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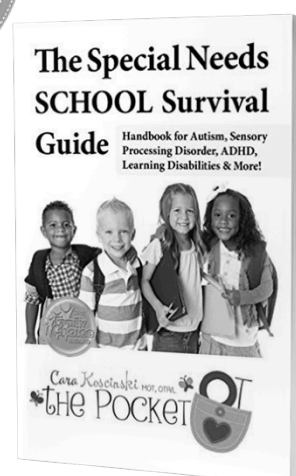
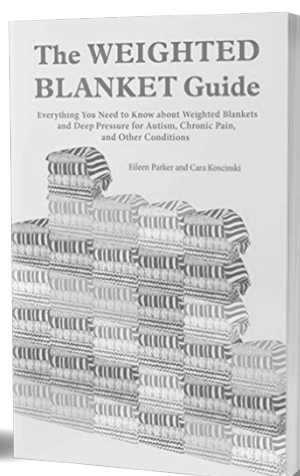
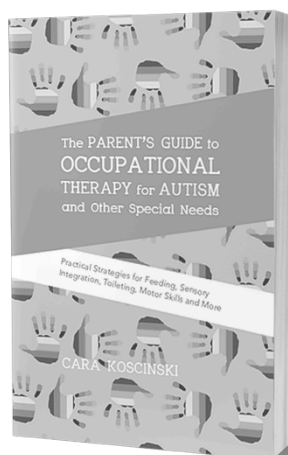
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Building Healthy Brains: Sensory Strategies for Optimal Brain Function & Postural Concerns



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Objectives

- 1) Describe the importance of movement to higher level brain function.
- 2) Identify physical manifestations of immature brain function.
- 3) Identify hands-on movement activities that can be applied to children in order to improve brain maturity, improve posture, and connect body systems.

Why Movement?

- Optimal function of our bodies occurs when our sensory and motor systems are strong and able to adapt to the demands of the environment. Today's children often struggle with fidgeting, decreased attention, and immature motor patterns which manifest themselves through frustration and behavior issues. When our body's systems are not integrated to form a strong foundation, difficulties in many areas occur. This session provides education about using movement to improve overall function.
- Instruction and hands-on movement activities are provided.



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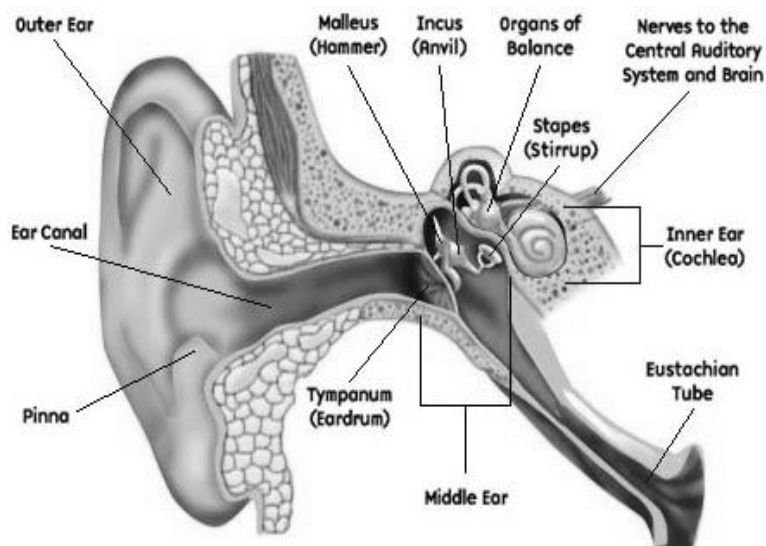
Babies placed into 'containers' for convenience OR by well-intentioned parents who misunderstand developmental progression



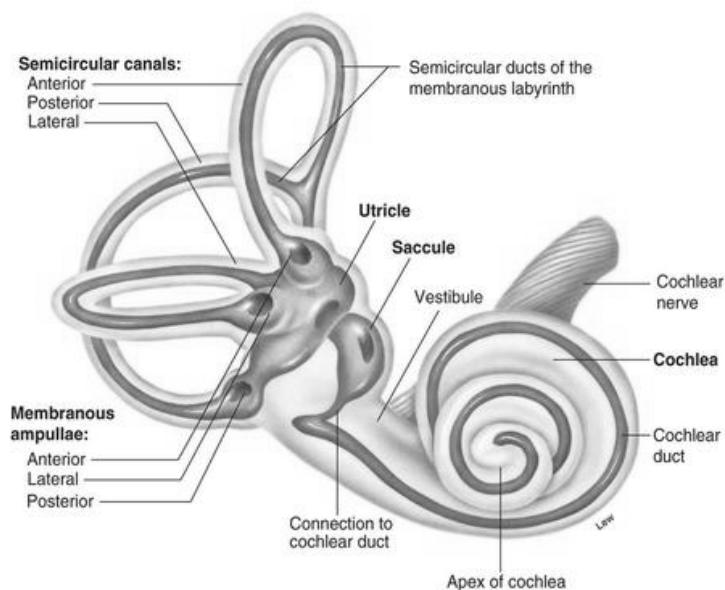
Video game and electronic device EXPLOSION limits active movement and physical exploration both in and outside.

Article: *"The National Association for Sports and Physical Education recommends, "Young children should not be sedentary for more than 60 minutes at a time, except when sleeping" (2009).*

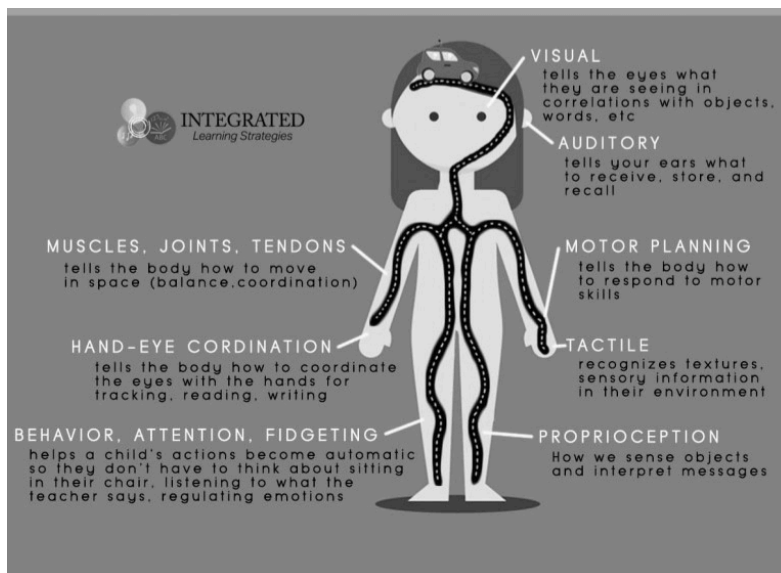
Ear Anatomy



- Five vestibular receptors in each ear
- three **semicircular canals** (horizontal, anterior, and posterior) that transduce rotational angular accelerations
- two **otolith receptors** (utricle and saccule) that transduce linear accelerations (Lindeman)



Vestibular MUCH more than inner ear

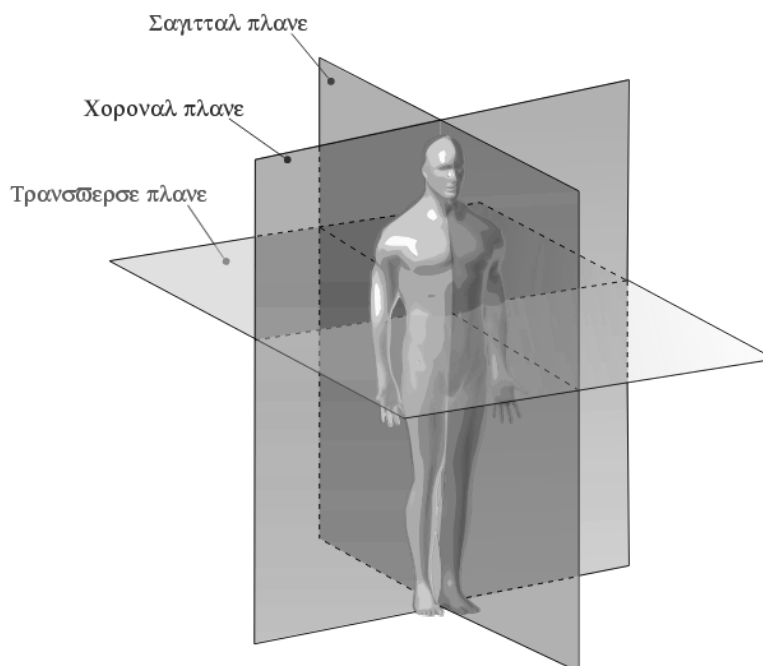


The Vestibular System

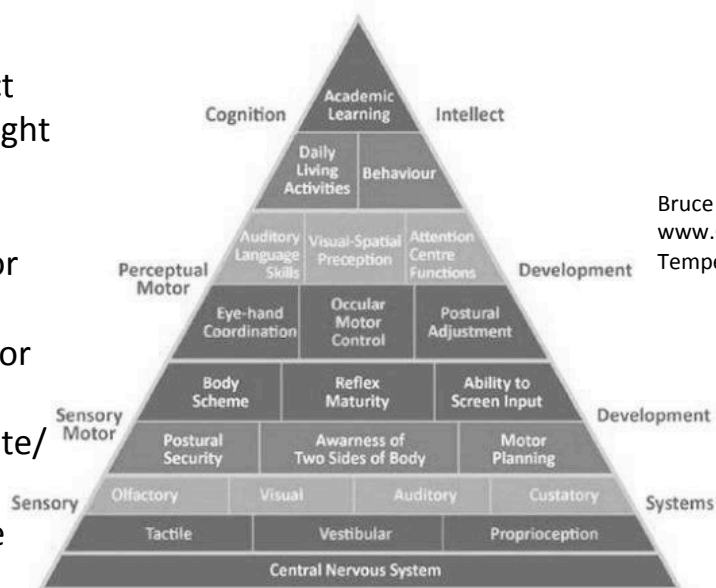
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Vestibular movement in ALL planes

RED: Sagittal Plane
BLUE: Frontal Plane
GREEN: Transverse Plane



Higher Abstract
Concrete Thought
Affiliation
Attachment
Sexual Behavior
Emotional
Reactivity Motor
Regulation
Arousal Appetite/
Satiety Sleep
Blood Pressure
Heart Rate



Bruce D. Perry, M.D., Ph.D.
www.ChildTrauma.org Body Temperature

Figure 1 - The Pyramid Of Learning

How do we achieve modulation?

- Levels of Sensory integration:
- Modulation and regulation are in brain stem and mid brain.
- Begin with existence then move from chemical reactions to behavioral states.
- When a task is requested and child melts down as they 'fall apart' because they are simply existing as best they can. **REGULATION** is when we assist in the change. **SELF-REGULATION** is when the child makes the change.

Part	Healthy Brain	Injured Brain
Frontal lobe	Personality/emotions Intelligence Judgement Body Movement Attention/concentration Speech (speak & write)	Paralysis Repetition of a single thought Decreased focus Mood swings, irritability, impulsiveness Changes in social behavior & personality
Parietal lobe	Sense of touch, pain, and temperature Distinguishing size, shape, and color Spatial perception Visual perception	Difficulty distinguishing left from right Lack of awareness or neglect of certain body parts Difficulties with hand-eye coordination Trouble with reading, writing, naming Difficulty with mathematics
Occipital lobe	Changes in breathing Difficulty swallowing food and water Problems with balance and movement Dizziness and nausea (vertigo)	Blind spots Vision deficits Visual illusions/hallucinations Difficulty reading and writing

Part	Healthy Brain	Injured Brain
Temporal lobe	Speech (understanding language) Memory Hearing Sequencing Organization	Difficulty understanding language and speaking (aphasia) Difficulty recognizing faces Difficulty identifying/naming objects Problems with short and long-term memory Changes in sexual behavior Increased aggressive behavior
Cerebellum	Balance Coordination	Difficulty coordinating fine movements Difficulty walking Tremors Dizziness (vertigo) Slurred speech
Brainstem	Breathing Heart rate Alertness/consciousness	Changes in breathing Difficulty swallowing food and water Problems with balance and movement Dizziness and nausea (vertigo)

Signs of Complex SPD:

Sensory MODULATION disorder

- Problem regulating in response to input
- Results in withdrawal of/negative responses
- Signs:
 - Upset by noises and sounds
 - Easily distracted by visual stimuli
 - Difficulty falling/staying asleep
 - Hypersensitivity to clothing

Sensory DISCRIMINATION disorder

- Problem in recognizing/interpreting differences or similarities in qualities of stimuli
- Signs:
 - uses too much force
 - Crashes/bumps into objects
 - Drops or knocks things over
 - Afraid of heights
 - Poor balance

Signs of Complex SPD:

Postural-Ocular disorder

- Problem w/ control of posture or control of movements seen in ms tone or joint instability and/or poor functional vision
- Seen in vestibular and prop. problems
- Signs:
 - Flat feet
 - Slumps while sitting
 - Weaker than other children
 - Fatigues easily
 - Problems with eye-tracking

Dyspraxia

- Problem in planning, sequencing, executing unfamiliar actions
- Signs:
 - Awkward/poorly coordinated motor skills
 - Difficulty w/ ADLS
 - Prefers routine
 - Awkward pencil grasp and patterns
 - Does not prefer sports

Case study #1: Joshua

- Reflux
- GJ tube fed
- Mitochondrial disease
- Fear of making errors
- Flat feet
- Low energy
- Difficulty with reading and is two grades below in Language arts

Assessment

Assessment

Assessment:

- Weak Core
- Flat feet
- Tied together!
- Child has postural-ocular disorder

Case study #2: Jacob

- Hypervigilant
- Retained moro -- easy startle
- Toe-walker and was serial casted by PT
- Fear of making errors
- Difficulty sleeping
- Poor balance
- Genius IQ yet few true friends

Case Study 2

Assessment:

- Weak Core
- Weak spinal reflexes
- Test for TLR (commonly have trouble riding a bicycle)
- Child has both sensory modulation disorder and sensory discrimination disorder

Regulation:

- Emotional regulation = the ability to attain and maintain an emotional state that matches the task or setting.
- ****Depends on what you're doing. Only certain moods are available because of your current body state.*
- Required for ALL functions in human life
- Central nervous system: we need to breathe to balance our arousal.
- Motor and emotional regulation are BOTH affected with imbalance.



How Do We Regulate?

Sympathetic NS

- Sympathetic nervous system is the 'accelerator' to our body
****Fight, Flee or Flight****
- **Cortisol**
- **Located in thoracic cord**
- **Sexual climax**

Parasympathetic NS

- Parasympathetic nervous system is the 'decelerator' to the system
****Rest, Recover and Digest****
- **Located in sacral cord**
- **Also controls bladder**
- **Colon,**
- **Sexual arousal**

Three Levels of Brain Function:

- **Arousal** for basic survival and action. Posture in flexion and extension. Sense of self so focus is on needs and self
- **Alertness**, motivation, emotion for movement and action on the object. Postural is lateral flexion and weight shift. Task-based play, imagination, motivation/emotion, attends to environment – naturally occurs around pre-school
- **Awareness** for challenges, skills, actions to and in response to objects in surroundings. Postural skills are trunk rotation, rhythm, timing. Mature perspective, can complete entire routines with HOW, WHY, WHEN – naturally occurs at school aged +

Signs of STRESS in children – Amygdala = FEAR

- Acting out/behavior
- Stomach and headaches
- Sleeping issues
- Anger or aggression toward others
- Dilated pupils
- Sweating
- Flushing of cheeks
- Wide “deer in headlights” eyes



How Does It all BEGIN?

Early Brain Function

- Born with a CHAOTIC brain
- Through a process known as synaptic pruning, neurons that are not useful to the brain die off
- Connections are building into an organized state by 2-3 years of age
- The concept of neuroplasticity explores how the brain changes in the course of a lifetime and how different areas of the brain can evolve and adapt over time.



Physiological Flexion

- Tonic Labyrinthine Reflex
- Present at birth (comes at 12 weeks in utero) and is progressively integrated between the 3rd and 4th year.
- Head flexes, (below level of spine) whole body flexes
- Head extends (below level of spine) whole body incl. arms, legs, and torso extend



Maladaptive Postures



Almost ATNR!

- Decreased or reversed spinal curvature
- Extension
- Developmental Interference:
attachment, flexion, sitting, crawling, leg ext.,
rotation, dissociated movement, flexor and ext.
imbalance

Physiologic Interference:

Breathing, eating, position of diaphragm, tight
upper trunk musculature,
Oral motor structure in poor alignment

Brain Chemicals

- Oxytocin
- Serotonin
- Cortisol (stress hormone)
- Acetylcholine



Change Over Time:

- As we age, we change we become more SYMPATHETIC (not in personality but in our NS)
- Consider:
 - Increased heart rate
 - Increased blood pressure
- When children grow, they need more rest in order to recover and develop.



Levels of Brain Function:

- Brain will do what it takes to SURVIVE so it uses compensation strategies.
- When a child has a stressed system, he is 'dysregulated.'
- This dysregulated child cannot focus on higher level brain functions because he's CONSTANTLY looking for potential threats in the environment.

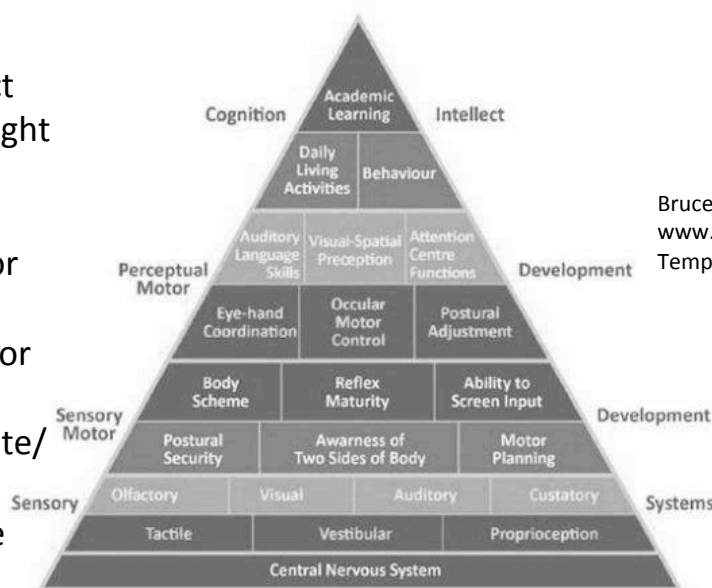


Signs of a Dysregulated Child

- Easily frustrated
- Worry and stresses easily
- Impulsive, irrational, aggressive
- Hyper aware of environment
- Poor fine motor skills
- Poor handwriting
- Insists on routine
- Difficulty with organization
- Panic attacks
- Difficulty sleeping
- Difficulty toileting
- Poor attention and focus
- Distracted by or bothered by smell, sound, sights, and sensory information
- Un-expected touch causes anxiety



Higher Abstract
Concrete Thought
Affiliation
Attachment
Sexual Behavior
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Reactivity Motor
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Figure 1 - The Pyramid Of Learning

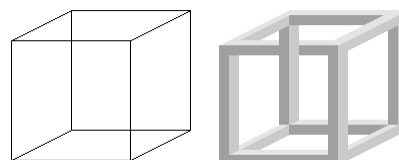
Perception is communication & interpretation

- Pons relays messages from the cortex and the cerebellum.
- Without the pons, the brain would not be able to function because messages would not be able to be transmitted, or passed along.
- Need interpreter via the sensory information to the cortex.
- Thalamus is responsible for relaying information from the sensory receptors to proper areas of the brain where it can be processed. If this part of the brain is damaged, sensory information would not be communicated.



Perception is ALL about Interpretation!

- Stimulus can be
 - Perceived (phantom limb)
 - Or considered a Sensation
- Some sensations cause perceptions and others are NOT perceived but evoke responses in the body such as blood pressure, blood gas
- Challenge: is HOW WE INTERPRET the information
 - Why we have visual tricks/puzzles
 - Why shots are more traumatic to some people
 - Why we THINK we move at a red light when someone next to us moves
 - Weber's Law demonstration ****What's important to one may not be registered by another****



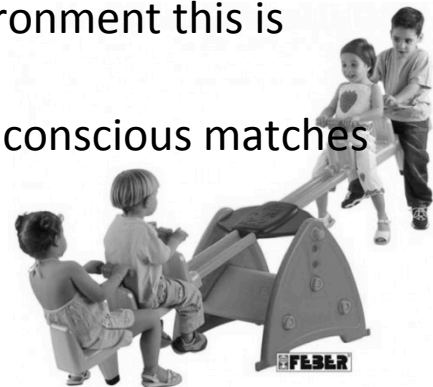
Presentation Questions:



- How does maturation of our sensory and motor system improve school performance?
- How can you provide movement experiences to improve attention?
- What factors in today's society are detrimental to building a strong foundation in both movement and sensory experiences?

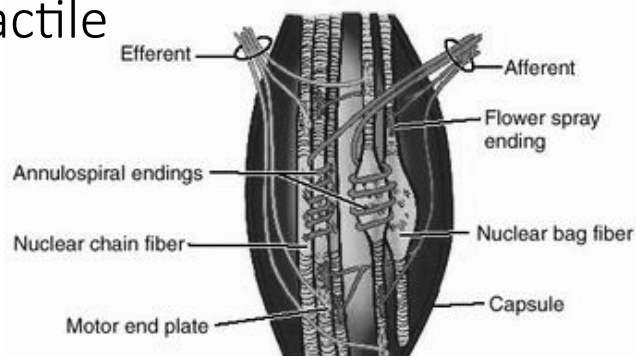
What IS Self-Regulation?

- Constant balancing of sympathetic and parasympathetic nervous system keeps us in a state of ability to interact with our environment this is REGULATION.
- Interplay between the two so our conscious matches what we are doing.
- How does STRESS affect us?



Proprioception and Tactile

Tactile information is received through the skin. There are at least six types of receptors. Notice disruption in their cell membranes or chemical changes.



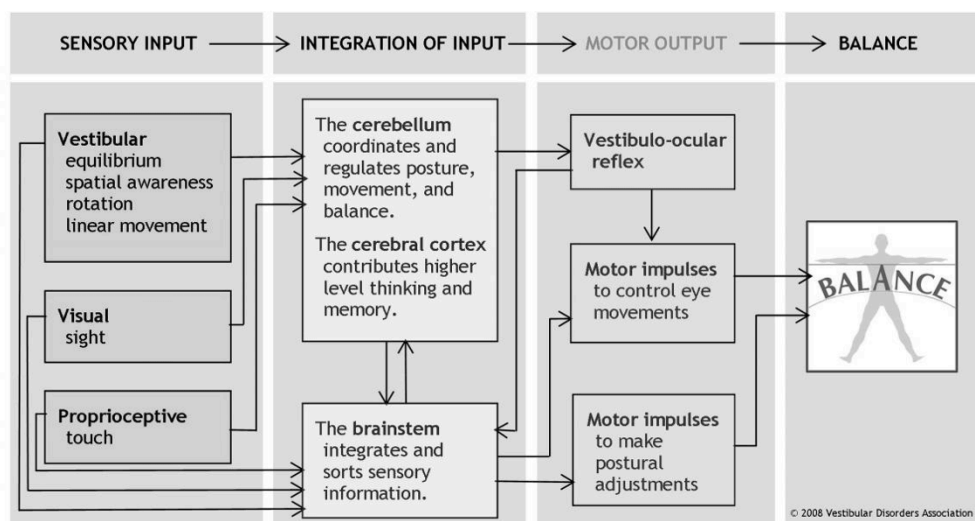
Proprioception

Monitors position of joints, tendons of joints and ligaments and the state of muscular contraction.

Tendon organs which measure the strain on a tendon and muscle spindles which monitor the length of the skeletal muscle (Innvista.com)

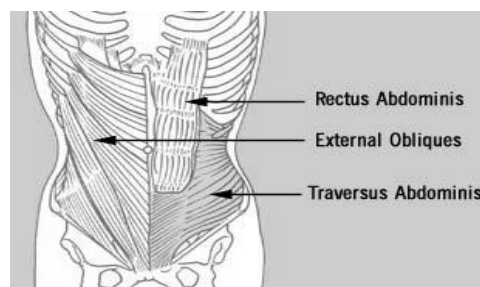
Therapeutic input lasts 2-4 hours.

Combination of Vestibular, Prop, and Vision



Core Stability

- Core muscles: help in developing mid-line
- Respiratory activation helps with Valsalva Maneuver
- Gravity and movement cause a baby to gain activation of the core muscles and refine as they grow and develop. Practice and development of many body systems (including: sensory, reflex integration, motor, and cognitive)
- Alignment changes w/ gravity and movement support activation of inner core team in first 2-3 years of life and refined into adolescence.
- Vision is important for hand-eye coordination, tracking/scanning for danger, etc.



Why might a person struggle?

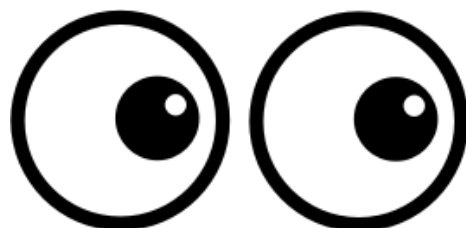
- In the child, stress and semicircular canal damage can cause low or erratic RAS function.
- They fluctuate in-and-out of wakefulness, particularly if they have no stimulation through movement. Much of their hyperactive movement is actually a means to stimulate and repair the damaged vestibular system, and maintain attention.
 - He may have a tendency to lose his balance easily and have playground accidents.
 - He will often violate another's personal space without realizing it, manifesting an incomplete understanding of spatial relationships in the environment. (<http://www.naturaladdtreatments.com/vestibular-system/>)

Levels of Brain Function:

- When primitive reflexes are retained, there's a 'tug of war' between the brainstem and the higher levels of the brain.
- The cortex then must use too much energy for basic function and cannot do its own job: learning, thinking, attention to task.

VISION is important!

- Our brain allocates a great deal of 'real estate' toward vision.
- Critical in ongoing postural reflexes that maintain upright position.
- Hand-eye coordination
- Dr. Roberto Kaplan



Why VISION?

- “The brain is like a system of roads. Information travels from one location to another.
- If the roads are direct and smooth, the travel is easy. If construction creates a barrier, the highway is blocked and traffic is redirected into clogged side streets. There is still movement, but it is slow and frustrating.
- Children with severe visual dysfunction spend too much time on these side streets and the simple act of perceiving the world becomes a nightmare.”
- Remember, VISION involves the brain as well as the eyes so it makes sense that disabled children would have a disabled visual system
- **Children with behavioral problems typically have multiple sensory issues, and visual dysfunction is one of them. 80% of the information we receive from our environment is visual! “**

Dr. Marie L. Fox, OD
Vision Therapist

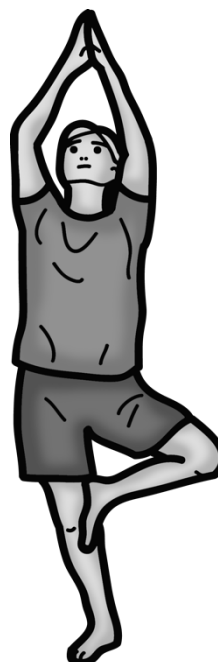
Oculomotor

- Marsden ball
- Hit a tennis ball with a stick/dow rod
- Balance board
- Arrows and jumping
- Toss bean bag in rainbow arc from one hand to the other and follow with eyes.
- Crawl with something on your back and rotate head side to side (ATNR integration)



Postural Control

- Affected by self-regulation
- Multiple system involvement:
 - Primitive Reflexes
 - Muscles
 - Sensory system information and integration
 - Previous experiences
 - Nervous system



Postural Reflexes

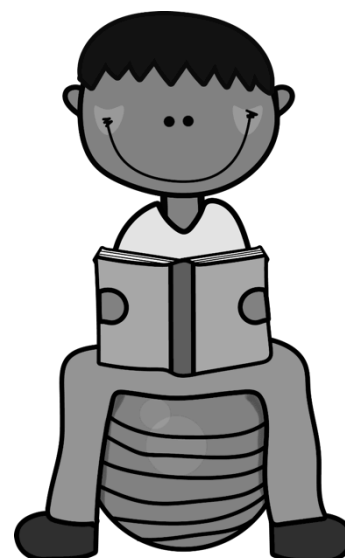
- Subconscious maintenance of posture
- Requirement throughout life to live against gravitational pull

RIGHTING:

Birth throughout life
 Help when there's a loss of balance
 Head control through standing

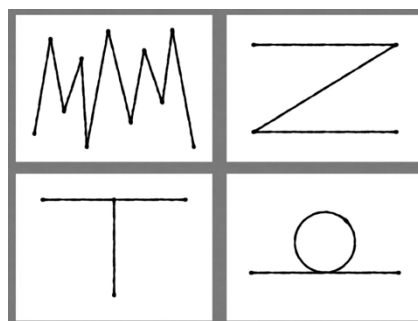
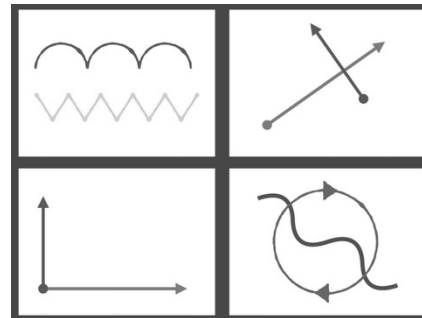
EQUILIBRIUM:

Six mo throughout life
 Event-specific and unique to each situation!
 Cortex with cerebellum to fine tune
 Base of support

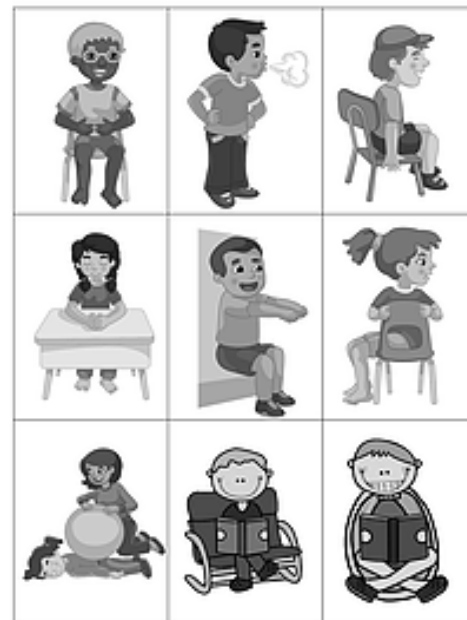
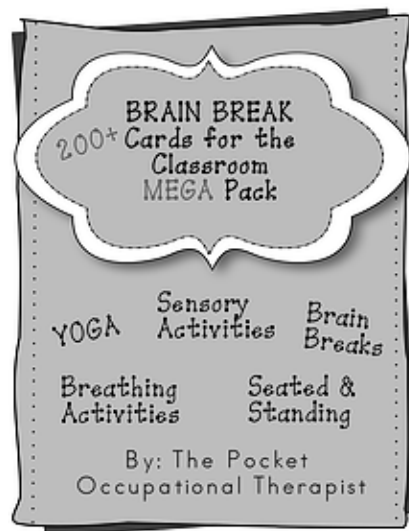


Pathways to Movement!

Wave	Shuffle
Spring	Twirl



BRAIN BREAKS!



Core stability

- Compensation Strategies
- Motor Patterns
- Breathing
- Rib cage, spine, pelvis alignment
- More compensation as time goes on.....not good for balance, gross motor, fine motor, oral-motor skills.



CORE and Emotion

- Breath
- Posture
- Emotion
- Use of extremities
- Emotional arousal



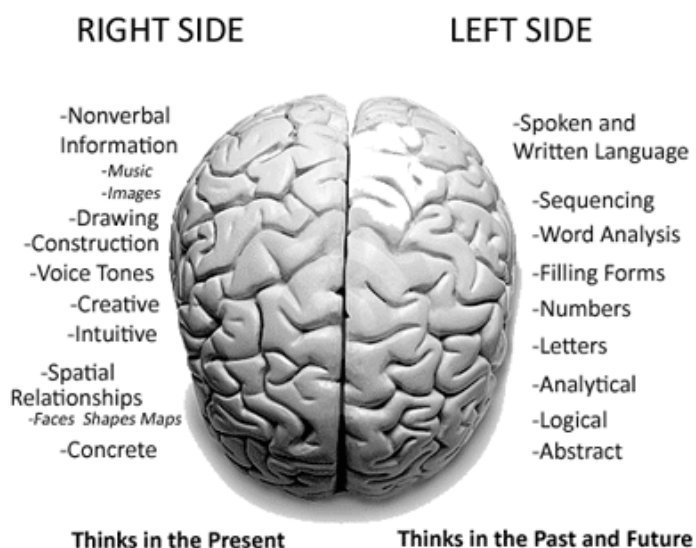
Motor **Muscles PULL but don't PUSH

- Jump on trampoline while catching a ball
- Pigeon and Duck walks
- Jumping over line w both feet
- Foot maze
- Make a box with each arm then each leg
- Balance beam
- Any activity requiring movement of body in coordinated way

Motor

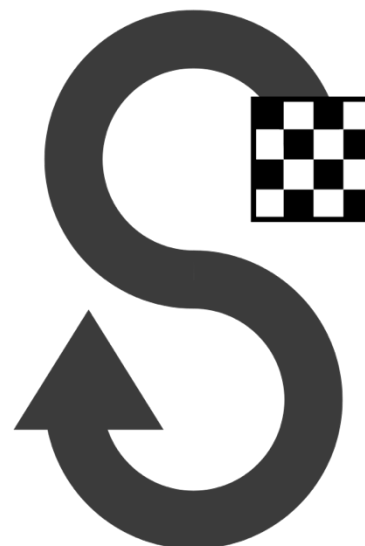
- Cross-Crawls
- Rock while in prone flexion (lineally and then laterally)
- SLOW the swing down
- Frog swing
- Straddle bolster and do activities which force midline crossing
- Bosu ball while tossing and catching
- Reaching for items presented backwards and behind
- Sitting back to back with OT to play 'around the world'

Our Amazing Brain....two different halves



Crossing Midline

- Elbow to Knee (Cross Crawls)
- Figure Eights (Brain Gym)
- Balance Walking
 - Use taped line, curb, or 2 x 4 piece of wood
 - Bend and pick things up while on beam
 - Toss and catch while on the beam
 - Balloon toss

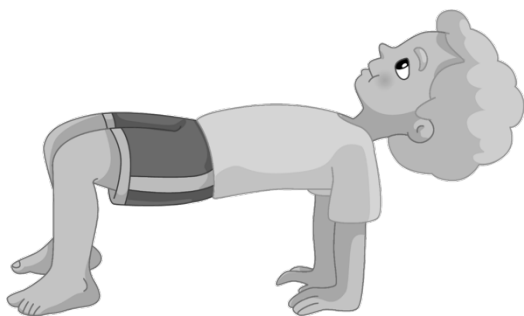


YOGA + Public School PE Standards

- Balance while bending and stretching
- Recognize that skill development requires practice
- Identify various body parts and location
- Move each joint in a full range of motion
- Learn teamwork through partners and groups
- Uses the entire body
- Move body safely

Core + Vestibular

- Bridge (grade up and down)

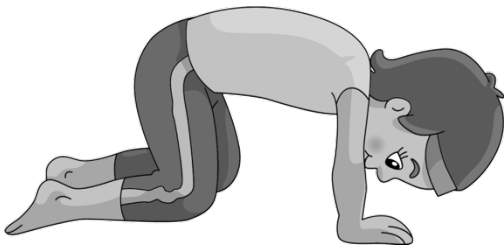


- Lemon Squeeze/Supine Twist

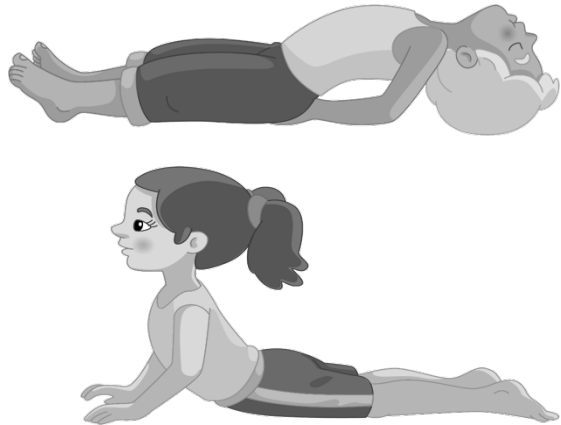


Core + Vestibular

- Cat/Dog



- Seahorse Pose/Snake Pose



Core + Vestibular

- Washing Machine

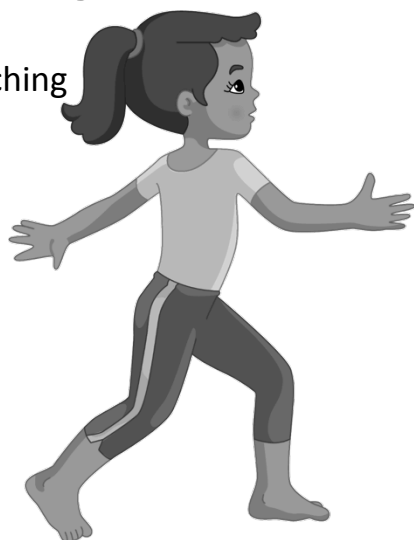


- Star



Crossing Midline

- Switching



- Cross Skipping



Complicated Poses

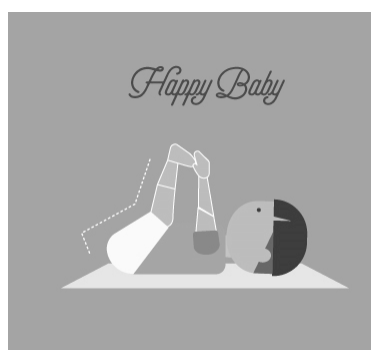
- Candlestick

Upside-down and 'blow' out toes.

Use with electric light OR match to see how we need oxygen

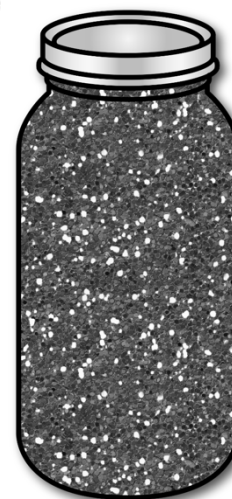


- Happy Baby



MIND over Matter

- Let children experience ANXIETY!
- Use affirmations
- Theme songs
- Send love and kindness to our bodies while in poses.
- Can use with multi-sensory experience such as a food or flower. Each required a-lot of energy to get to the place they are in.



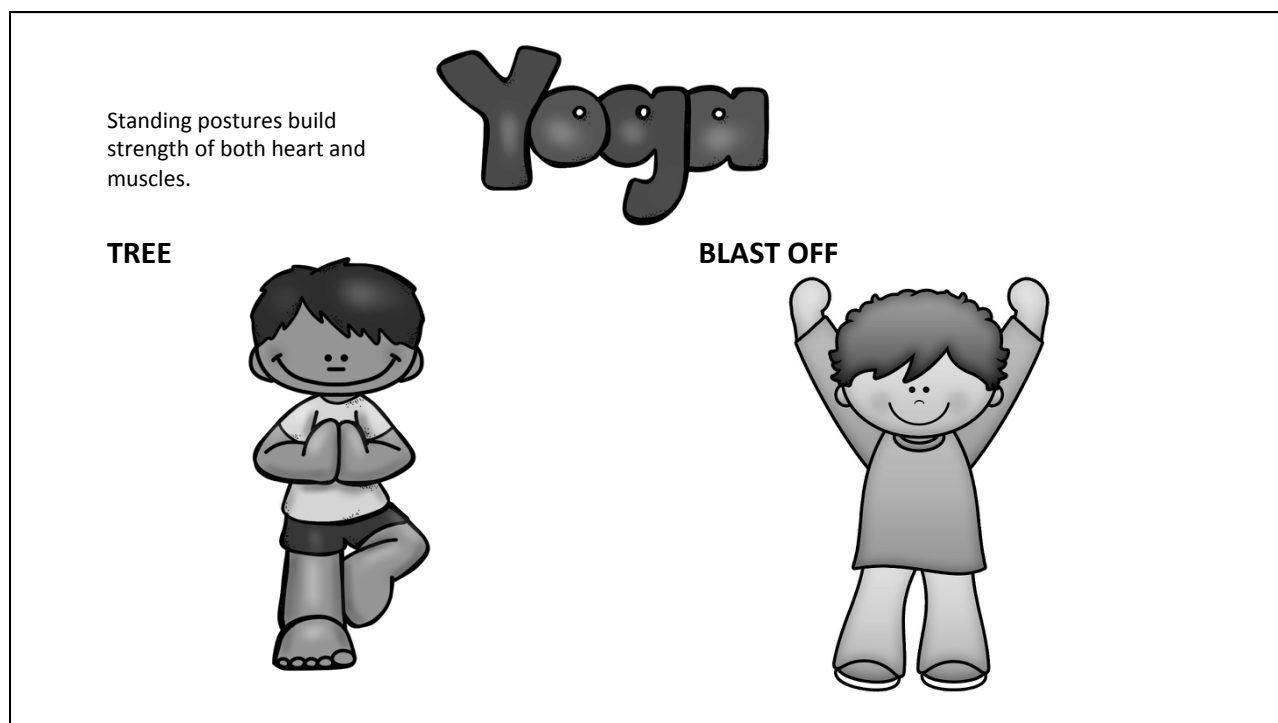
Yoga

RAG DOLL/Waterfall



Partner Poses

- Yogi says
- Freeze to music
- Musical mats – like YOGA obstacle course
- Downward dog tunnel
- Back to back and lock arms
- Hold hands facing each other and pretend to 'sit'

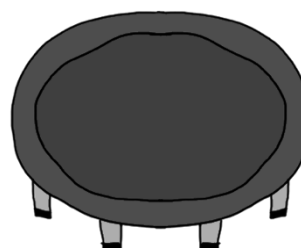
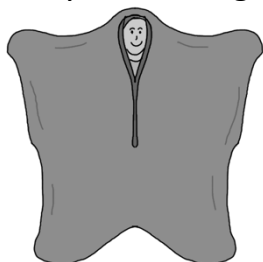


Attention and Focus

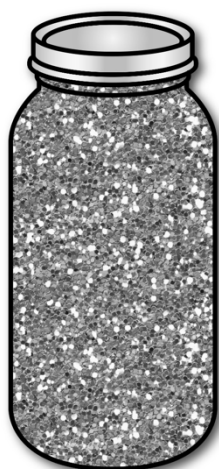
- YOGA Ball
 - Standing Desk
 - Hippocampus helps us to make new memories *smaller in PTSD and severe depression.
 - Mindfulness increases awareness of current surroundings and the HERE and NOW vs. what we THINK WILL HAPPEN (pre-conceived ideas).
 - Connected socially with others, the universe,
 - Life is ebb and flow of emotions and we simply ride them out.
- Psychology Today ~Melanie Greenberg, clinical psychologist.

Calming Techniques

- Return to Flexion
- Lower lighting
- Decrease Environmental Stimulus
- Proprioceptive Input PUSH, PULL, LIFT, CARRY
- Sensory Processing Techniques:



Tune In and Focus on Mindfulness



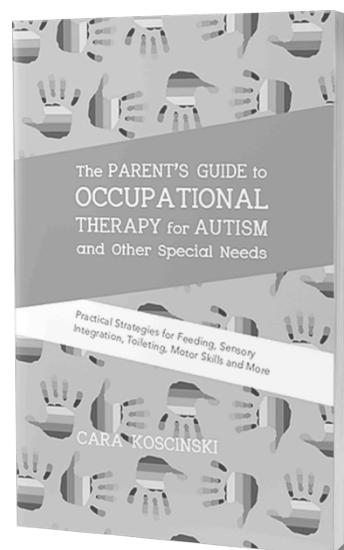
- Focus in on and feel breath.
- Mind jar: shaken up represents our chaotic thoughts
- Deep breath = settling of our thoughts
- Breath is the anchor (touch backs to connect)
- Focus on who each student is and slow breath and mind down
- When in pose, think about connection to body.

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- <http://synergyclinic.net/retained-neonatal-reflexes/>
- Bruce D. Perry, M.D., Ph.D. www.ChildTrauma.org Body Temperature
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