



Understanding Sensory Integration and Implications on Attention Skills

Janice Keener, Psy.D.
Corey Yates MS, OTR/L



AGENDA

- * Introduction
- * Brief overview of ADHD Diagnostic Criteria
- * Overview on Sensory systems and Impact on ADHD
 - * Activities to improve upon symptoms are on slides for review
- * Resources for the impact Sensory Integration Differences on ADHD

DIAGNOSING ADHD

Inattention

- * Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or with other activities.
- * Often has trouble holding attention on tasks or play activities.
- * Often does not seem to listen when spoken to directly.
- * Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (e.g., loses focus, side-tracked).
- * Often has trouble organizing tasks and activities.
- * Often avoids, dislikes, or is reluctant to do tasks that require mental effort over a long period of time (such as schoolwork or homework).
- * Often loses things necessary for tasks and activities (e.g. school materials, pencils, books, tools, wallets, keys, paperwork, eyeglasses, mobile telephones).
- * Is often easily distracted; Is often forgetful in daily activities

DIAGNOSING ADHD cont.

* Hyperactivity and Impulsivity

- * Often fidgets with or taps hands or feet, or squirms in seat.
- * Often leaves seat in situations when remaining seated is expected.
- * Often runs about or climbs in situations where it is not appropriate (adolescents or adults may be limited to feeling restless).
- * Often unable to play or take part in leisure activities quietly.
- * Is often “on the go” acting as if “driven by a motor”.
- * Often talks excessively.
- * Often blurts out an answer before a question has been completed.
- * Often has trouble waiting his/her turn.
- * Often interrupts or intrudes on others (e.g., butts into conversations or games)

DIAGNOSING ADHD cont.

- * *Combined Presentation*: if enough symptoms of both criteria inattention and hyperactivity-impulsivity were present for the past 6 months
- * *Predominantly Inattentive Presentation*: if enough symptoms of inattention, but not hyperactivity-impulsivity, were present for the past six months
- * *Predominantly Hyperactive-Impulsive Presentation*: if enough symptoms of hyperactivity-impulsivity, but not inattention, were present for the past six months.

What is Sensory Integration?

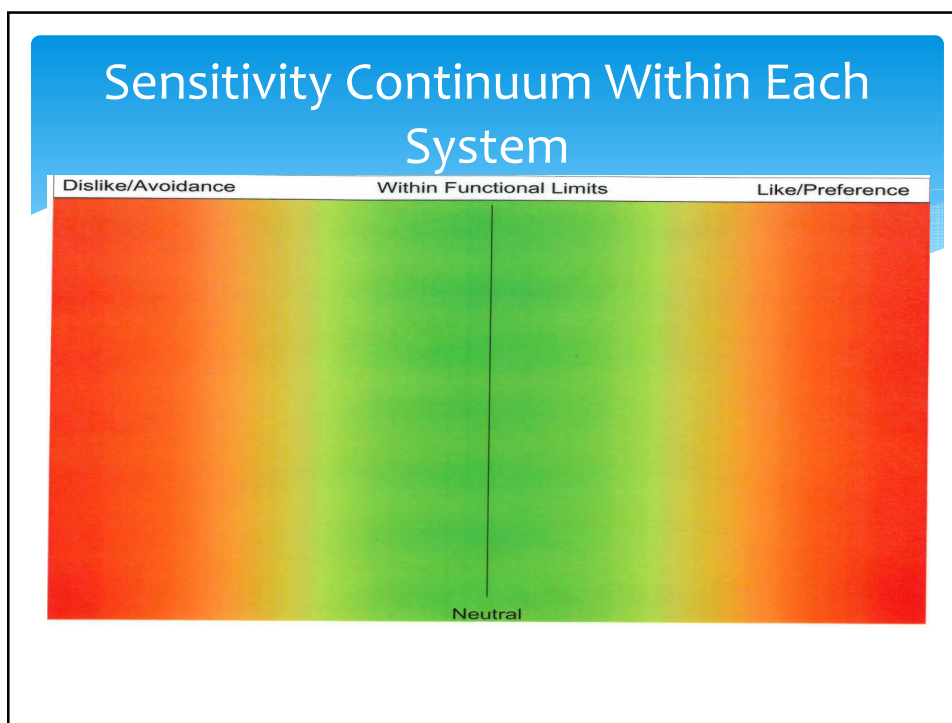
- * Sensory Integration [SI]: organizing sensory input to respond and interact with the environment. Input from all sensory channels are integrated in the brain and used to create perceptions, thoughts, emotions and physical actions. SI comes from the nervous system and influences learning and behavior.
- * Sensory Modulation: ability to filter and prioritize environmental stimuli (responsiveness/how sensitive)
- * Sensory Discrimination: ability to perceive and differentiate input (skill)
- * There are 8 sensory channels
- * For each sensory channel, there is a continuum of sensitivity level, resulting in personal likes, dislikes and varying skill level

What is Sensory Integration?

- * Sensory Integration [SI]: organizing sensory input to respond and interact with the environment. Input from all sensory channels are integrated in the brain and used to create perceptions, thoughts, emotions and physical actions. SI comes from the nervous system and influences learning and behavior.
- * Sensory Modulation: ability to filter and prioritize environmental stimuli (responsiveness/how sensitive)
- * Sensory Discrimination: ability to perceive and differentiate input (skill)
- * There are 8 sensory channels
- * For each sensory channel, there is a continuum of sensitivity level, resulting in personal likes, dislikes and varying skill level

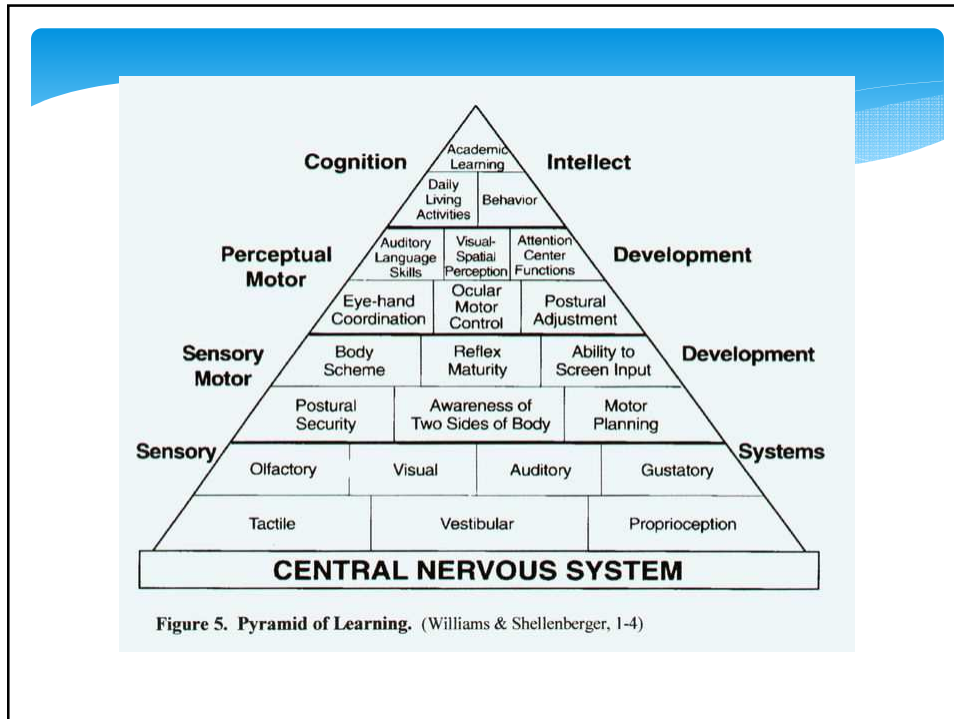
Function or Dysfunction?

- * Range of normal
- * Appropriate to have likes dislikes
- * Do preferences limit your function?
- * Is arousal state within functional limits to allow engagement?
- * Are social skills impacted?






Sensory Integration lays the Foundations for:



- Regulation of arousal state
- Grading physical movements
- Posture (control & endurance)
- Behavioral regulation
- Emotional regulation
- Social skills
- Motor-planning
- Mapping and planning time
- Self-care skills
- Executive function skills







The 8 Sensory Systems

- * Taste
- * Sight
- * Hearing
- * Smell
- * Touch
- * Movement and Position (Proprioception)
- * Gravity and Balance (Vestibular)
- * Internal organs (Interoception)

Tactile System /Touch

Receptors for light touch and deep touch
1 of 3 'Core' senses
Temperature, itchiness, pain (along with interoception)



Potential Differences & Signs of Problems:

- * Dislike standing in line or difficulty w/ personal space
- * Dislike touching/playing w/ messy things
- * Frequent mouthing/chewing on objects
- * Avoids or craves specific food textures
- * Constant touching of things/others
- * No or decreased reactions to bumps/falls/scrapes
- * Specific about clothing textures (bothered by tags)
- * Decreased or extra-sensitive hot/cold awareness
- * Distress with hair washing & teeth brushing

Tactile System /Touch cont.

IMPACT ON ADHD:

- * Children w/ ADHD (w/o hyperactivity) have more tactile and visual deficits
- * Children w/ attention d/o more likely to have touch sensitivities, resulting in clothing sensitivities, difficulty w/ social interactions, and negative behaviors such as complaining and 'pulling away'
- * Children w/ attention d/o more likely to have difficulty w/ fine motor coordination skills
- * Tactile processing differences can lead to inattention and hyper-activity

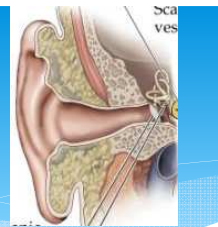
Activities to Develop the Tactile System:

- * Textured Bins: macaroni, sand, marbles, rock, rice, pom-poms (wet & dry play)
- * Use tools: tweezers, clothes pins, buttons, dressing dolls, eye-droppers, scissors, lacing
- * Use cooking/eating utensils for scooping, pouring, measuring
- * Various texture toys, felt, play-doh, cards, musical instruments, bean bags, stuffed animals
- * Messy play: bubbles, finger paint, cooking, shaving cream
- * Pretend/Dress up play
- * Play guessing games by touching objects with eyes closed

Vestibular System

Balance

- * Relationship to gravity
- * 1 of 3 'core' senses
- * Structures located in inner ear



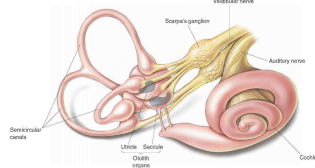
Potential Differences & Signs of Problems:

- * Difficulty staying still during seated tasks; frequent movement in general
- * rocking (while seated or standing)
- * Craves spinning or swinging ('never seems to get dizzy')
- * Likes being upside-down
- * Fears or avoids movement
- * Dislikes head tilted back for hair washing
- * Avoids playground equipment (such as swings)
- * Car sickness; difficulty w/ elevators/escalators

Vestibular System cont.

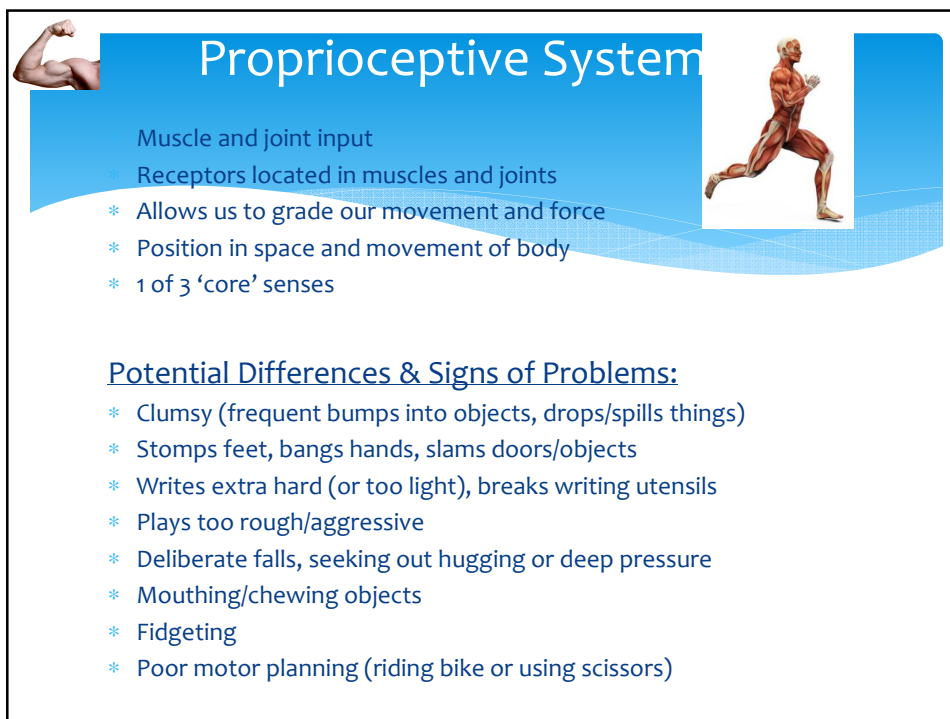
IMPACT ON ADHD:

- * Vestibular input can decrease hyperactivity



Activities to Develop Vestibular System:

- * Movement games (Twister, Simon Says, Bop-It)
- * Animal walks, log rolling
- * Yoga
- * Martial arts and sports
- * Playgrounds/swings
- * Dancing, stretching, running, bike, skating
- * lay down to look up at clouds, stars, or play I-Spy
- * Changing positions during table-top tasks
- * Boating, swimming and water activities
- * Jump houses and ropes courses
- * Roller coasters and movement rides
- * Horseback riding



Proprioceptive System

Muscle and joint input

- Receptors located in muscles and joints
- * Allows us to grade our movement and force
- * Position in space and movement of body
- * 1 of 3 'core' senses

Potential Differences & Signs of Problems:

- * Clumsy (frequent bumps into objects, drops/spills things)
- * Stomps feet, bangs hands, slams doors/objects
- * Writes extra hard (or too light), breaks writing utensils
- * Plays too rough/aggressive
- * Deliberate falls, seeking out hugging or deep pressure
- * Mouthing/chewing objects
- * Fidgeting
- * Poor motor planning (riding bike or using scissors)

Proprioceptive System cont.

IMPACT ON ADHD

- * Children w/ ADHD are more likely to have difficulty w/ UE/LE coordination and abnormal muscle tone; greater difficulty w/ sensory-motor skills and fine motor coordination skills
- * Proprioceptive input can be used to provide regulating and calming input
- * Children w/ attention d/o more likely to have poor body awareness

Activities to Develop Proprioceptive System:

- * Anything that provides resistance to muscles and joints!
- * Freeze Tag and wrestling games, sports
- * Animals walks, dancing, running, yoga
- * Playground equipment and ropes courses
- * Tug-o-war
- * Chores
- * Play-doh, putty, digging, scooping
- * Take muscle breaks during other tasks (especially 'sit-down' tasks)
- * Swimming and horseback riding
- * Going to the beach, hiking and climbing

Visual System



- Closely linked to vestibular and proprioceptive system.
- Many different visual perception skills
- Important for mapping environments
- * Control of eye movements

Potential Differences & Signs of Problems:

- * Poor eye contact
- * Turns head to side, or gets close when looking at things
- * Seeks intense input (such as close-up looking at lights)
- * Difficulty tracking objects (such as ball to catch)
- * Difficulty w/ moving spaces on game board; difficulty w/ puzzles or handwriting
- * Difficulty finding things (such as a game in a closet)
- * Easily distracted by things in environment
- * Loses place when reaching and/or difficulty copying from board
- * Difficulty separating eyes from head movements
- * Frequent rubbing eyes, or complaint of eyes being blurry, itchy or tired

Visual System cont.

IMPACT ON ADHD:

- * Children w/ ADD (w/o hyperactivity) have more tactile and visual deficits

Activities to Develop Visual System

- * I-Spy games
- * Board games
- * Reading
- * Scavenger hunt
- * Target activities
- * Coloring (dot-to-dots, mazes, color by number)
- * Stringing beads, completing buttons and other fasteners
- * Visual-motor activities like Light Bright, Legos
- * Playground equipment
- * Charades, dress up, group dance
- * Sports & Yoga

Auditory System



- Helps map environments, time and space
- Receptors in inner ears
- * High frequency/low frequency, vibrations

Potential Differences & Signs of Problems:

- * Sensitive to noises (covers ears w/ loud or sudden noises, such as toilet flush; easily bothered by background noise)
- * Doesn't always respond to name
- * Difficulty locating sound (where is the ringing phone?)
- * Constantly distracted by background noise
- * Requesting repeated directions ("huh? What?")
- * Constant making of noises (humming, etc)
- * Prefers loud music/electronics

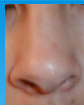
Auditory System cont.

IMPACT ON ADHD:

- * Children w/ attention d/o more likely to have auditory sensitivities and more frequent behaviors related to auditory differences
- * Increased sensitivity and difficulty w/ modulation of auditory input negatively impacts attention skills and can result in social-emotional differences/difficulties

Activities to Develop Auditory System:

- * Games requiring listening/talking: Bingo, Guess Who?, Simon Says, red light green light
- * Singing/dancing
- * Clapping/rhythm games
- * Imaginary play
- * Listening to music while engaging in other activities
- * Listen to auditory stories, lessons or meditations
- * Playing musical instruments and whistles



Smell & Gustatory System



Smell and Taste

- * Smell is directly linked to arousal (energy) level; useful for self-regulation
- * Protect from noxious stimuli

Potential Differences & Signs of Problems:

- * Sensitive to smell, complains of things smelling bad
- * Smelling people and/or objects
- * Strong behavioral and/or emotional responses to smells/tastes
- * Prefers foods with extra spice, or extra bland
- * Limits food textures
- * Eats inappropriate objects (such as paper)

Olfactory & Gustatory Systems cont.

IMPACT ON ADHD:

- * Children w/ attention d/o are more likely to have taste and smell hyper and hypo-sensitivities; more likely to be 'picky eaters'
- * Taste and smell differences can impact behavioral and social-emotional responses
- * Taste and smell input can be used to providing regulating input as part of sensory diet

Activities to Develop Gustatory & Olfactory input:

- * Cooking
- * Food crafts
- * Scented lotions, soaps, bubble bath, shaving cream
- * Experiment with different food textures & tastes; sour, spicy, sweet, savory, crunchy, chewy
- * Use smells and tastes to improve emotional, behavioral and energy/arousal regulation
- * Experiences different outside environments, beach, grass, flowers, rain, snow
- * Essentials oils, candles and air fresheners

Interoception/Visceral Sense



Sensation of hunger/fullness
 bowel/bladder awareness
 Awake/asleep
 * Pain sensation
 * Illness

Potential Differences & Signs of Problems:

- * Decreased awareness of need to use bathroom; frequent accidents (may be night or day)
- * Altered sleep performance (difficulty falling asleep, frequent waking up)
- * Over-eating (doesn't seem to get full)
- * Not feeling gradual hunger (all of a sudden 'starving')
- * High tolerance for pain
- * Decreased awareness of illness

Interoception/Visceral Sense cont.

IMPACT ON ADHD:

- * Children w/ attention d/o more likely to be picky eaters, have narrower ability to cope & respond appropriately w/ hunger, pain, tiredness etc.

Activities to Develop Interoception:

- * Limited known ways to develop, more use of compensatory strategies
- * Bed time routines w/ calming activities
- * Morning routines w/ alerting strategies
- * Bathroom schedules
- * Regular and preventative health care

What To Do When You Have Concerns and How is SI Assessed?

- * Looking for patterns of sensory foundation for behavior
- * Occupational therapy (various models of intervention)
- * Referral from PCP or specialist (if you have concerns, start with your PCP or doctor who addresses ADHD concerns)
- * Specific Assessments
 - * SIPT
 - * Sensory Profile or Sensory Processing Measure
 - * Caregiver Interview
 - * Clinical Observations

Sensory-Based Interventions & Strategies

- * Therapeutic Brushing
- * Therapeutic Listening
- * Interactive Metronome
- * Brain Gym
- * Yoga
- * Sensory or Sensory Stories
- * Stick Kids
- * Support Strategies
- * How Does Your Engine Run?

Key Points for Attention Disorders and Sensory Integration:

- * There is a high correlation between ADHD and SI differences and/or deficits
- * Sensory hyper and hypo-sensitivities and difficulty with sensory modulation are noted in children w/ attention disorders, across all areas.
- * Children with ADHD often have difficulty w/ receiving, perceiving and regulating sensory input/output, including individual sensory channels and integrating together as a whole.
- * Deficits with sensory modulation are linked to impaired attention, impaired arousal, and impulsivity
- * Higher levels of sensory sensitivity are linked to higher levels of aggression and disruptive behaviors
- * Discuss Sensory-related sensitivities with ADHD provider

Key Points for Attention Disorders and Sensory Integration: cont.

- * Children with ADHD have a high co-morbidity rate w/ other diagnoses:
 - * Oppositional Defiant Disorder
 - * Conduct Disorder
 - * Mood disorder
 - * Anxiety
 - * Depression
 - * Learning Disorders
- * Overlap between ADHD and Autism Spectrum Disorder (ASD)
 - * Strong correlation between ASD and SI differences
- * Irritability in infancy correlates w/ higher rate of ADHD later on and infancy traits include: more reactivity, less adaptability, lower threshold for sensory stimuli
- * Deficits with Executive Functions are associated in people w/ attention d/o and people w/ SI differences
- * Occupational therapy is an identified intervention to address Sensory hyper and hypo-sensitivities

REFERENCES

Corey Yates: corey.yates@chkd.org
 Children's Hospital of Kings Daughters
 Therapy Services including:
 Occupational Therapy
 Physical Therapy
 Speech Therapy

Janice Keener, Psy.D.
 Children's Hospital of the Kings Daughters
 Developmental Pediatrics



Resources & References

- * Sensory Integration and the Child, Jean Ayres
- * Learn to Move, Move to Learn (Autism/Asperger Publishing Company)
- * SPD foundation.net
- * SI Global Network.com
- * The Out of Sync Child, by Lucy Miller, OTR/L
- * AOTA Addressing Sensory Integration Across the Lifespan through Occupational Therapy www.aota.org
- * STAR Institute www.spdstar.org

Articles

- * Dunn, W. & Bennett, D. (2002). Patterns of sensory processing in children with attention deficit hyperactivity disorder. *Occupational Therapy Journal of Research*, 22, 1. 4-14.
- * Ermer, J. & Dunn, W. (1998). The sensory profile: A discriminant analysis of children with and without disabilities. *American Journal of Occupational Therapy*, 52(4), 283-290.
- * Panagiotidi, M., Overton, P., & Stafford, T. (2018). The relationship between ADHD traits and sensory sensitivity in the general population. *Comprehensive Psychiatry*, 80. 179-185.