buttons, shirt, nails, bite cheeks/flip

Look: Visual
- Watch fireplace, sunset/sunrise, camp fire, fish tank
- Lightning/flash
- Outlined vs. organized
Sensory Processing

- ALL information comes into the brain as sensory information
- 5 Senses
- Ability to organize and make sense of incoming information
  - Inhibition & Filtering
  - Cortical processing
- Influenced by:
  - Immune system
  - Nutrition
  - Toxins
  - Activity Level
  - Muscle Tone
  - Arousal Level (Stress Chemistry)

Components of Sensory Processing

- Protective Responses
  - Defensiveness
- Modulation/Regulation
  - Arousal level matches activity
- Registration of Stimuli
  - Details
- Integration of Information
  - Icing on the cake!

Defensiveness

- Hyper sensitive response to “non-noxious” stimuli (Mimics PTSD)
- Can be in any sensory system
- Fight or Flight remains in “ON” position
- All about stress chemistry
Modulation/Regulation

- Regulated by chemistry (neurotransmitters) released from brainstem
- "just right" for the task
- Awake, Asleep, Alert, Attentive
- Inhibition to manage overwhelming amount of incoming sensory information
- Filtering mechanism to focus on salient stimuli

Indications of Modulation Problems

- Trouble with transitions
- Sleep/wake difficulty
- Distractibility
- Perseverations
- Impulsivity
- Lack of emotional regulation
- Self-stimming behaviors
- Some self-injurious behaviors

Registration of Stimuli
(Specific to vestibular & proprioception)

- Poor core strength
- "Losing the fight" with gravity/low tone
- Difficulty staying in chair
- Shuffles rather than walk
- Tends to lean, prop and collapse into furniture
- Flat hands (HUGE impact on handwriting)
Sensory Integration

- S.I. Theory vs. sensory integration
  - Theory developed by Jean Ayres, OT
  - Specific protocol for diagnosis & treatment
- Sensory Processing Disorder (SPD)
  - DSM V: 2012?
- Sensory processing/Sensory diets
  - Embedded into natural routine
  - Necessary for all students (and adults, too!)

3 Power Sensations

- Tactile System
  - Body boundaries (me vs. not me)
- Proprioceptive System
  - Body contents
- Vestibular System
  - Relationship to gravity
  - Key information for body scheme, body awareness and ultimately self-esteem
  - Audition/Visual Systems
    - provide environmental cues & spatial concepts

Tactile System

- Touch receptors located just under the skin
- Defines body boundaries
- Includes space just beyond us
  - Why space definition impacts attitudes
- Pressure touch vs. light touch
- Protective vs. discriminatory
  - Protection vs. localized, precise sensation which allows us to discriminate shapes, textures, and sizes of hand held objects
Proprioceptive System

- Receptors in muscles, tendons and joints
- Unconscious awareness of joint & muscle movement
- Defines our body contents
- Motor maps, automated functioning
- Personal sense of self
- Together with tactile system are the basis for self concept/self image

Vestibular System

- Receptors in inner ear, attached to cochlea
- Unconscious awareness of movement and position in space
- Relationship to gravity
- Direct effect on muscle tone, postural control and movement
- Vestibular input is like “turning the lights on” in the brain
- Integral role in language and auditory processing

Research related to Vestibular Processing

- Healthy babies given 16 sessions of vestibular activation had significantly more advanced reflexes & motor skills than control group (Clark, D.L. et al)
- Premature infants gained weight faster, were less irritable, and spent more time in a quiet alert state when given vestibular input (Anderson, J.)
- Puppies & kittens showed an increase in brain cell development over control group when given vestibular stimulation (Kosmarskaya, E.N.)
Vestibular-Auditory-Visual Triad

A strong vestibular foundation is needed to activate the core muscles of the body and provide a central axis (TRIAD)

- Auditory Input
  - The orienting response, locate and process sound source in a precise and efficient way
  - Vestibular/Cochlear system creates an internal image of space, a tangible concept of time
  - Rhythmic components of sound guide our timing and sequencing of body movements
  - Relates to difficulties with balance, coordination, eye muscle control and visual perception

Learning Hierarchy

Motor Skills
- Motor Skills rely on experience, feedback, and repetition

Motor Patterns
- Suggestive of a blueprint

Visual
- Auditory (travels on 8th Cranial Nerve)

Tactile
- Discriminatory vs. Protective

Proprioceptive
- Unconscious info from joints & muscles

Vestibular
- Unconscious info: movement & position in space

Primitive Reflexes: Normal patterns that we are born with

Genetic Material/DNA

Vestibular-Auditory-Visual Triad

- Visual
  - Strong core provides solid base for using eyes similar to the way a tripod stabilizes a camera
  - Ability to keep eyes steady on a target even when head or body is moving
  - If vestibular system is not working properly to guide postural control, the eyes cannot participate efficiently (i.e. copying from a distance, reading, writing, tying shoes, catching or kicking a ball)
  - Also contributes to our ability to use landmarks as a guide and move through environments
  - Ability to mentally visualize objects and events affects life skills such as making transitions, solving problems and preparing for future events
### Brain Science

- **Neurons**
  - Electrical and Chemical communication
  - Nerve Growth Factor
  - Myelination (Omega/Fish oils)
  - Neurotransmitters
    - Serotonin, Dopamine, Histamine, Endorphines, etc.

### Brain Chemistry Defines Us...

<table>
<thead>
<tr>
<th>Serotonin</th>
<th>Dopamine</th>
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<tbody>
<tr>
<td>Master modulator</td>
<td></td>
</tr>
<tr>
<td>Affects all other NT’s</td>
<td></td>
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<tr>
<td>All is well with world, promotes calm</td>
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<tr>
<td>Responsible for working memory</td>
<td></td>
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<tr>
<td>Huge impact on arousal</td>
<td></td>
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<tr>
<td>Stress depletes supply</td>
<td></td>
</tr>
<tr>
<td>*Prop, activity, sleep, sunlight</td>
<td></td>
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<tr>
<td>Pleasure chemical</td>
<td></td>
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<tr>
<td>Initiation/Activator</td>
<td></td>
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<tr>
<td>– Gives us will/motivator</td>
<td></td>
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<tr>
<td>Promotes focus/concentration</td>
<td></td>
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<tr>
<td>Chemical of emotional brain center (need it to smile!)</td>
<td></td>
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<tr>
<td>Involved in addictions</td>
<td></td>
</tr>
<tr>
<td>*Pressure touch, protein, music with strong rhythm</td>
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</tbody>
</table>

### Brain Chemistry Defines Us...

<table>
<thead>
<tr>
<th>Norepinephrine</th>
<th>Histamine</th>
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<tbody>
<tr>
<td>Chemical for selective attention (holds attn vs. dopamine which grabs attn)</td>
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<tr>
<td>Contributes to fight or flight response</td>
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<td>Enhanced when serotonin is enhanced</td>
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<tr>
<td>Also activated with new/novel experience</td>
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<tr>
<td>Conductor of the NT orchestra</td>
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<tr>
<td>Found in brainstem &amp; body</td>
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<tr>
<td>Helps with state (modulation)</td>
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<tr>
<td>Gives us our nuances of behavior</td>
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<tr>
<td>Allergies &amp; medications have huge impact!</td>
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The “New” Brain

Factors contributing to the increasing number of children experiencing difficulty with sensory processing:

- “Back to sleep” program
- Container generations
- Liability & Safety
- Technology
- Overall decreased movement
- Toxins
- Nutritional Factors

A “SANE” Approach

- Sleep
  - REM vs. Non-Rem
  - Bedtime Routine
- Activities
  - Proactive, not reactive
- Nutrition
  - Toxins, Chemicals, Preservatives, etc.
  - Fish Oil, Multi-vitamin, Protein
- Environment
  - Routines, Rhythm, Visual Schedule

Sensory Diets

- Use latency to your advantage
- Find natural opportunities in daily routine
- Have fun & be creative
- NO SUBSTITUTE for one point suspension swing
- Therapy complements sensory diets
- Consistency is the key!!
Latency Effect
In a typically developing system

– Vestibular: 8 hours
  • Powerful impact on what follows
– Tactile & Proprioceptive: 2 hours
  • No such thing as too much

Vestibular Activities

• Swings
• Rocking toys and chairs
• Riding toys
• Scooter boards
• Seesaws and merry go rounds
• Therapy balls

Heavy Work Activities

• Whole body actions involving pushing, pulling, lifting, climbing, hanging, crawling
• Resistive Activities
• Oral activities such as chewing, sucking and blowing

Generally organizing. Can improve attention, arousal level, body awareness, and muscle tone. May decrease defensiveness.
Heavy Work Ideas

- Jungle gyms, rock walls, zipline
- Trampoline, jump rope, hoppity balls
- Tug of war games, Push of war
- Mop, sweep, vacuum, rake
- Roller blades, bikes, scooters
- Animal walks, wheelbarrow walk

More Heavy Work Ideas

- Swimming
- Weighted items: blankets, clothes, wrist or ankle weights, weighted pals
- Pushing/pulling objects
  - Laundry basket, wagon, putty, towel or blanket on tile floor, Theraband
- Carrying objects
  - Groceries, backpacks, watering can

Sandwich/Squishing activities

- Sandwich between floor pillows or cushions
- Hot dog game
- Bear hugs
- Firm towel dry after bath, wrap tightly
- Roll ball over back in prone position
- Massage, lotion or deep pressure rubs
- Arm/Hand hugs
Oral Motor activities

- Chewy Foods: dried fruit, beef jerky, gum, granola bars, soft pretzels
- Resistive sucking: crazy straws, sports bottles, thick liquids/foods through straws
- Blowing activities: wind instruments, bubbles, whistles, blopens, kazoos, cotton ball game

Fine Motor/Upper Extremity Activities

- Tools/toys
  - Clothespins, spray bottles, play doh, rolling pins, paper punches, rubbing plates
  - Silly putty, fidget toys, stress balls, squishes, sand
  - Sidewalk chalk, sandpaper, brush dog!
  - Cooking activities (stirring, pressing, kneading)
- Vertical surfaces (Easels, wipeboards)
  - Washing windows, shower, tables
  - Paint with water on side of house

A Note Regarding Behavior

- Think sensory first
- All behavior is communication
- Consistency
- Proactive sensory diets
- Honor all communication
- Eliminate emotional response
Final Considerations

- Sleep
- Nutrition
- Vitamins/Fish oil
- Water
- Movement
- Behavioral Strategies

Sensory Solutions, LLC
Sarasota, FL

Mission Statement: Sensory Solutions is dedicated to broadening the traditional therapy model to include wellness for children of all abilities, parent education, and classes that promote growth and learning.