



To understand the Solutions, you need to understand how the body and the brain work



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"The fundamental difference between computers and the human mind is the basic organization of memory." Computers organize logically and linearly. The brain remembers based on cues (other information and memories). It can connect and reconnect information in unlimited ways. This is how we get inventions/innovation.



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Development has a sensory foundation: Piaget's 4 Cognitive Stages

0-2 Years

Sensorimotor stage: sensory experiences and physical action

2-7 Years

Preoperational stage: words, images, symbolic thinking

7-11 Years

Concrete operational stage: logical reasoning and classification of object/

11-15 Years

Formal operational stage: abstract reason, idealism, complex logic



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The Senses and Learning

Problem-Solving, abstract reasoning, creativity,
citizens of the community, volitional behavior
(Executive function, ideation)

Integration with cognitive and language concepts
(Praxis/Play/Communication/Purpose/

Internal Feedback/Learning/Sensorimotor
development

Tactile, Visual, Auditory Exploration of Materials
and the world through movement



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The Senses We Learn in School

Taste
(gustatory)



Hearing
(auditory)

Touch
(tactile)



Smell
(olfactory)

Sight
(visual)



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The Hidden Senses



Proprioception:
Provides awareness of where
body parts are and what they are
doing



Vestibular:
Responsible for sense of balance,
space and speed/direction of
movement



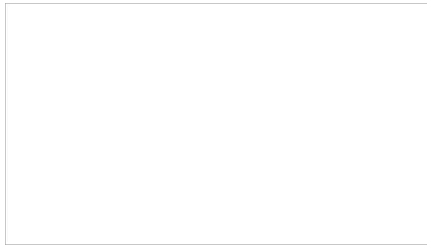
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Watching the Process in Infants



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Typical Sensorimotor Development



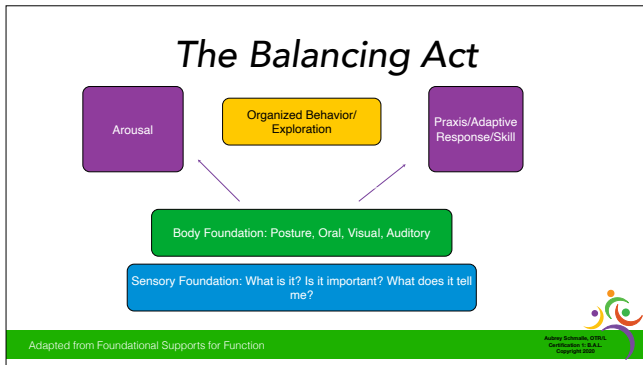
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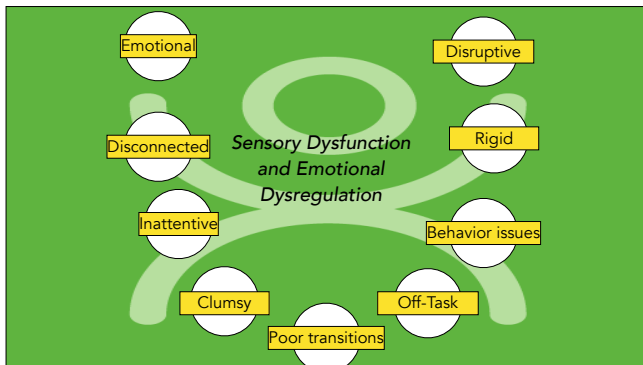
Think about Ball Play



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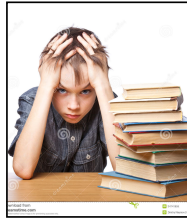






You expect me to...

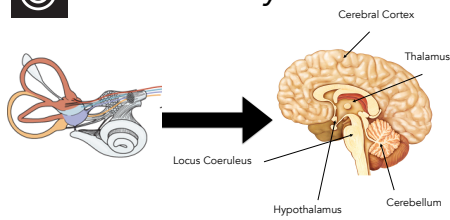
- Learn
- Behave
- Be nice to my friends
- Listen
- Communicate
- Sit
- Get my work done



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Vestibular System



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Vestibular System

- Responsible for perception of speed and direction of movement
- Increases alertness and energy to prepare the body for action (more blood flow to the muscles, increased heart rate, tells eyes to look around)
- Enhances formation and retrieval of memory



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Somatosensory System



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NIOSH
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Proprioceptive System

- Gives us awareness of our muscles and joints as well as how our body is moving
- Helps us understand how our body parts relate to each other and move for planning and coordinated movement (body scheme and body awareness)
- Allows efficient muscle grading in relation to object use and movement; tells us the weight of objects.
- Can act as a calming regulator for managing arousal



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Tactile System

- Provides information about the shape and size of objects
- Is protective and provides information on pain and temperature
- Gives information about the textures of objects
- Can act as a calming regulator for managing arousal



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Influencing Self-Regulation



Vestibular



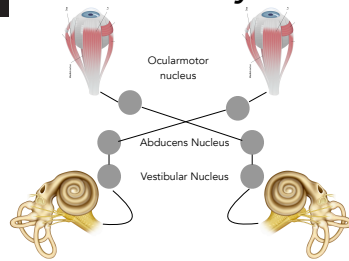
Proprioception



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The Visual System



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Visual System

- Both eyes work together to collect information about environment (Binocular vision) - Colors, brightness
- Vision is more than seeing clearly - ability of the eyes to accurately take in and process information from the environment
- Vision represents 70% of the sensory nerve fibers of the entire body (Padula, 1988)
- Vision is not meant to work in isolation. Understanding of visual information is based on other sensory cues.



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Vestibular-Mediated Visual Skills

- Visual Fixation = Sustained Focus
- Tracking = Following a moving person/object
- Convergence/Divergence = Shifting between teacher and desk work
- Quick Localization = Visual attention shifts in space to monitor peers/objects
- Saccades = Attention shifts needed to read/monitor





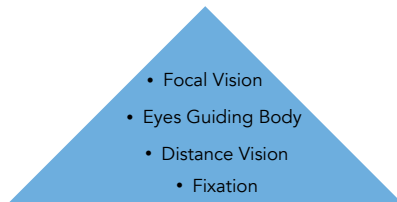
Developmental Milestones

- Vestibulo-ocular mechanisms are mature by 1 year of age
- Vestibular system effectiveness for gaze stabilization is mature by 3 years of age
- Smooth pursuits in preschoolers are slightly irregular and refine around 5 years of age





Normal Visual Development





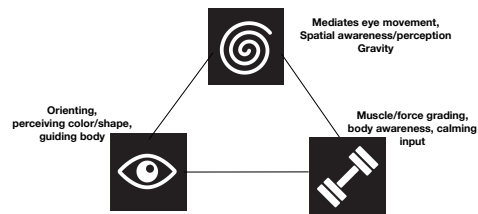
Key Observations: Binocular Vision Deficits

- Using ambient vision vs. focal vision
- Laying down to play games
- Can't sustain focus on a object or person
- Has limited visual attention before becoming distractible and disengaged
- Hyperfocuses or gets really close to objects of interest but does not shift attention between objects and people
- Exhibits excessive blinking/eye rubbing



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The Senses Were Designed to Communicate!

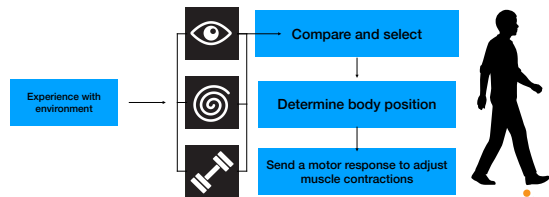


Visual-Vestibular-Somatosensory Triad



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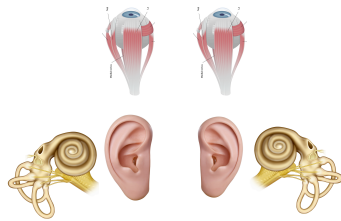
How Sensations Interact to Control Body Movement



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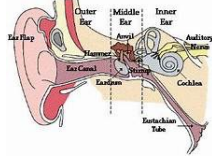


Auditory System



Auditory System

- Give us a sense of the size of a room and where sounds are coming from
- Allows us to differentiate between sounds for language development and to select the most important sounds to attend to
- Helps us differentiate between foreground and background sounds
- Gives us information about the volume and pitch (frequency) of sound



Visual-Vestibular-Auditory Triad

