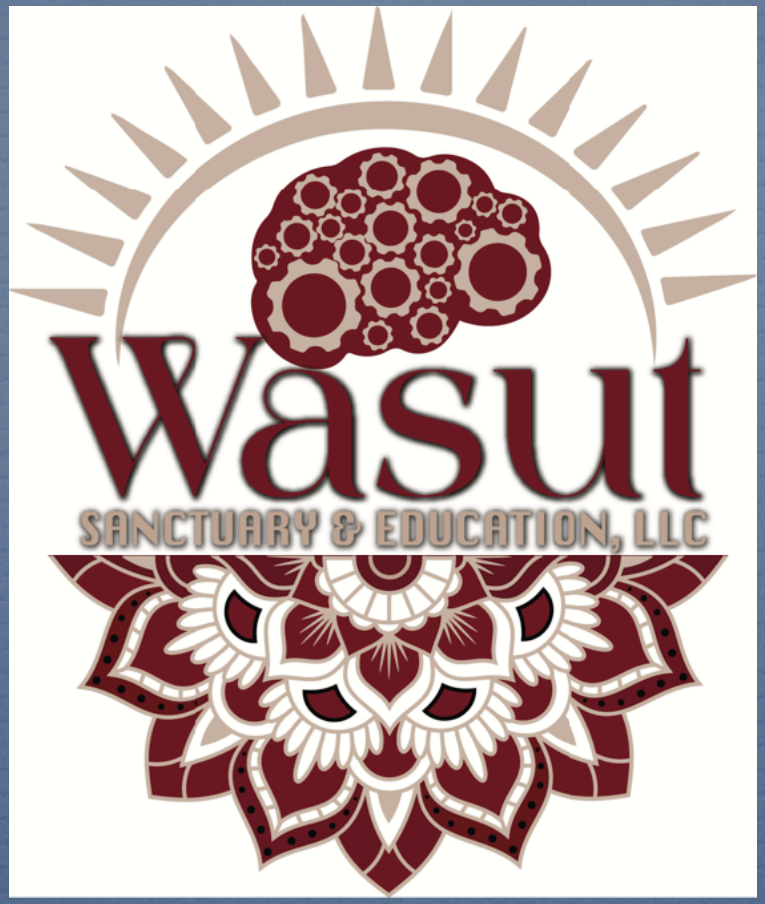


Neuroscience of Self-Regulation: Applications for the Pediatric Population

VARLEISHA D. LYONS
PHD, OTD, OTR/L, ASDCS, FNAP, FAOTA

“Materials that are included in this course may include interventions and modalities that are beyond the authorized practice of mental health professionals. As a licensed professional, you are responsible for reviewing the scope of practice, including activities that are defined in law as beyond the boundaries of practice in accordance with and in compliance with your professions standards.”

Disclaimer:

The views, thoughts, and opinions expressed in this presentation belong solely to the author, and not necessarily to the author's employer, organization, committee or other group or individual.

Varleisha D. Lyons PhD, OTR/Lis employed by the American occupational therapy association (AOTA).
This work is independent of her role and not affiliated with AOTA, Inc.

Objectives

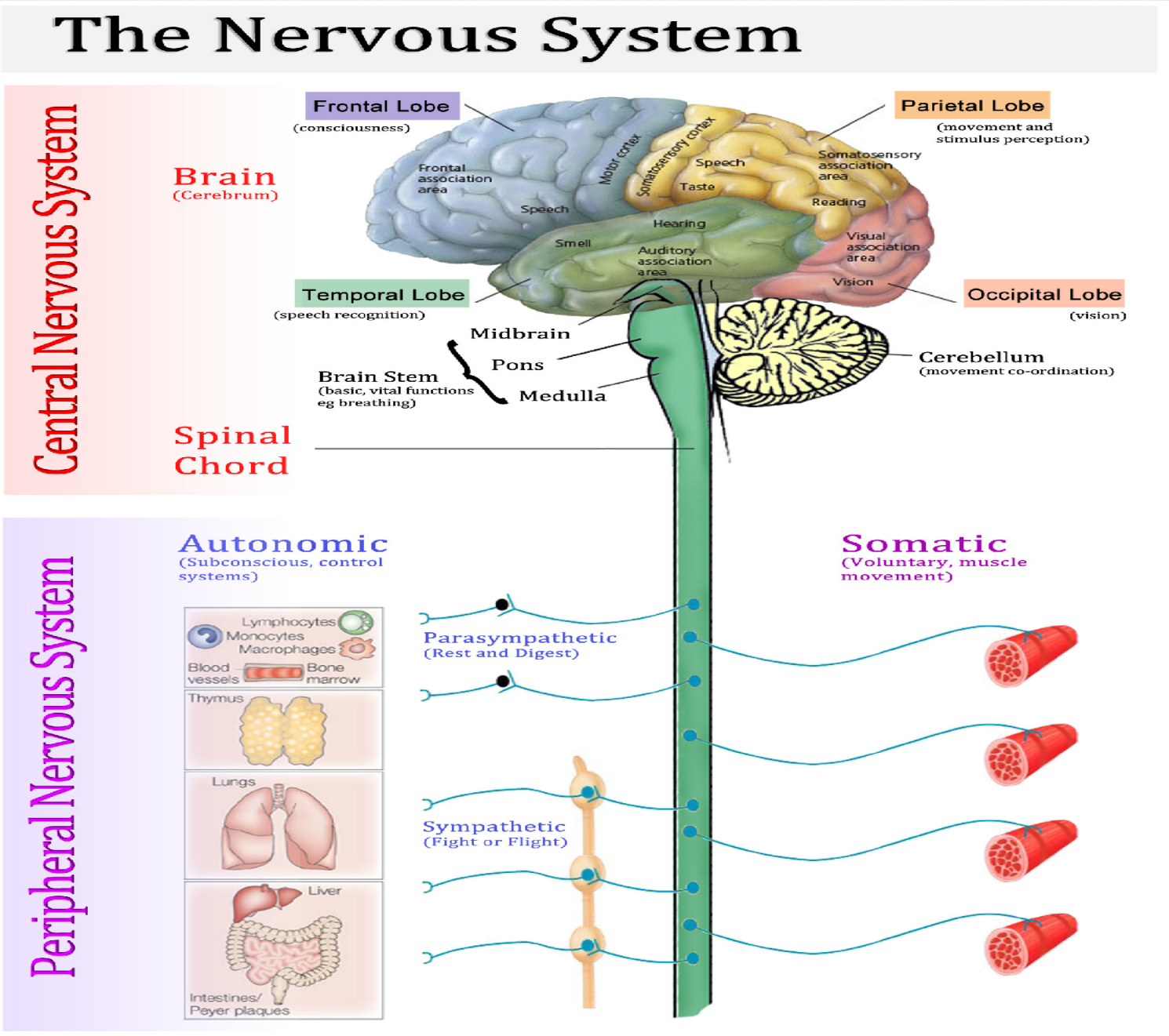
- **Describe** the neuroanatomical structures involved in self-regulation and their role in behavior and sensory processing.
- **Identify** how neuro-developmental and trauma-related differences affect regulation in pediatric populations.
- **Apply** evidence-based self-regulation strategies grounded in neuroscience to clinical practice.
  Integrate sensory-based and mindfulness-informed approaches to support children in school, home, and therapeutic settings.
- **Evaluate** pediatric self-regulation challenges using neuroscience-informed assessments and observation strategies.
- **Design** individualized, developmentally appropriate intervention plans that address the unique needs of diverse pediatric clients.

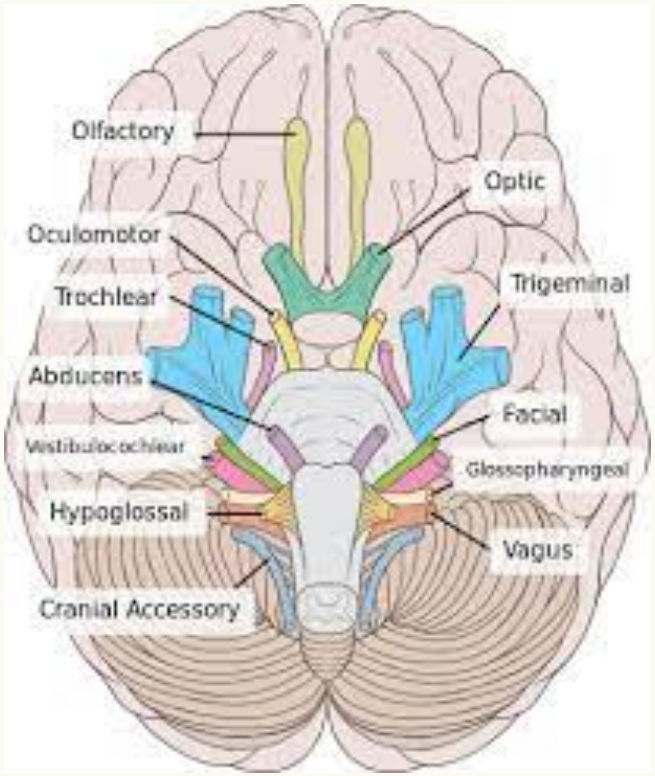
Upper Motor Neurons: Pyramidal

Conscious Control Response is Adaptive!

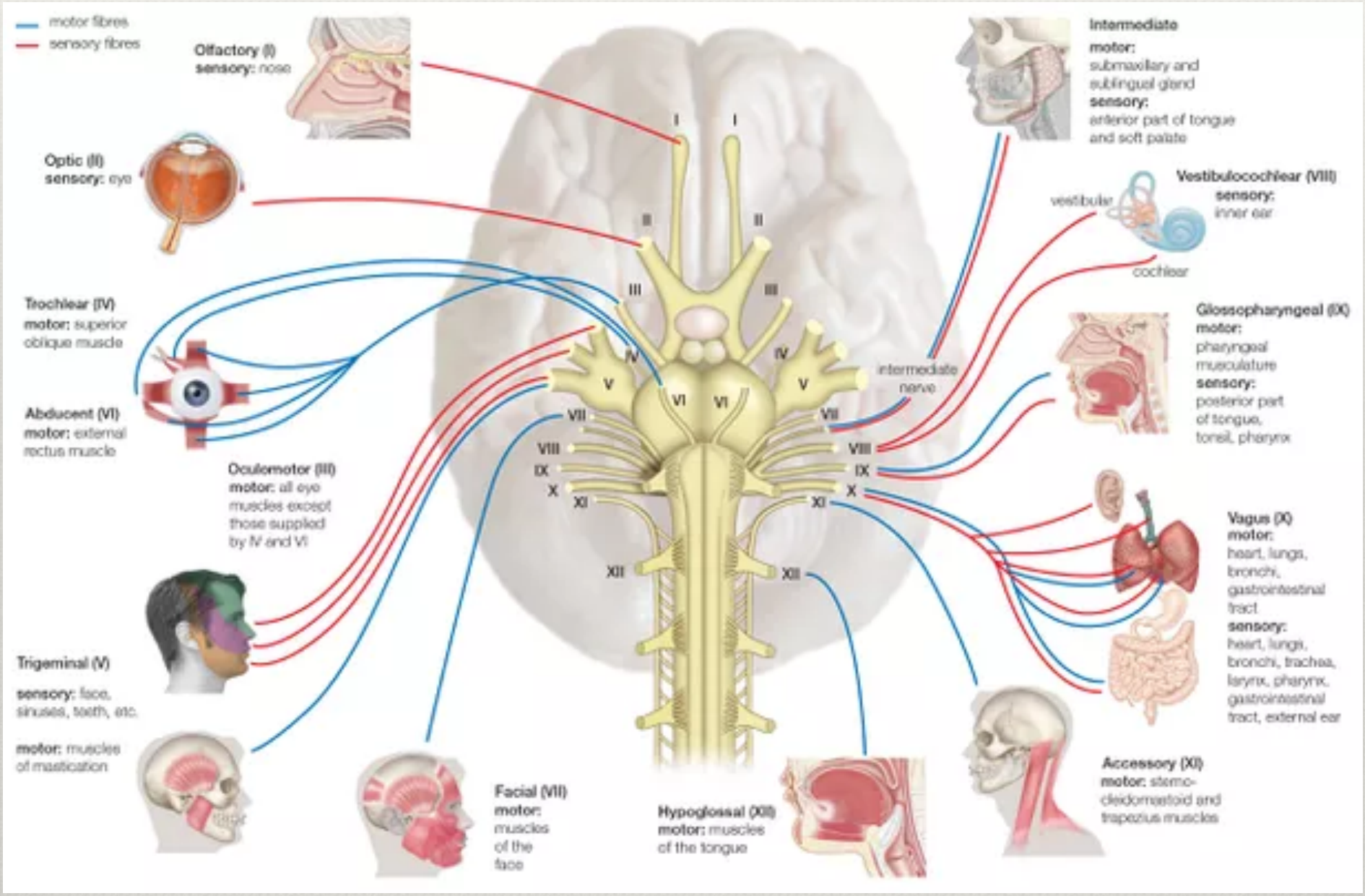
Lower Motor Neuron: Extrapyramidal

Unconscious Reflexes; and Inhibitory to Modulate movement Response is always the same!

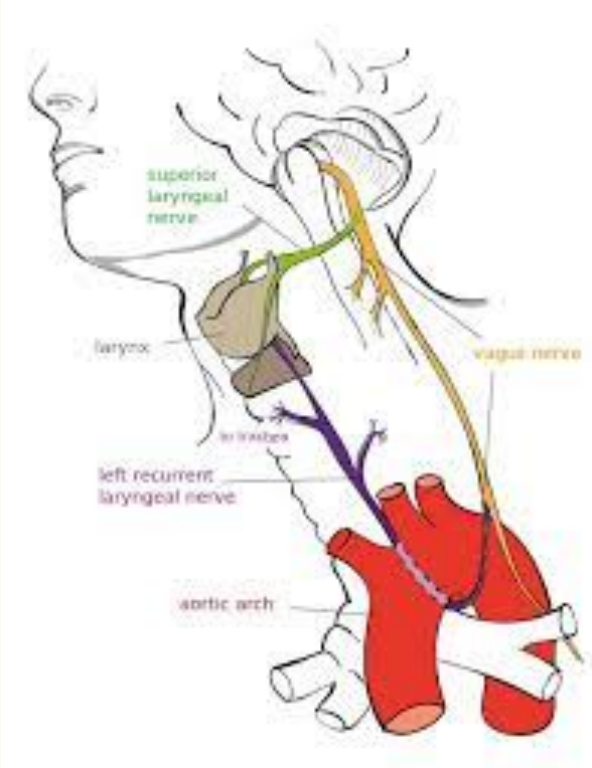




The Cranial Nerves


motor fibres
sensory fibres
Olfactory (I)
sensory: nose
Optic (II)
sensory: eye
Trochlear (IV)
motor: superior oblique muscle
Abducent (VI)
motor: external rectus muscle
Oculomotor (III)
motor: all eye muscles except those supplied by IV and VI
Trigeminal (V)
sensory: face, sinuses, teeth, etc.
motor: muscles of mastication
Facial (VII)
motor: muscles of the face
Hypoglossal (XII)
motor: muscles of the tongue
Intermediate
motor: submaxillary and sublingual gland
sensory: anterior part of tongue and soft palate
Vestibulocochlear (VIII)
sensory: inner ear
vestibular
cochlear
Glossopharyngeal (IX)
motor: pharyngeal musculature
sensory: posterior part of tongue, tonsil, pharynx
Vagus (X)
motor: heart, lungs, bronchi, gastrointestinal tract
sensory: heart, lungs, bronchi, trachea, larynx, pharynx, gastrointestinal tract, external ear
Accessory (XI)
motor: sterno-cleidomastoid and trapezius muscles
intermediate nerve
I
II
III
IV
V
VI
VII
VIII
IX
X
XI
XII

Eye Yoga



Vagus Nerve

PNS

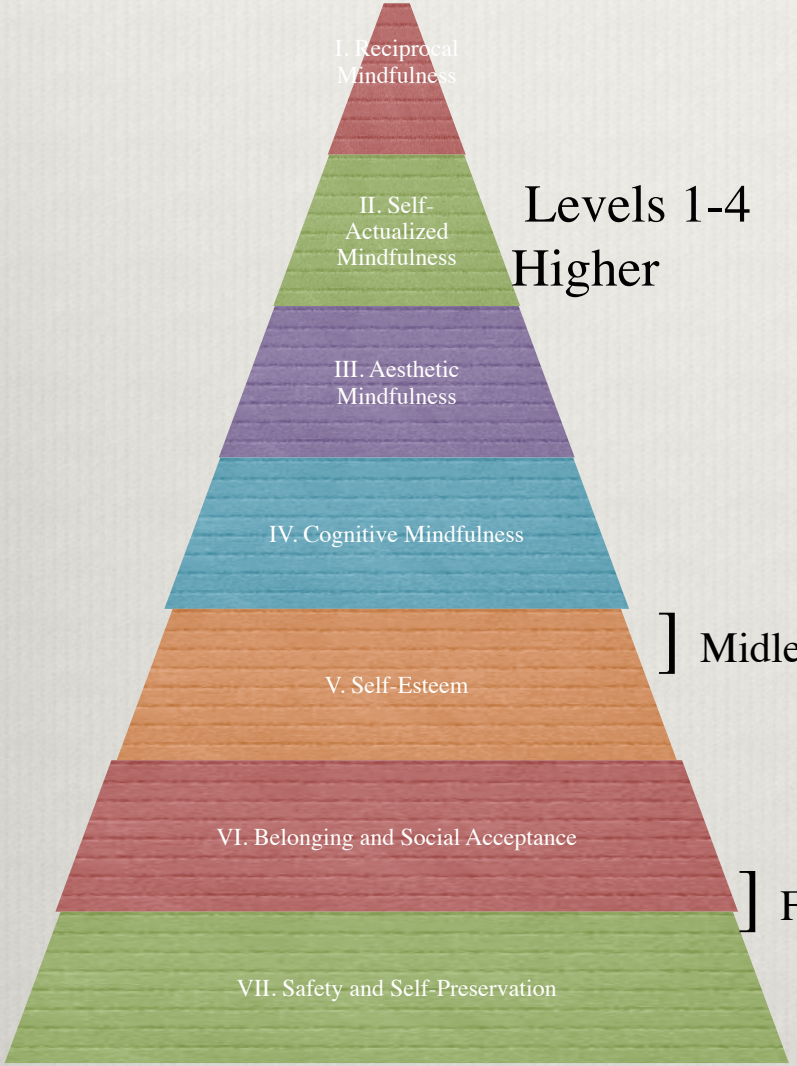
TABLE 3.1. Sequential Neurodevelopment and Therapeutic Activity

Age of most active growth	"Sensitive" brain area	Critical functions being organized	Primary developmental goal	Optimizing experiences (examples)	Therapeutic and enrichment activities (samples)
0–9 mo	Brainstem	• Regulation of arousal, sleep, and fear states	• State regulation • Primary attachment • Flexible stress response • Resilience	• Rhythmic and *patterned* sensory input (auditory, tactile, motor) • Attuned, responsive caregiving	• Massage • Rhythm (e.g., drumming) • Reiki touch • EMDR
6 mo–2 yr	Diencephalon	• Integration of multiple sensory inputs • Fine motor control	• Sensory integration • Motor control • Relational flexibility • Attunement	• More complex rhythmic movement • Simple narrative • Emotional and physical warmth	Music and movement • Reiki touch • Therapeutic massage • Equine or canine interactions
1–4 yr	Limbic	• Emotional states • Social language; interpretation of nonverbal information	• Emotional regulation • Empathy • Affiliation • Tolerance	• Complex movement • Narrative • Social experiences	Play and play therapies • Performing and creative arts and therapies • Parallel play
3–6 yr	Cortex	• Abstract cognitive functions • Socioemotional integration	• Abstract reasoning • Creativity • Respect • Moral and spiritual foundations	• Complex conversation • Social interactions • Exploratory play • Solitude, satiety, security	Storytelling • Drama • Exposure to performing arts • Formal education • Traditional insight-oriented or cognitive-behavioral interventions

Note. This table outlines the sequential development of the brain, along with examples of appropriately matched experiences that help organize and influence the respective parts of the brain that are most actively developing at various stages. For maltreated children, developmental "age" rarely matches chronological age; therefore, the sequential provision of therapeutic experiences should be matched to developmental stage and not chronological age.

Perry, B. D. (2006). Applying principles of neurodevelopment to clinical work with maltreated and traumatized children: The neurosequential model of therapeutics.

SAM 7-Level Hierarchy

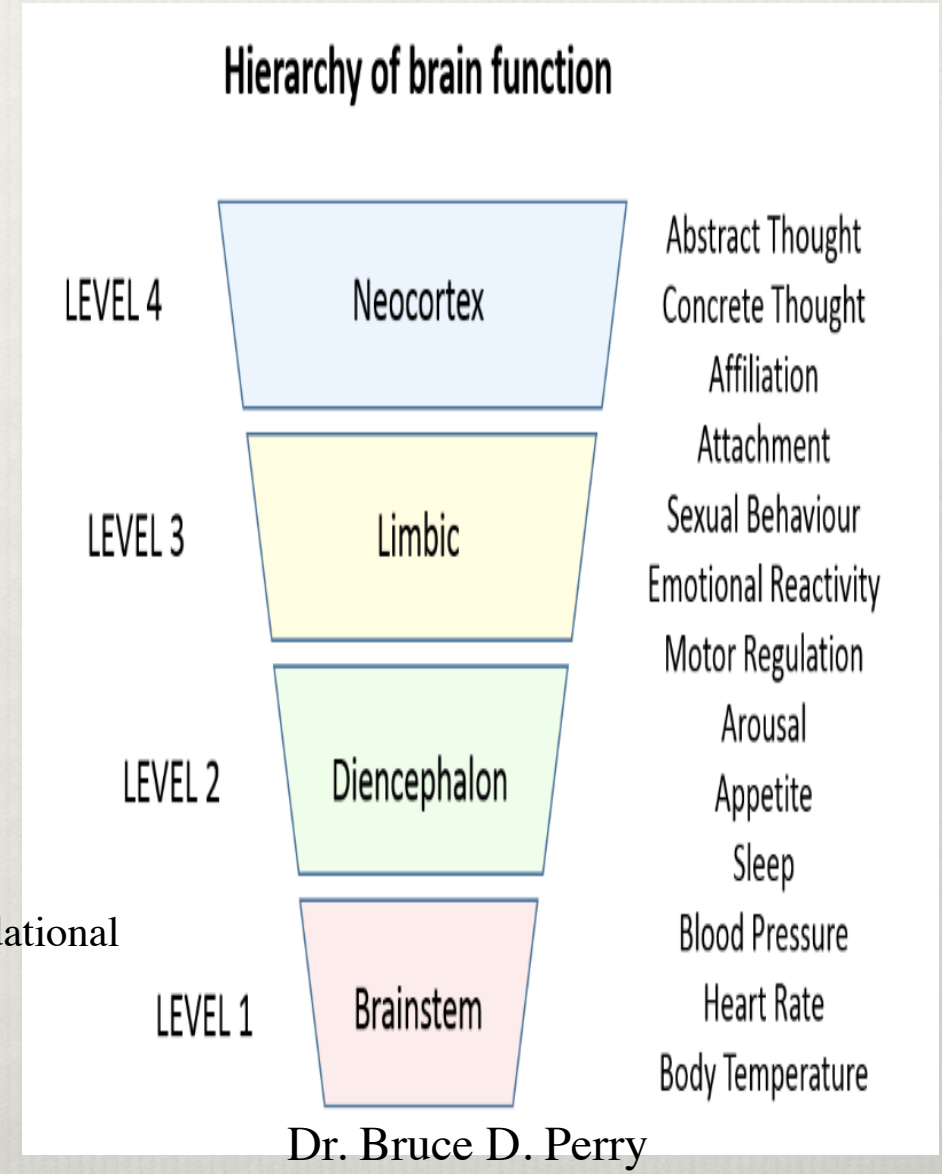


Levels 1-4
Higher

] Midlevel

] Foundational

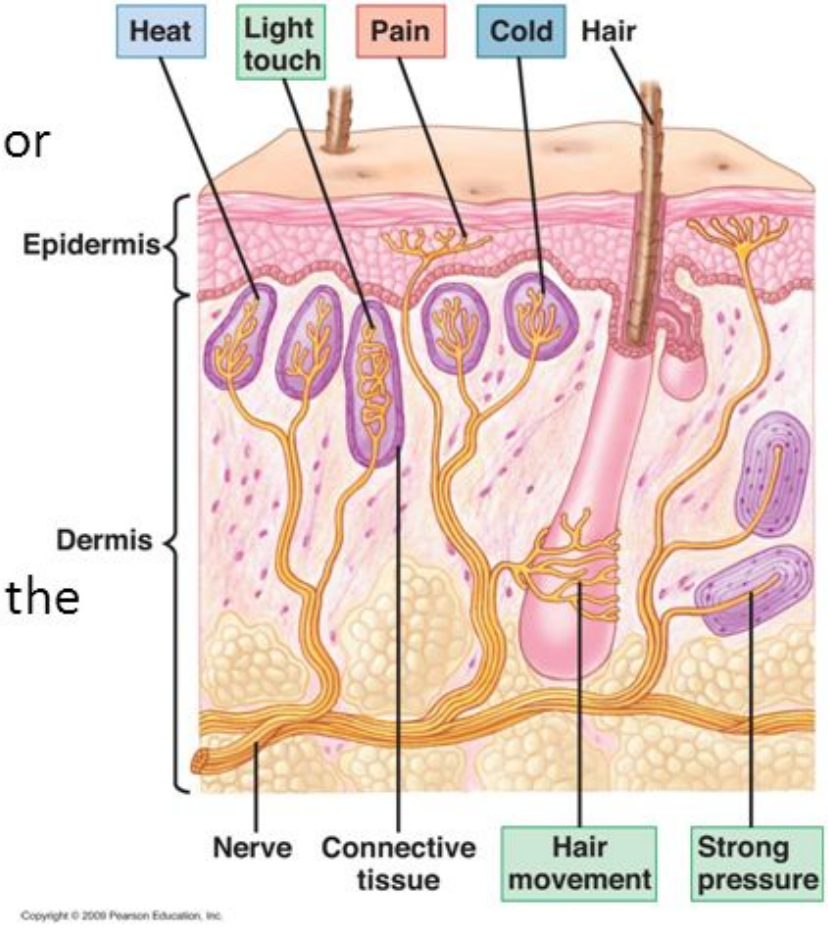
Dr. Varleisha D. Gibbs



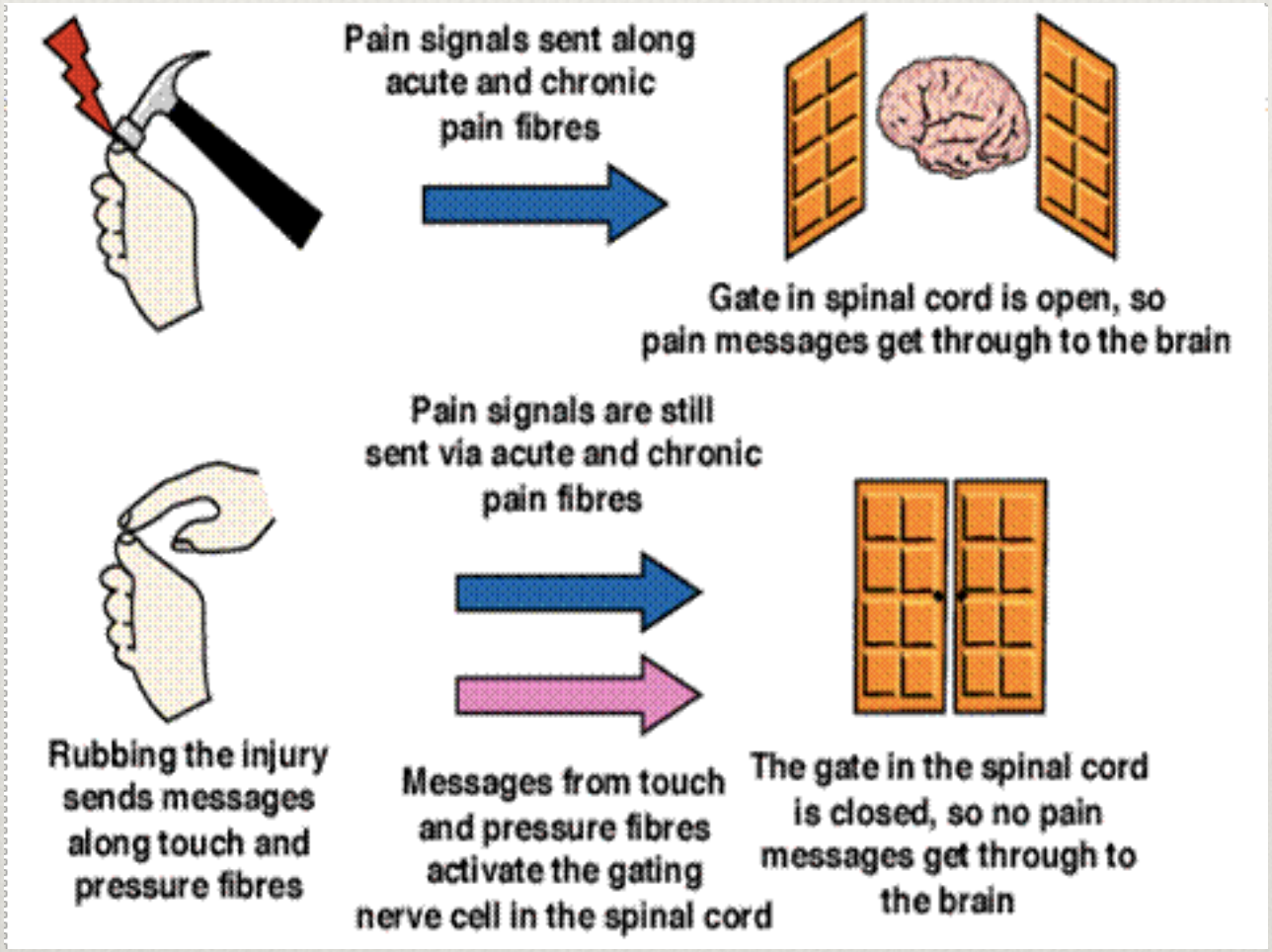
Dr. Bruce D. Perry

Sensory Receptor Types

- **Nociceptors**
  - Respond to excess heat, pressure, or chemicals
  - Tissue damage
  - All parts of the body but brain
- **Thermoreceptors**
  - Temperature of skin and blood
  - Maintains homeostatic control via the hypothalmus
- **Photoreceptors**
  - Light absorbing pigments
  - Light detection



Pain Gates



Proprioception and Touch are transmitted faster than pain! Neurons for pain are smaller and Unmyelinated. How can we use this knowledge?

Neurotransmitters

Sensory stimulation is important to arousal

- Glutamate: Excitatory; cognition, memory, learning
- GABA: Inhibitory; regulates anxiety, motor control, vision, and many other cortical functions **(sometimes less in those with ADHD and Autism)**

Modulatory:

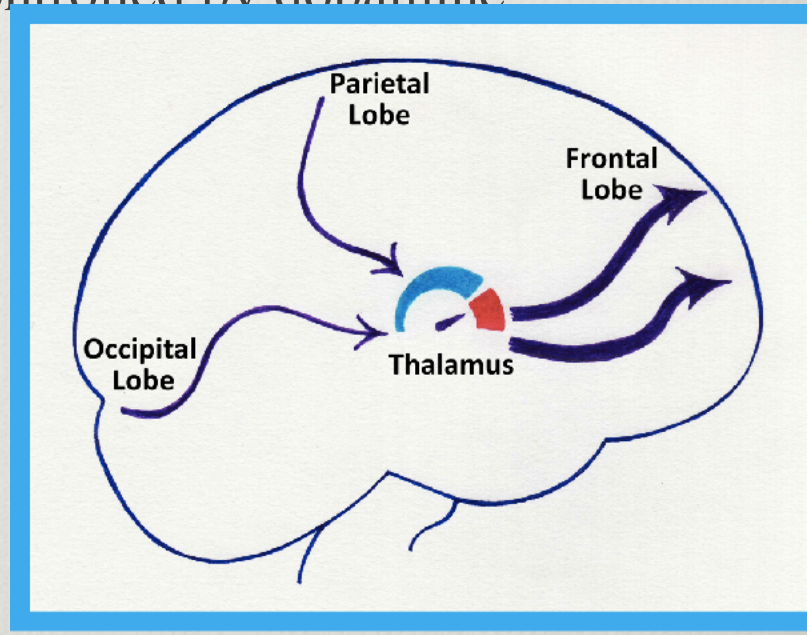
- Norepinephrine: Stress hormone
- Serotonin: Well-being; mood and social behavior, appetite/digestion, **sleep**, memory **(results in Melatonin)**
- Dopamine: Reward motivated; motor functions

(Too much = psychosis, aggression, addiction). If you take it externally, it may result in your body making less. (Less= lethargic and unmotivated)

Thalamic Gating

- The Thalamus is the relay station...allows in relevant information
- Helps to regulate arousal and attention
- The sensory gates of the Thalamus are controlled by dopamine
- Either facilitates or blocks

the messages

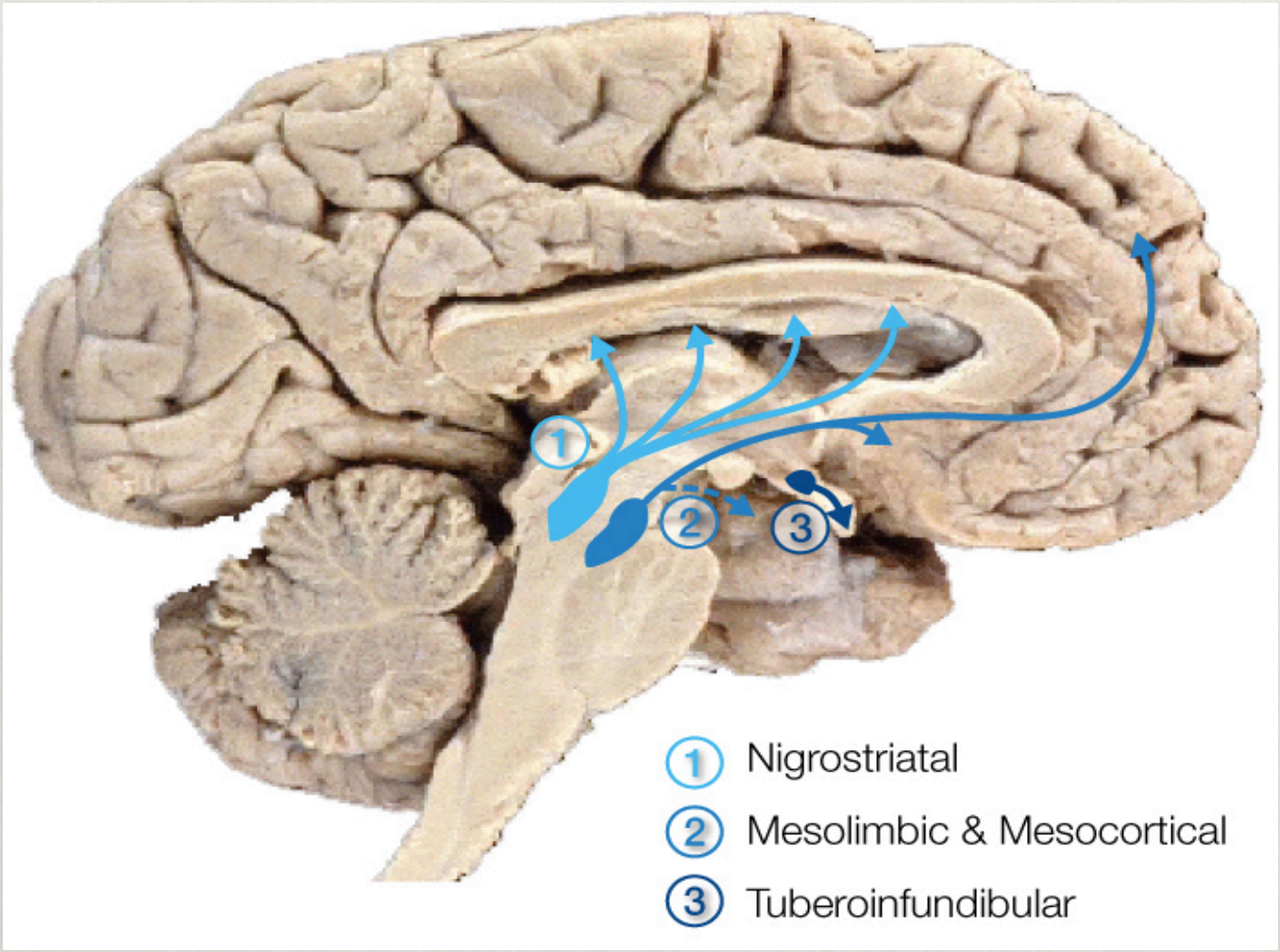


Too much Dopamine=

Too much information relayed and not filtered.

Too little=Important information may be filtered!

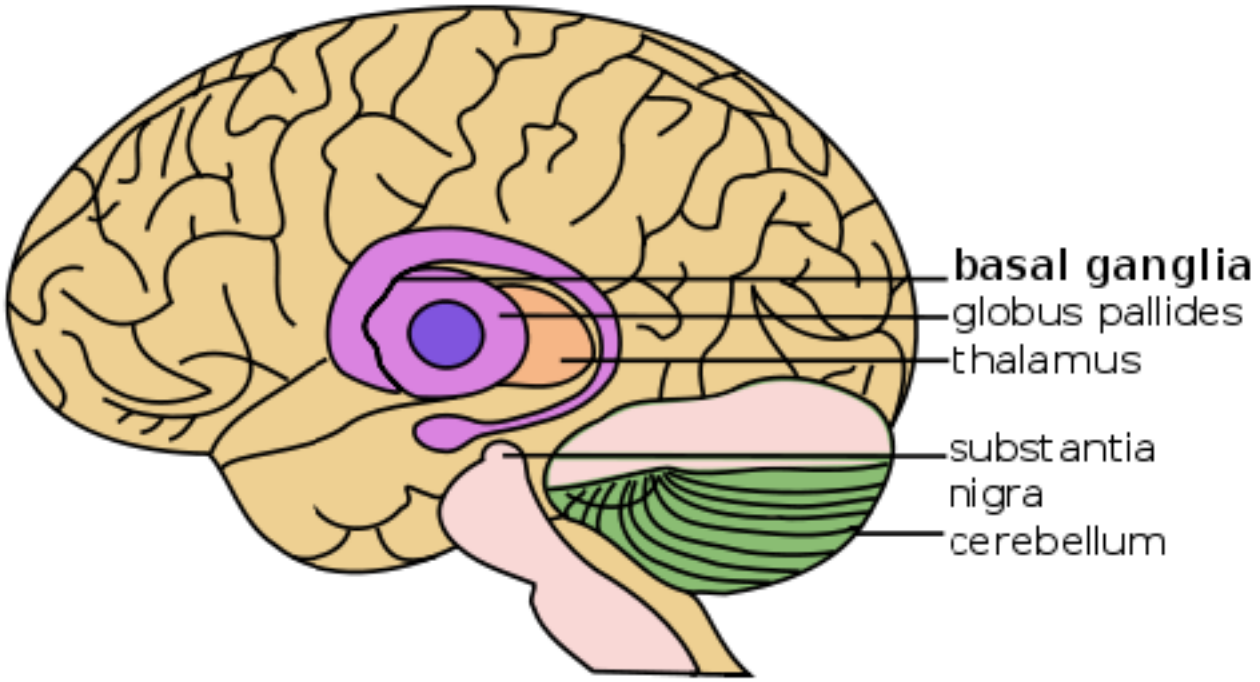
Dopaminergic Pathways



- Projections to the Frontal lobe for Executive fx
- Additional projections to the limbic system

Retrieved from:
http://learn.genetics.utah.edu/content/addiction/beyond/

Basal Ganglia and Related Structures of the Brain



Basal Ganglia Function

- Movement Initiation
- Control of Movement
- Postural Control
- Dysfunction
  - Rigidity
  - Lack of motivation
  - Resting Tremors
  - Flat Affect
  - Unwanted movements and decreased coordination

Decreased Dopamine

Effect of head trauma , damage to Basal Ganglia-> Secondary development of ADHD

Case 1-traumatic amniocentesis at 17 weeks of gestation

Complete elimination of basal ganglia

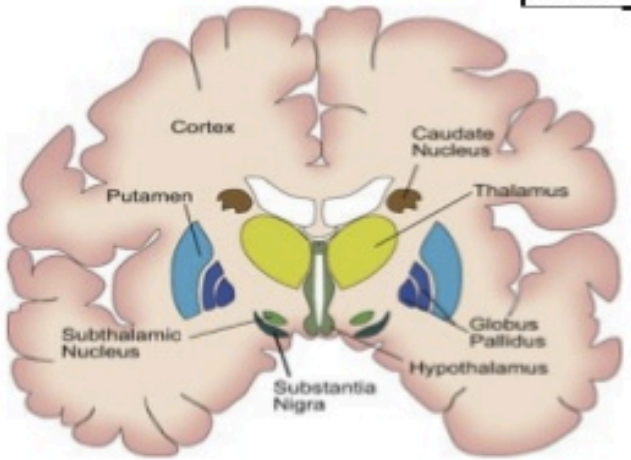
Lesions of Right Putamen → Higher in SADHD

Posterior Ventral Putamen → Higher in ADHD

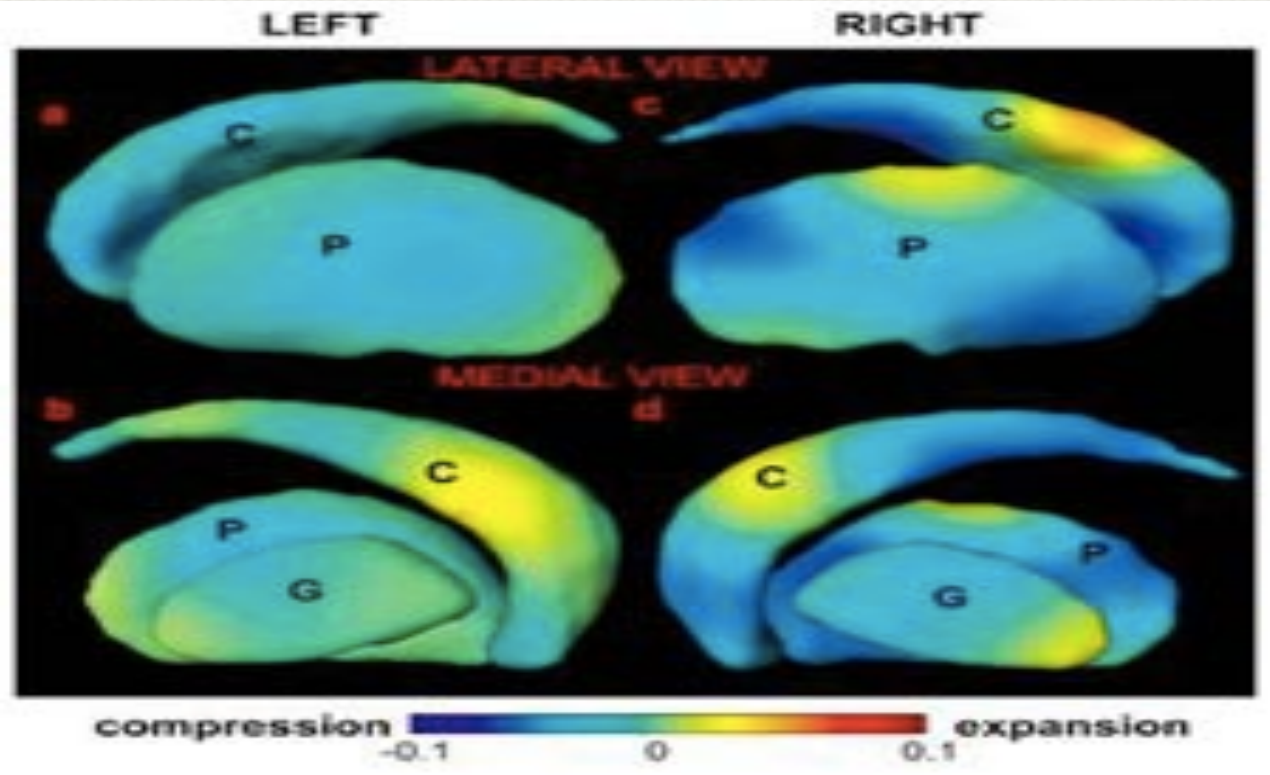
Case 2-
99 children(age4 -19) → Closed head injury → Chance of SADHD

Chance of SADHD → basal ganglia-3.2%

Chance of SADHD → Thalamus-3.6%



Brain development and ADHD Author : Amy L. Krain, F. Xavier Castellanos Clinical Psychology Review 26 (2006) 433–444

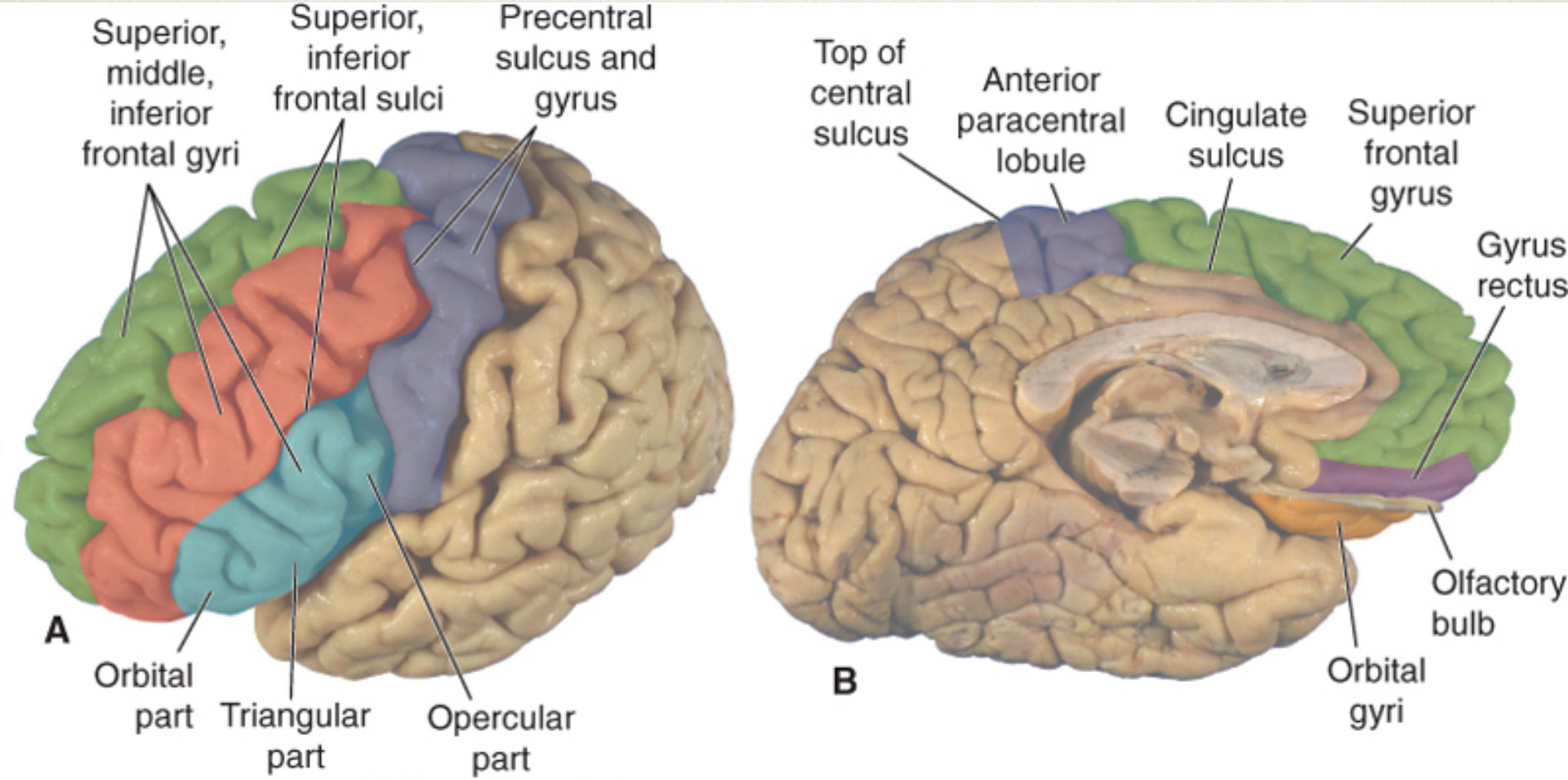


"Motor, social, and communicative impairments in boys with ASD were found to be associated with shape abnormalities in the basal ganglia. The findings suggest abnormalities within parallel frontal-subcortical circuits are differentially associated with impaired acquisition of motor and reciprocal social and communicative skills in ASD. Shape compression pattern of basal ganglia in boys with ADHD suggests that ADHD-associated deviations from typical brain development involve multiple frontal-subcortical control loops, including circuits with premotor, oculomotor, and prefrontal cortices."

Retrieved from: Center for Imaging Science (2018). http://cis.jhu.edu/research/highlights/shape_analysis.php

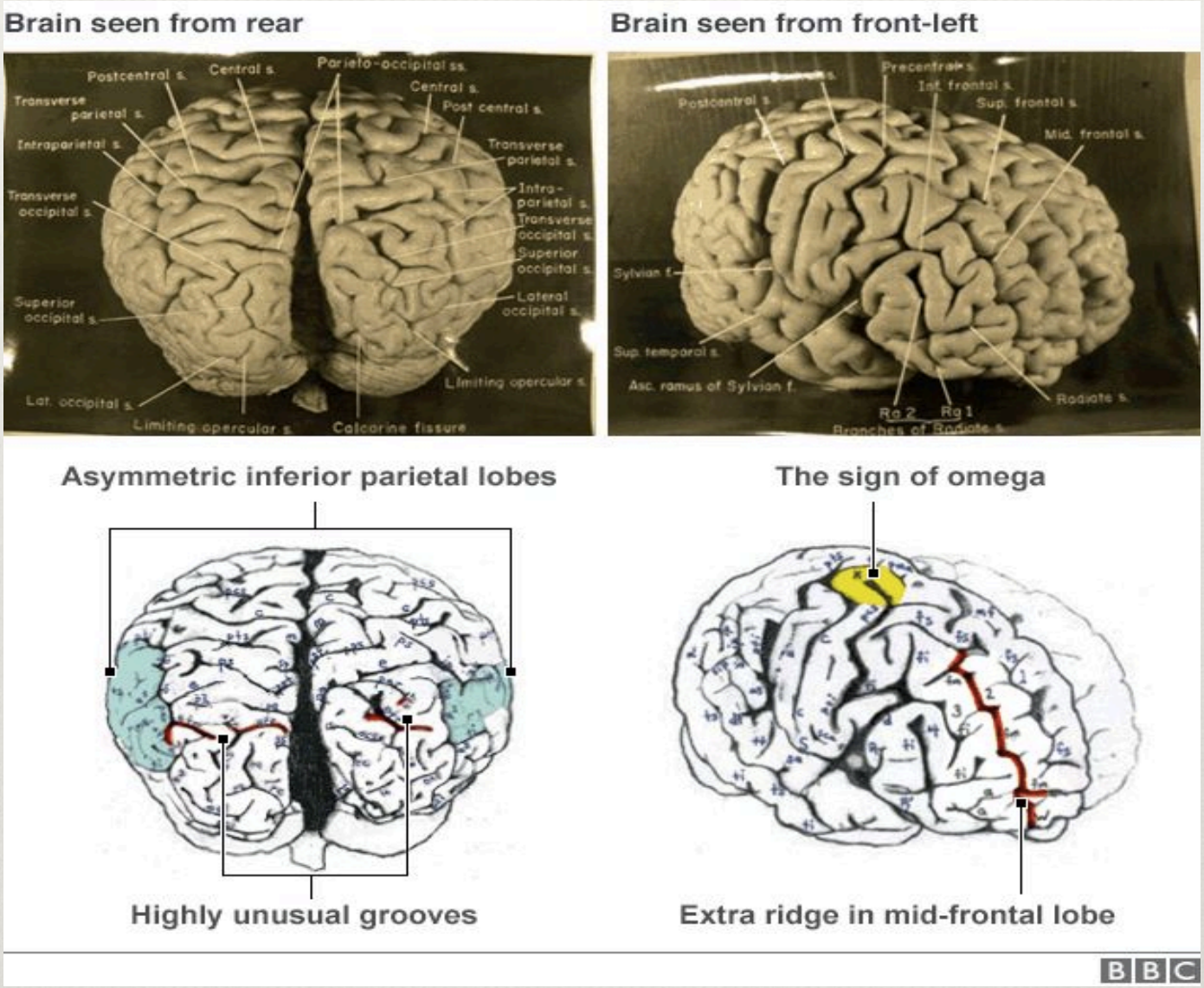
Gyri Review

Sensory Motor Strips



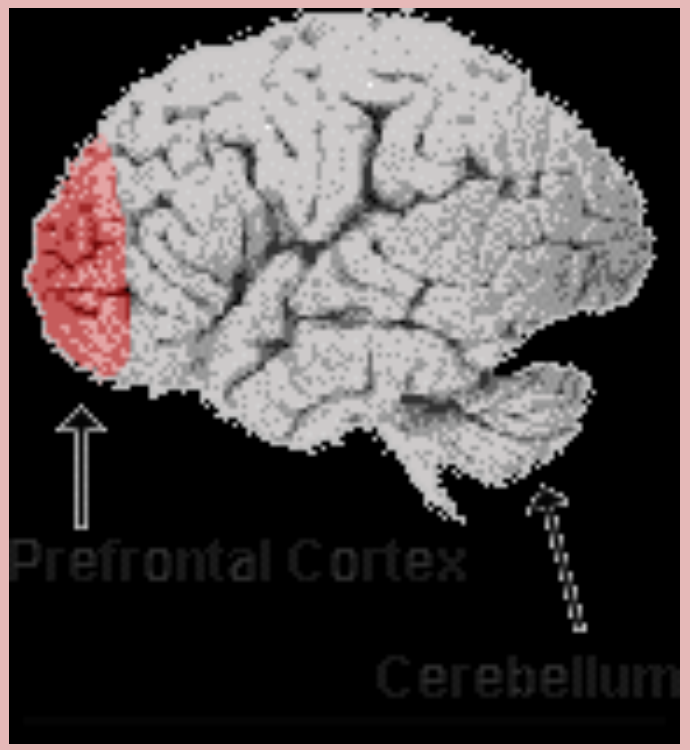
Frontal Gyri

- The **superior frontal gyrus:** self-awareness, in coordination with the action of the sensory system
- The **middle frontal gyrus**: sustaining attention and working memory
- The **left inferior frontal gyrus** (IFG), also considered Brodmann Area 44 corresponds to Broca's area



Based on Falk, Lepore & Noe, 2013, The cerebral cortex of Albert Einstein: a description and preliminary analysis of unpublished photographs, Brain 136(4):1304-27.

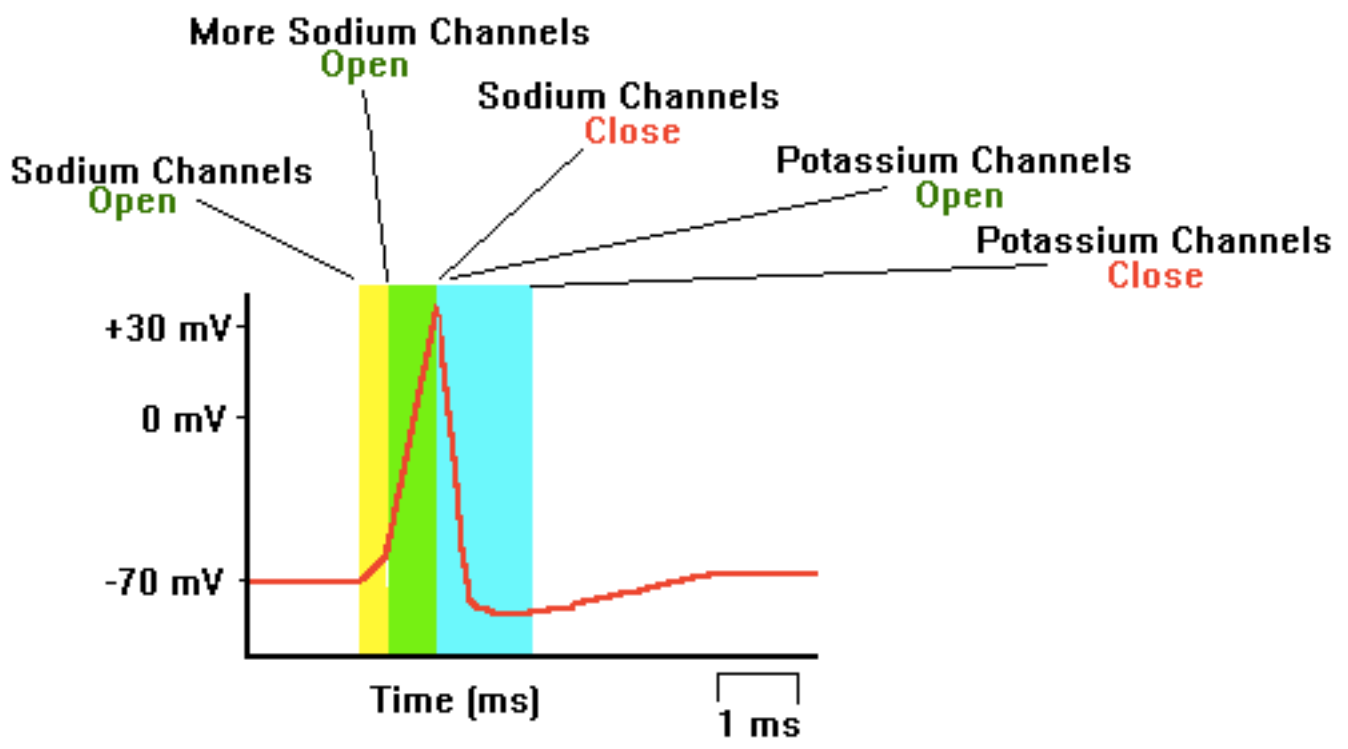
Pre-Frontal Cortex
Executive Functioning:



Attention
Inhibition
Best Choice
Flexibility
Problem Solving
Planning,
Working Memory
Making sense of emotions
being sent from Cingulate Gyrus*

Pre-Motor Cortex of the Frontal Lobe: Role in movement, posture, and understanding the actions

Recap…
Threshold!!!



Resting Potential is at -70 mV

Neuronal firing “action potential”

only occurs when threshold is met: “Strong Enough and Long Enough”

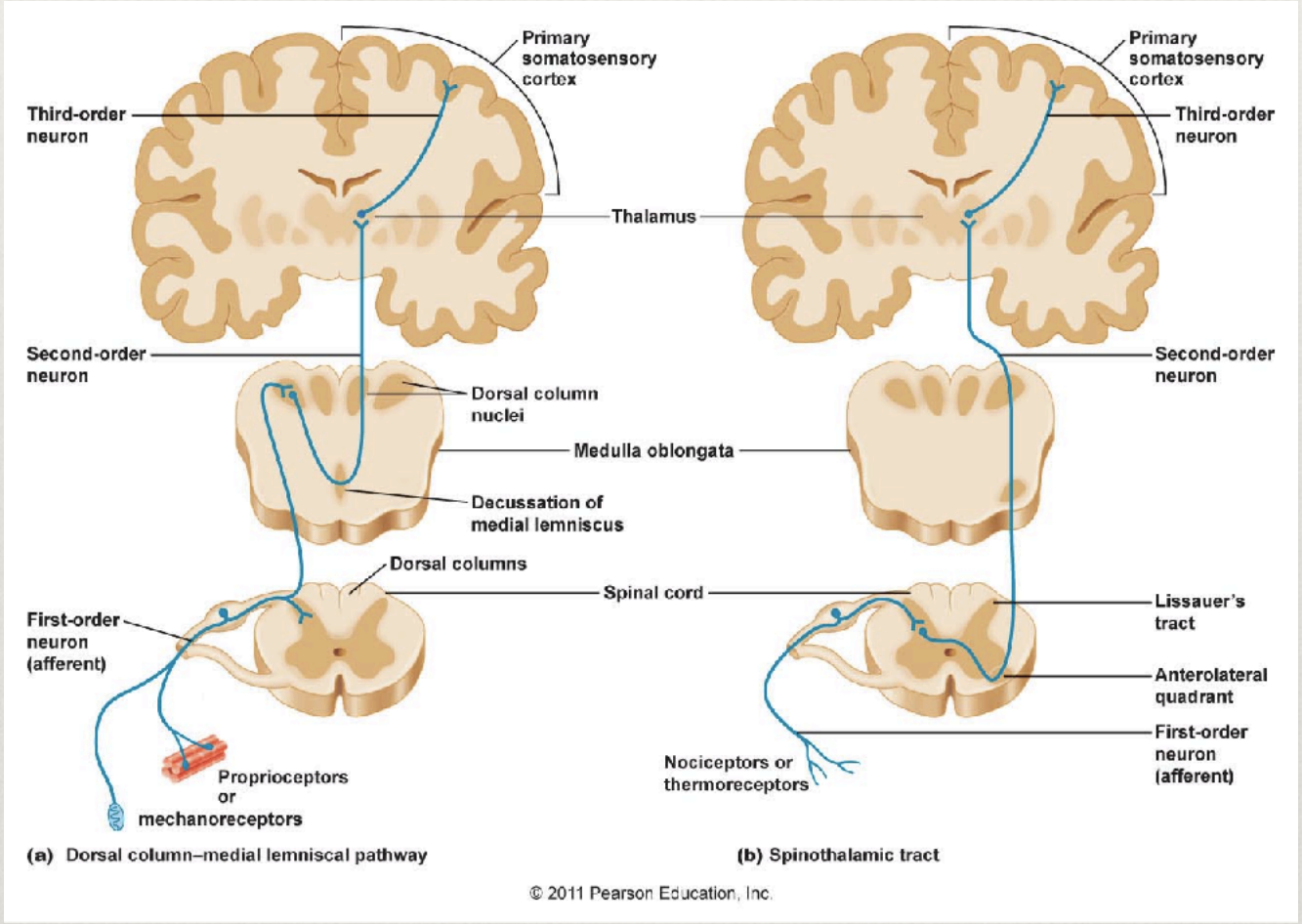
Happens differently for all of us!

Case Study

- Two videos
- High Threshold and craving behaviors **bouncing on ball**
- Is gentle swinging enough?
- **Ice Play** to meet threshold!

Our Connection to the World

The Sensory Pathways



Spinothalamic for Pain, Temperature, and Light Touch! Signals may get crossed.

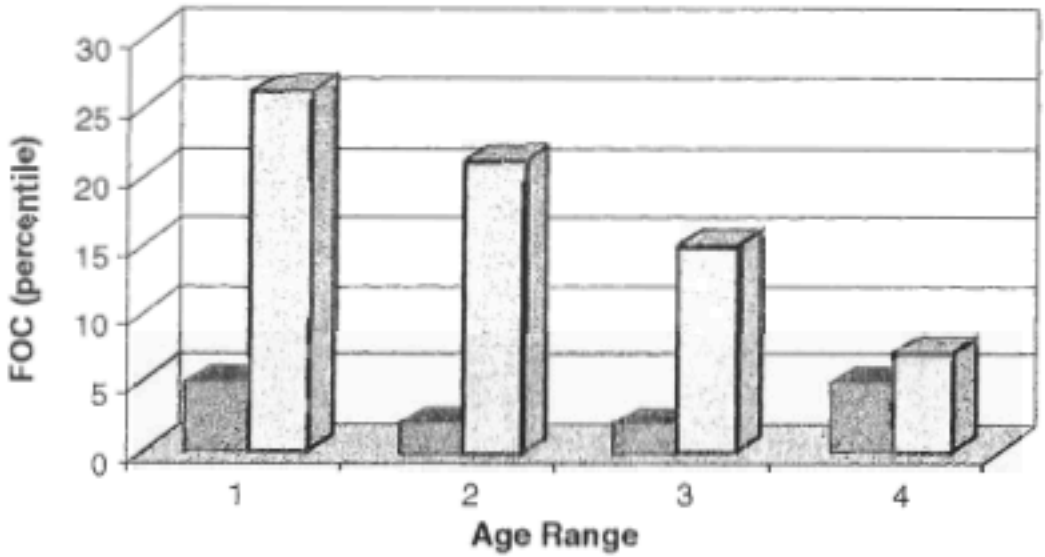
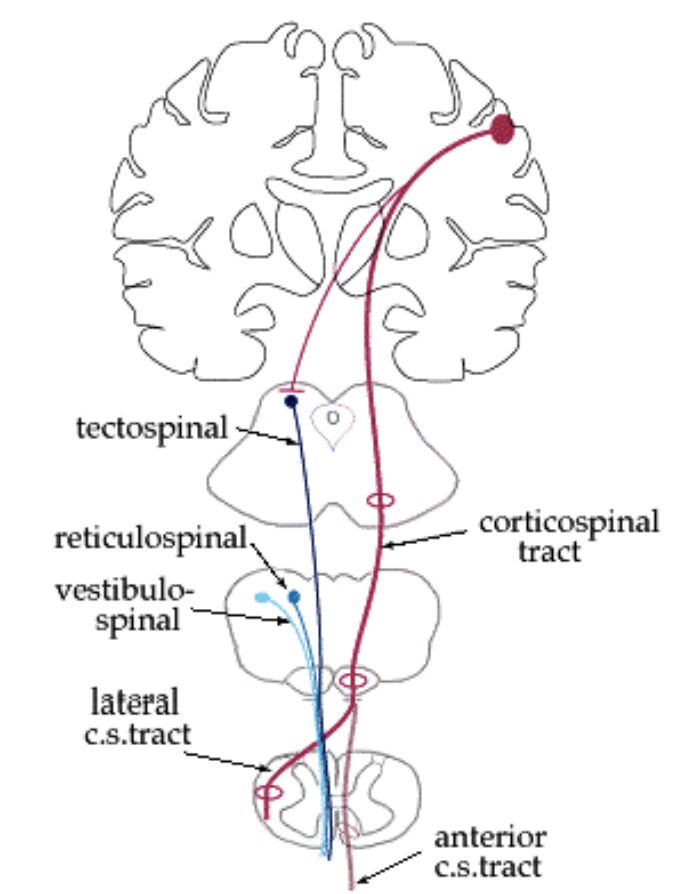


FIGURE 3.5. Sensory deprivation neglect: Effects of early removal on recovery. Children were removed from severely neglectful environments at different ages (ages 8 months to 4 years, 8 months). Their frontal-occipital circumference (FOC; a crude indicator of brain size) was measured (black bars) and compared to same-age norms. Children were placed in foster care and were reevaluated 1 year later . FOC was measured (white bars) and increased in each group; with increasing age, however, the improvement after a year of foster placement started to decrease, such that after 3 years in the neglectful environment (group 4), there was no longer any statistically significant improvement 1 year later. It is interesting to note that 100% of the children in group 4, 74% in group 3, 46% in group 2, and only 27% in group 1 required special educational services when they reached school age.

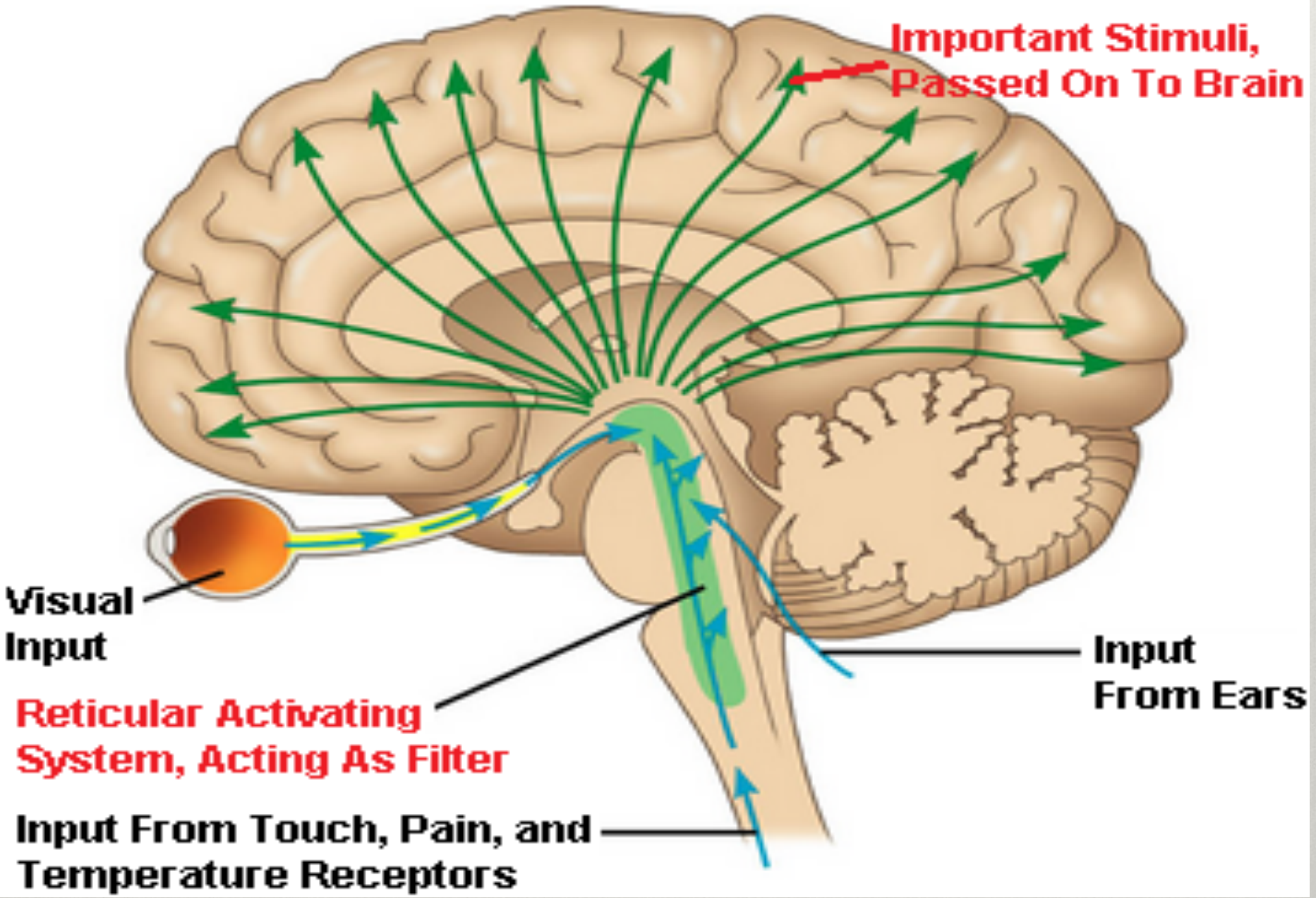
Perry, B. D. (2006). Applying principles of neurodevelopment to clinical work with maltreated and traumatized children: The neurosequential model of therapeutics.

Motor Pathways

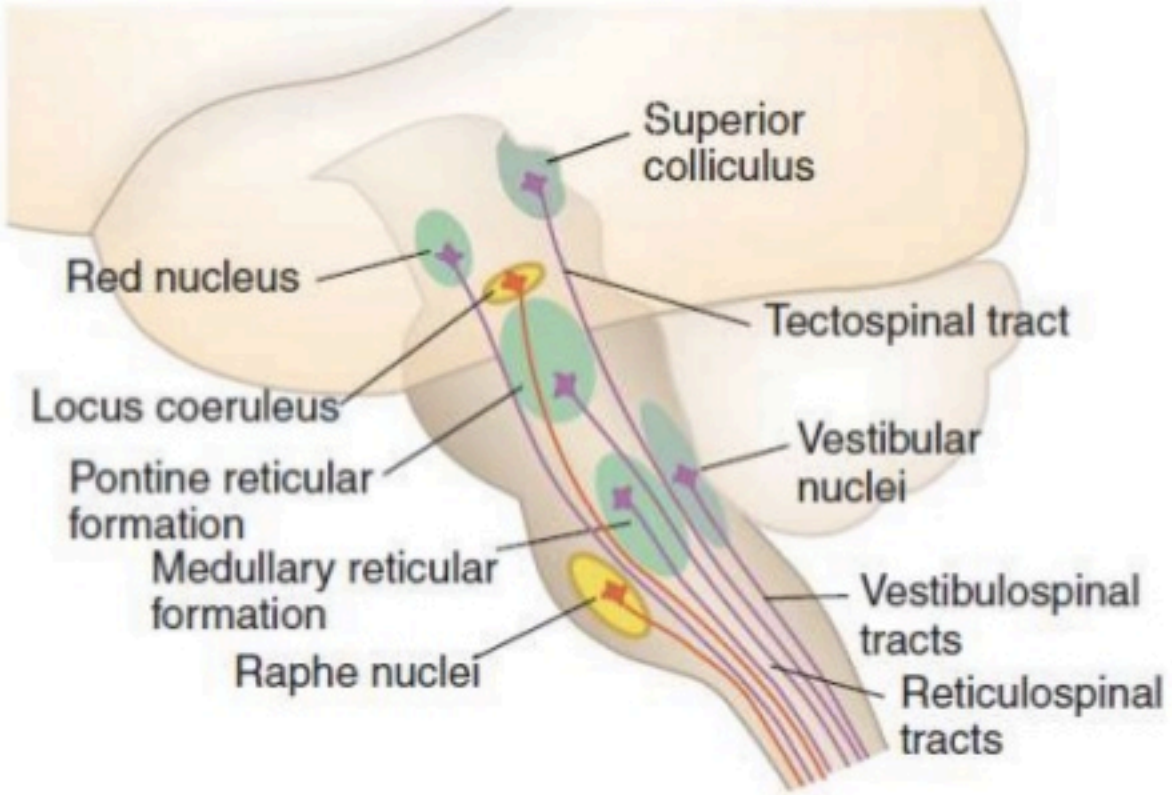


Controlled by the pathway and communication with the Basal Ganglia and Cerebellum

The Reticular Activating System



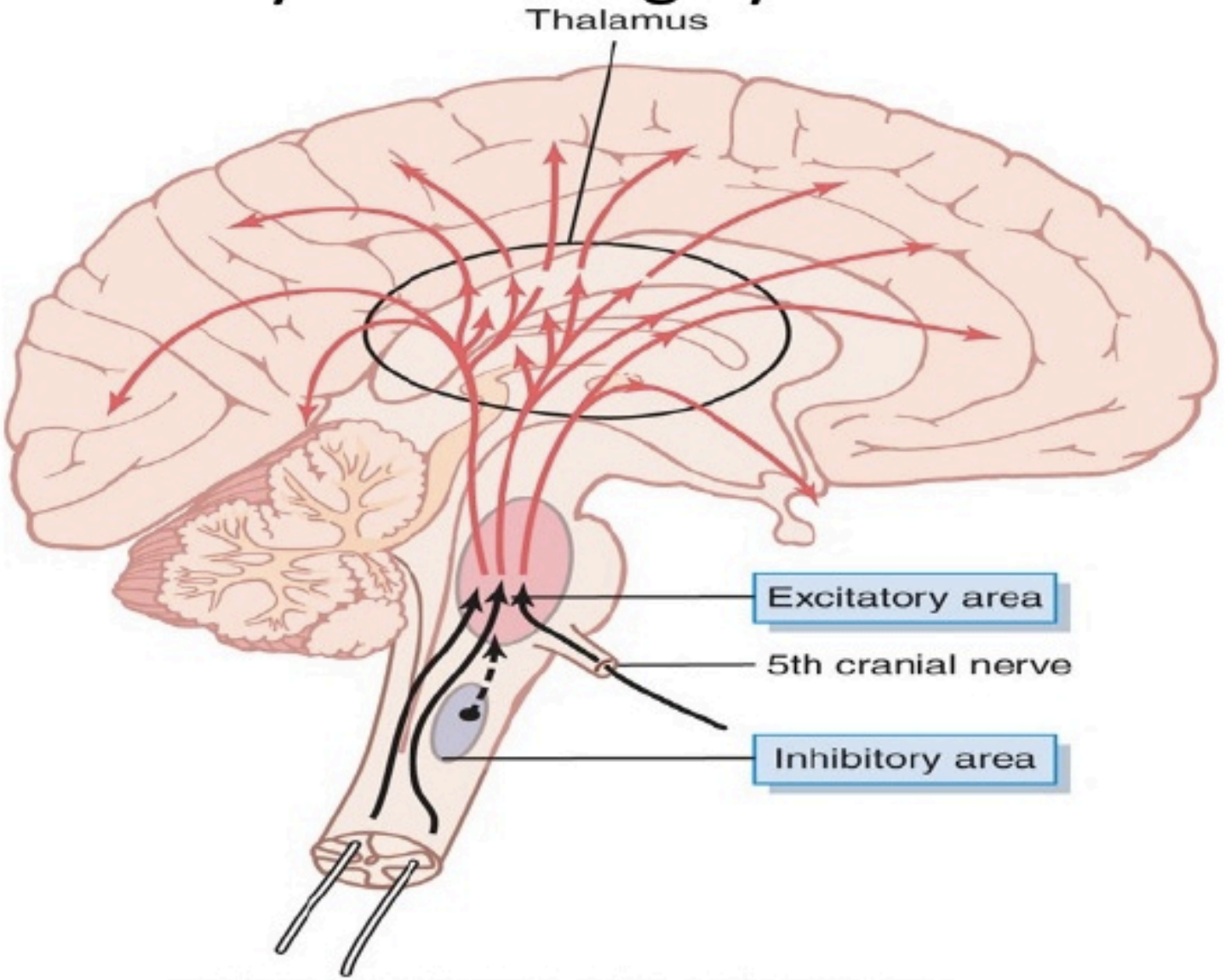
Motor control centers in the brain stem:



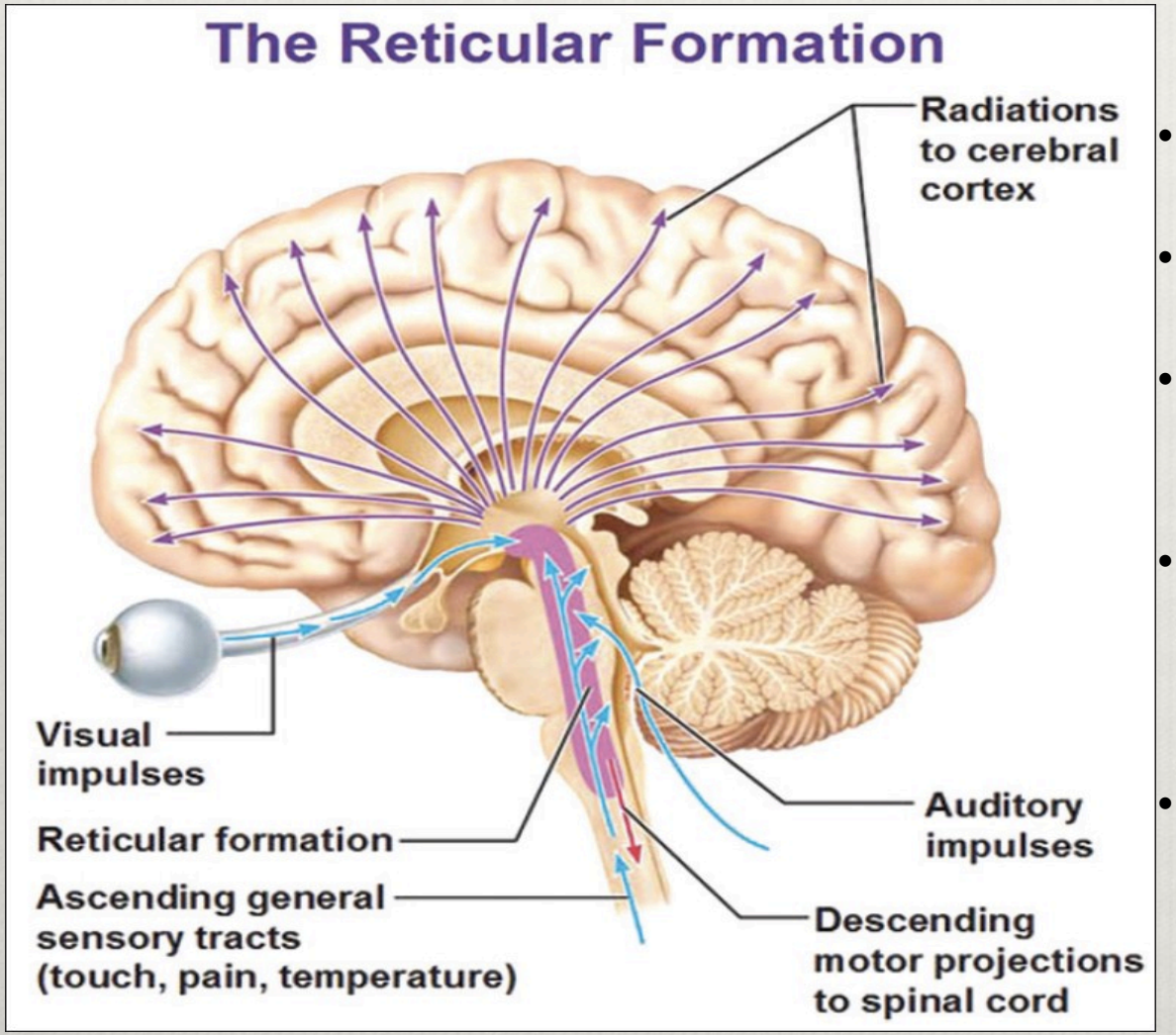
The major brain stem nuclei sending fibers to the spinal cord.

--The Central Nervous System, 4th Edn

Excitatory activating system of brain



Self-Regulation :Neuroscience

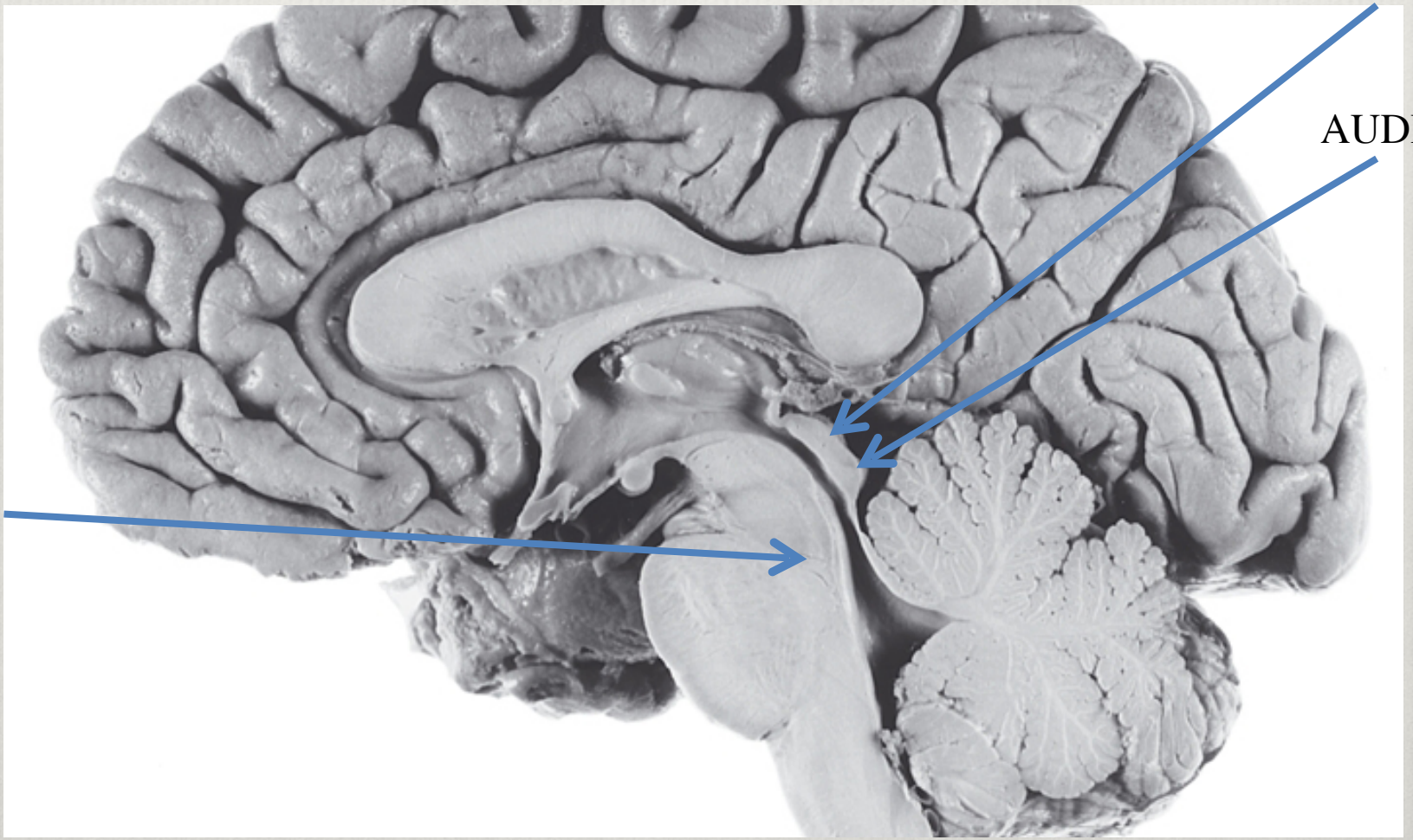


- Poor Sleeping habits
- Hyper-/Hypo arousal
- Lack of Attention (unless it is preferred and wired)
- Poor Posture and Motoric Abilities (connection to cerebellum)
- Over activation of SNS (Fight-flight)

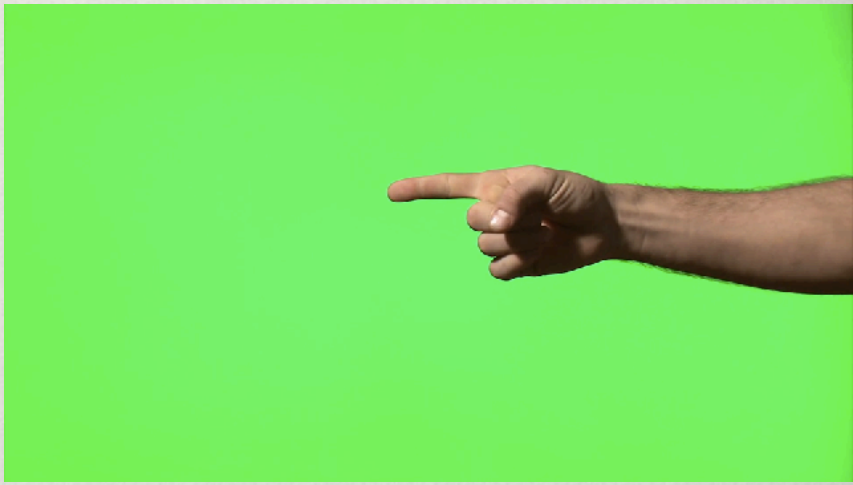
Origin of descending analgesic pathway to help modulate pain!

Motor Output and the ANS

THE VISION, SOUND, AND ANS CONNECTION

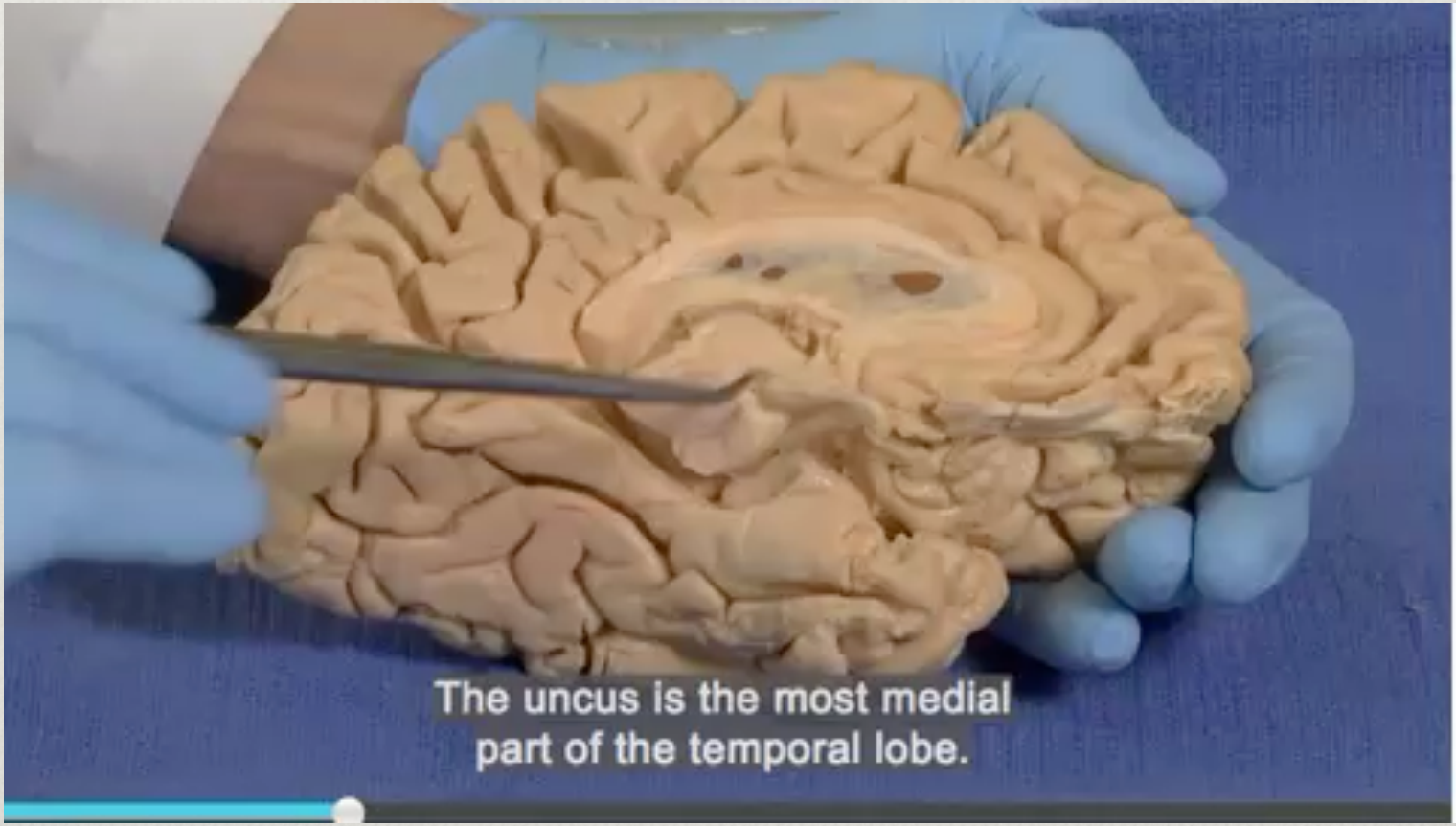


Using the Strong Visual System



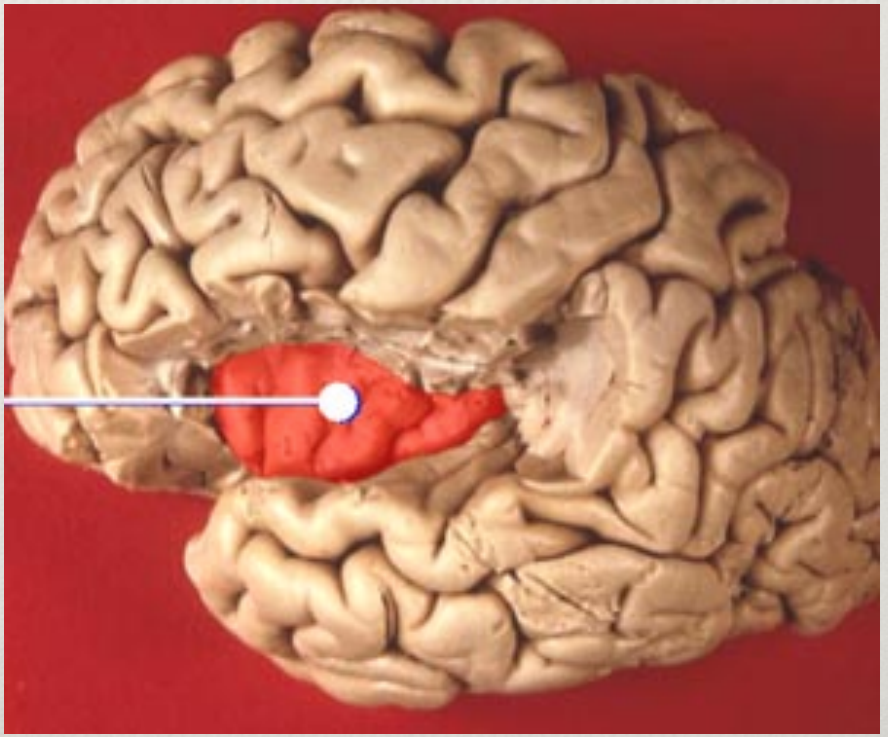
The Emotional Brain

Cingulate Gyrus



Insular Cortex

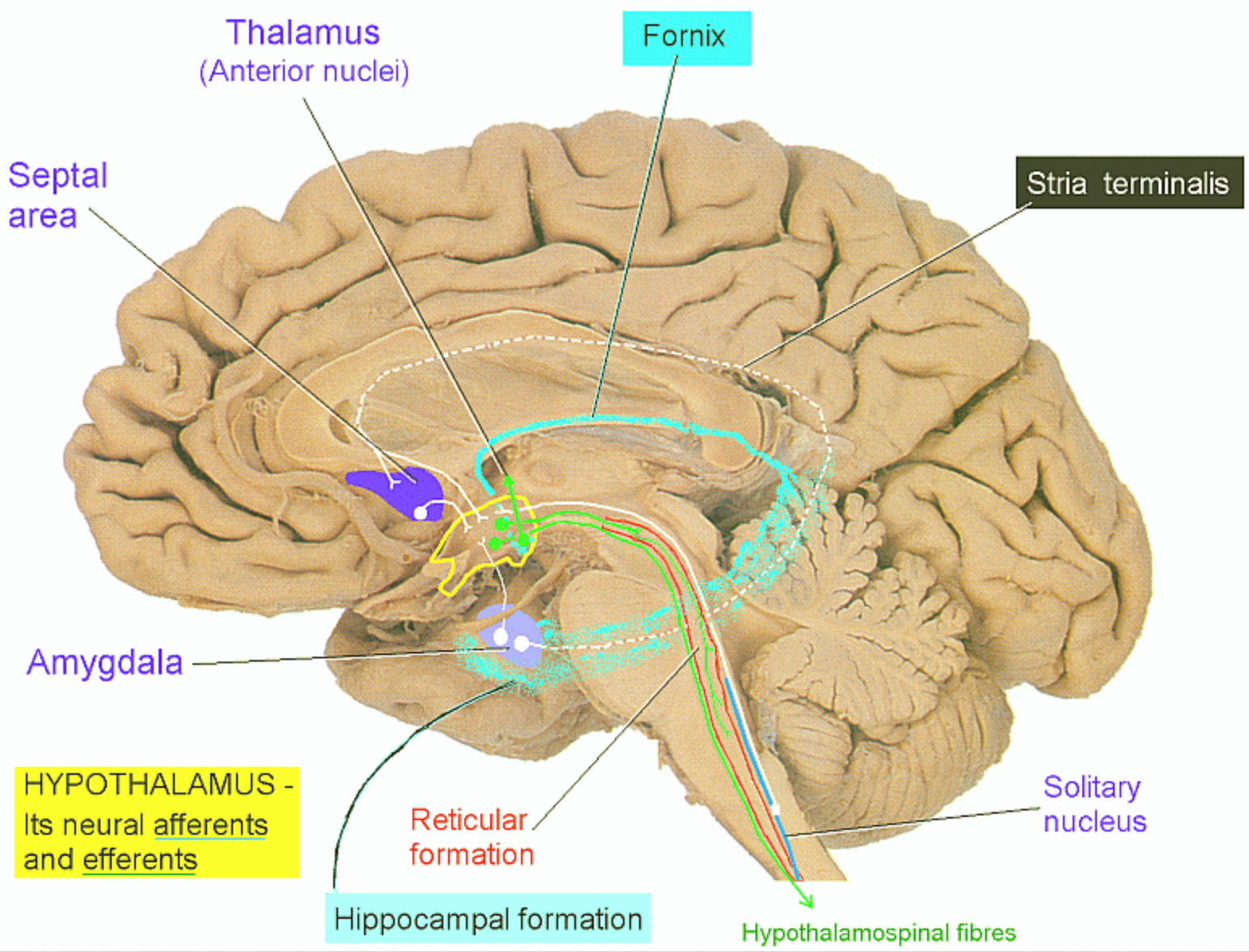
- Fifth lobe of brain; Sensory, Emotional, and Cognitive Integration “hub”
- Vagus nerve termination: Correlation to the ANS
- Research revealing dysfunction in Dxs including Anxiety disorder, addiction, Autism



Emotional Regulation

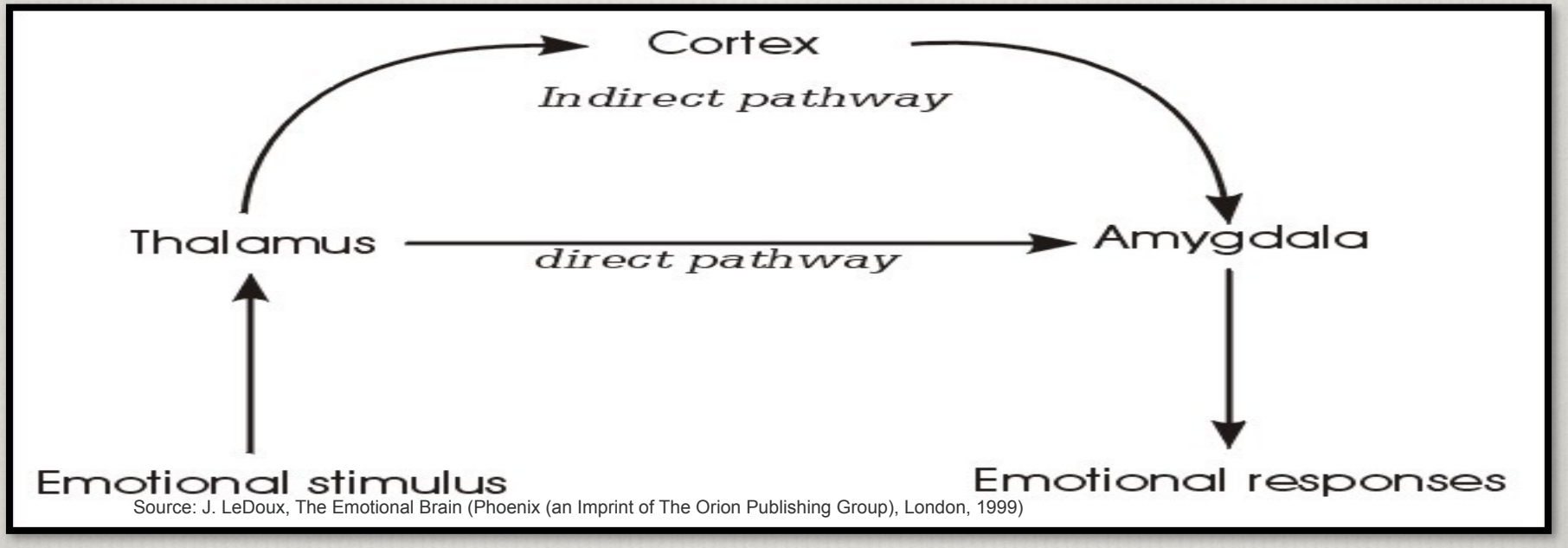
- Anterior Insula and Anterior Cingulate Cortex, Insula Cortex, Superior Frontal Gyrus
- Negative Emotions and Pain (Anterior Insula and Anterior Cingulate Cortex)
- Reappraising negative stimuli to "inhibit" performance; involved in working memory
- Role in social interaction, morals, and empathy…emotional response to music

(Falquez et. al, 2014)


Thalamus
(Anterior nuclei)
Fornix
Septal
area
Stria terminalis
Amygdala
HYPOTHALAMUS -
Its neural afferents
and efferents
Reticular
formation
Solitary
nucleus
Hippocampal formation
Hypothalamospinal fibres

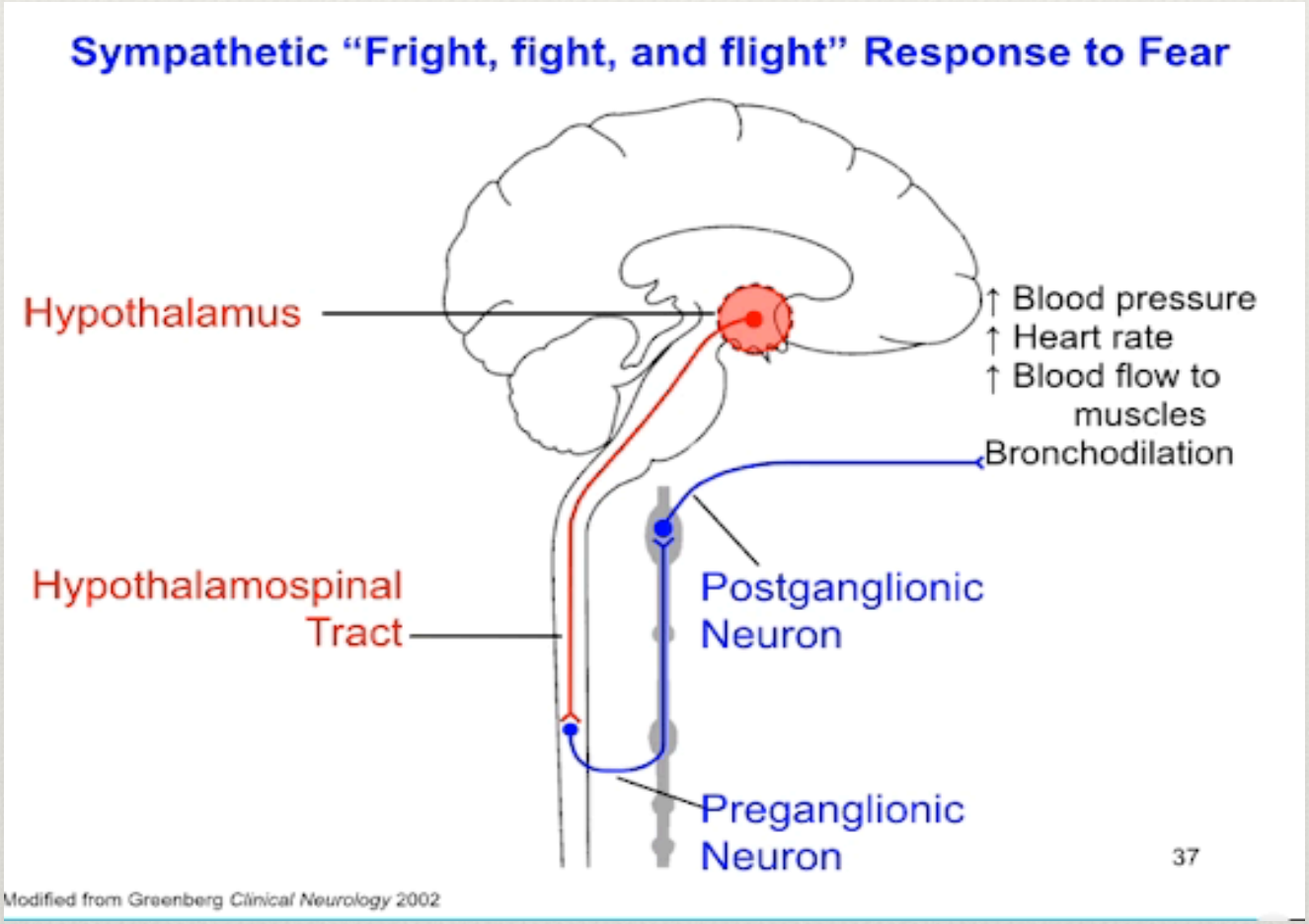
THE PATH TO :
Fear, Anxiety, and Stress

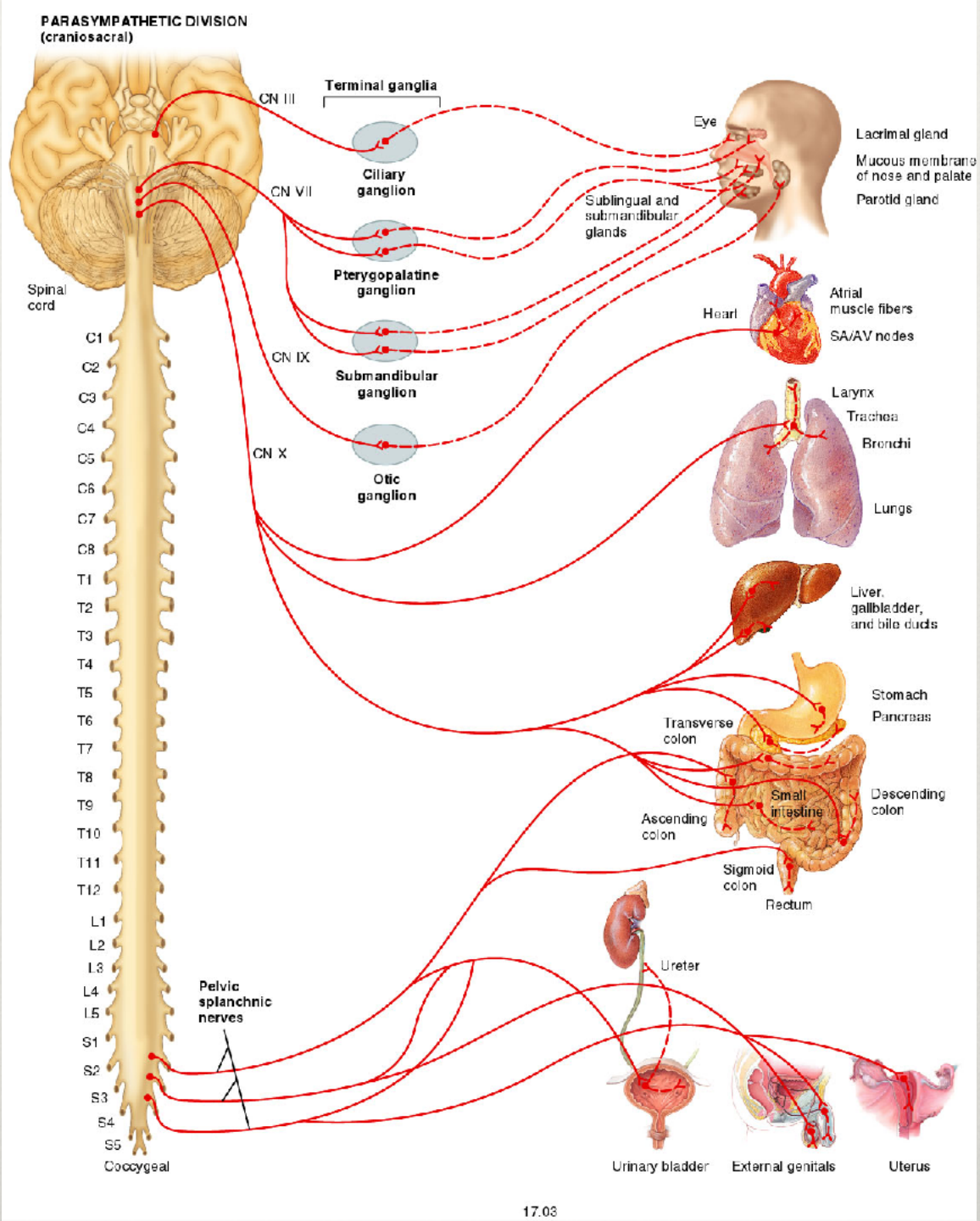
- The "short path of fear" is the direct pathway to the Amygdala. The "long path of fear" is the indirect pathway to the Amygdala.



Source: J. LeDoux, The Emotional Brain (Phoenix (an Imprint of The Orion Publishing Group), London, 1999)

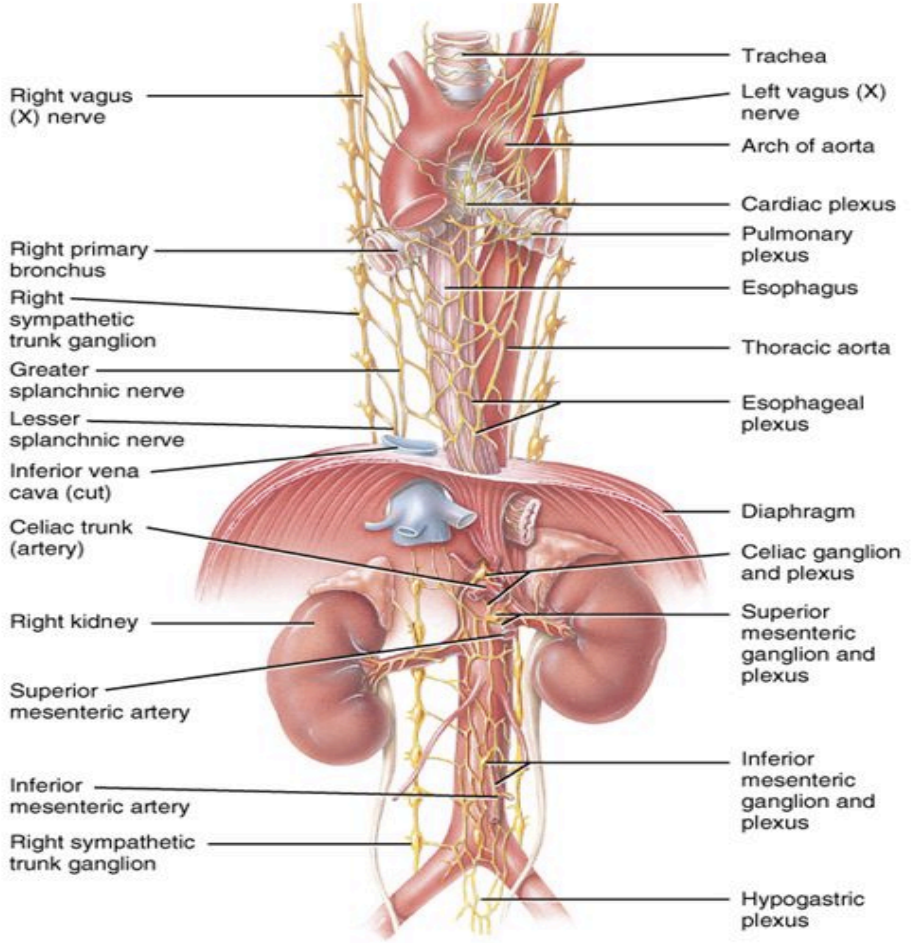
RESPONSE TO SHORT PATH





(Schaaf, Miller, Sewell, & O'Keefe, 2003)

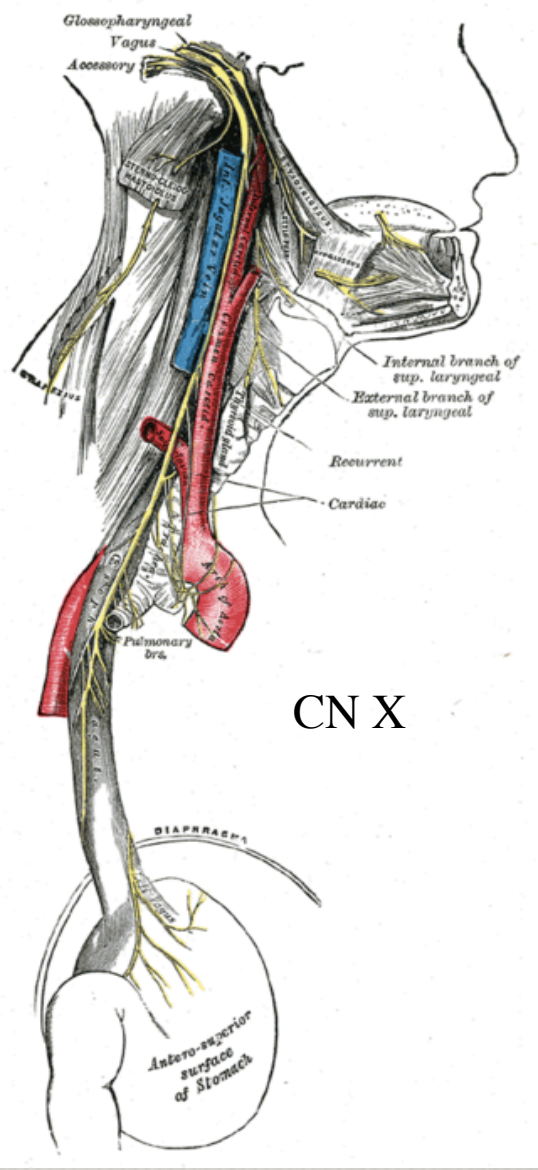
Ganglia & Plexuses of Sympathetic NS



O'Brien, M. (2015)

Brain Gut Connection!

- Over 30 different neurotransmitters utilized
- Resembles and Acts similar to the CNS
- More than 90% of the body's serotonin is made within the gut
- More than 50% of the body's dopamine
- Can mediate behavior
- Communicates bi-directionally with CNS



Connection to ASD

- 3-4 x more likely to have Gastrointestinal Dysfunction
- Encopresis
- Maybe not just a co-morbidity
- Research revealed a substantial reduction in the spatial density of intestines and increased interganglionic space

(Colins et. al, 2014; Rao, M & Gershon, 2016)

Plexus of the ANS

- Myenteric
- Celiac
- Submocus

- PNS and SNS responses
- Sensory, Motor, and Inter- Neurons
- Sensory includes “taste” receptors; detects glucose similar to taste buds
- Interneurons integrate sensory information

Connection of the ANS

- Vagus, Vagus, Vagus!
- Longest CN in the Body
- Sensory and Motor
- Vagovagal reflex
- Has both Parasympathetic and Sympathetic divisions

- Organs
- Pulmonary Plexus
- Esophageal Plexus
- Cardiac
- Stomach
- Gall Bladder
- Pancreas
- Small Intestine
- External Ear
- Part of the brain meninges
- Connection to extra-ocular motor muscles via connection to the trigeminal nerve; oculocardiac reflex

- Muscles
- Cricothyroid muscle: Tensor muscle of pharynx for phonation
- Levator veli palatini muscle: Elevates soft palate to prevent food in pharynx
- Salpingopharyngeus muscle
- Palatoglossus muscle: Muscle of the tongue; not Hypoglossal but Vagus nerve
- Palatopharyngeus muscle: Pull up pharynx to cover food while eating
- Superior, middle and inferior pharyngeal constrictors
- Muscles of the larynx: Speech

Baquiran & Bordoni, 2023

Vagal Maneuvers

- Bearing Down: Valsalva maneuver, closed glottis; occluded straws/whistles

- Coughing: similar to bearing down; easier

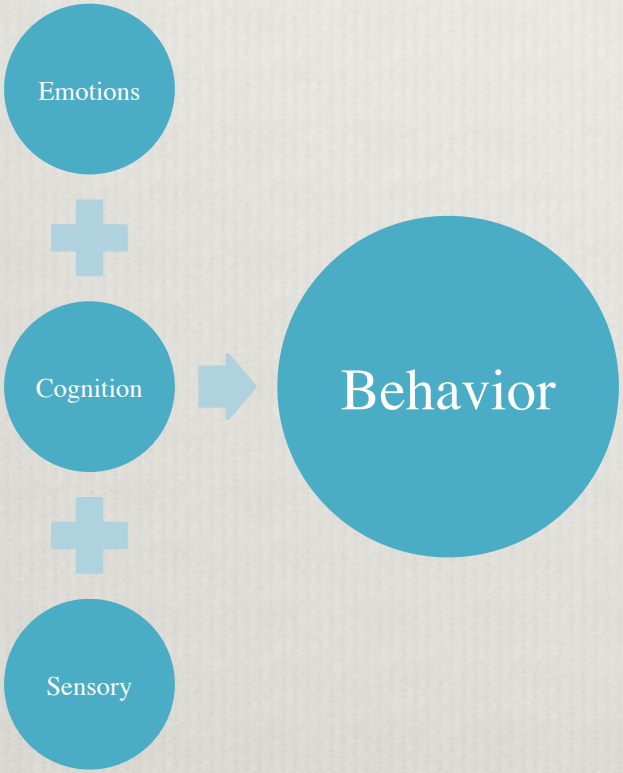
- Cold Stimulus to the Face: Divers reflex; ice pack or cold cloth to face about 10 secs.

- Gagging: The gag reflex stimulates the Vagus nerve.

Wake Forest Baptist Health. Vagal Maneuvers for a Fast Heart Rate. http://www.wakehealth.edu/Health-Encyclopedia/Health-Topics/Vagal-Maneuvers-For-A-Fast-Heart-Rate.htm#ps1283-sec Accessed August 2014.

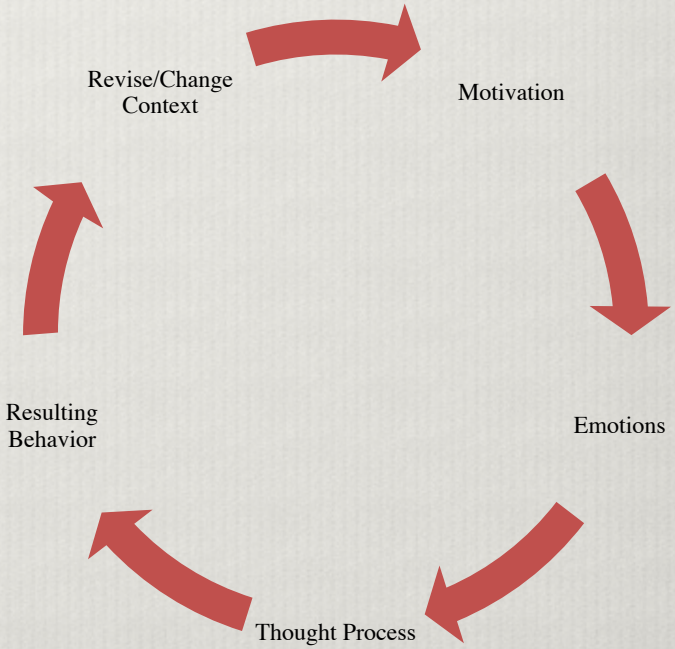
Self-Reg. vs. Co-Reg.

Self-Regulation

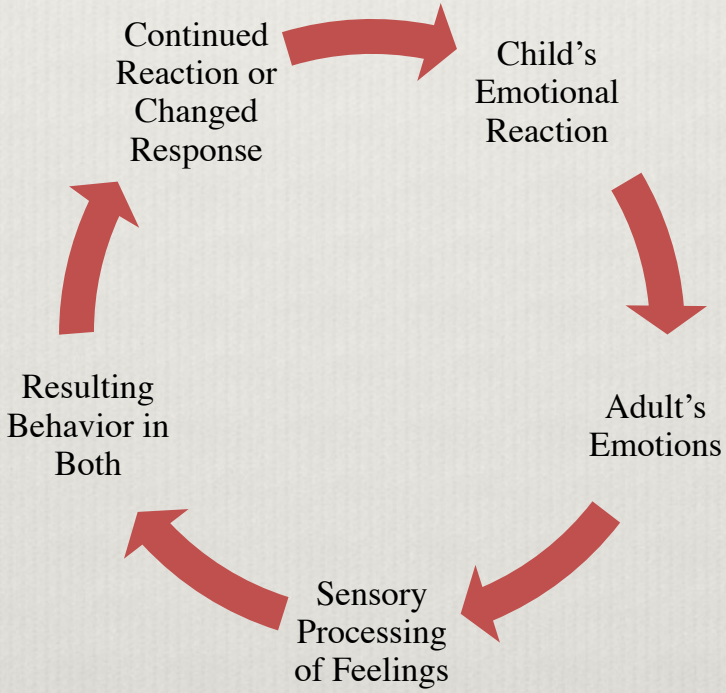


vs.

Co-Regulation



Reciprocal Regulation



Contextual Intervention

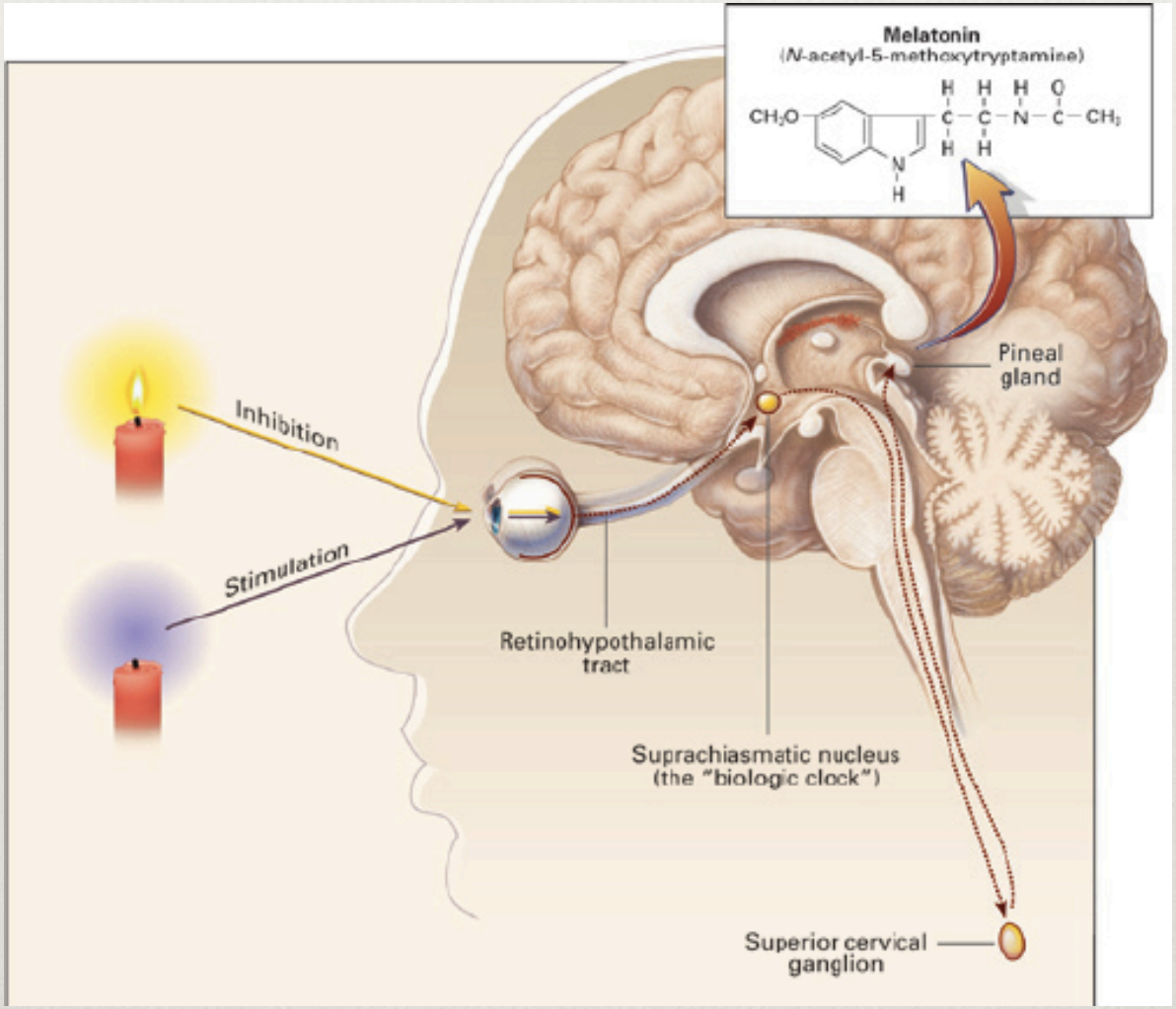
1960 Classroom

What is CSI?

Contextual Sensory Intervention

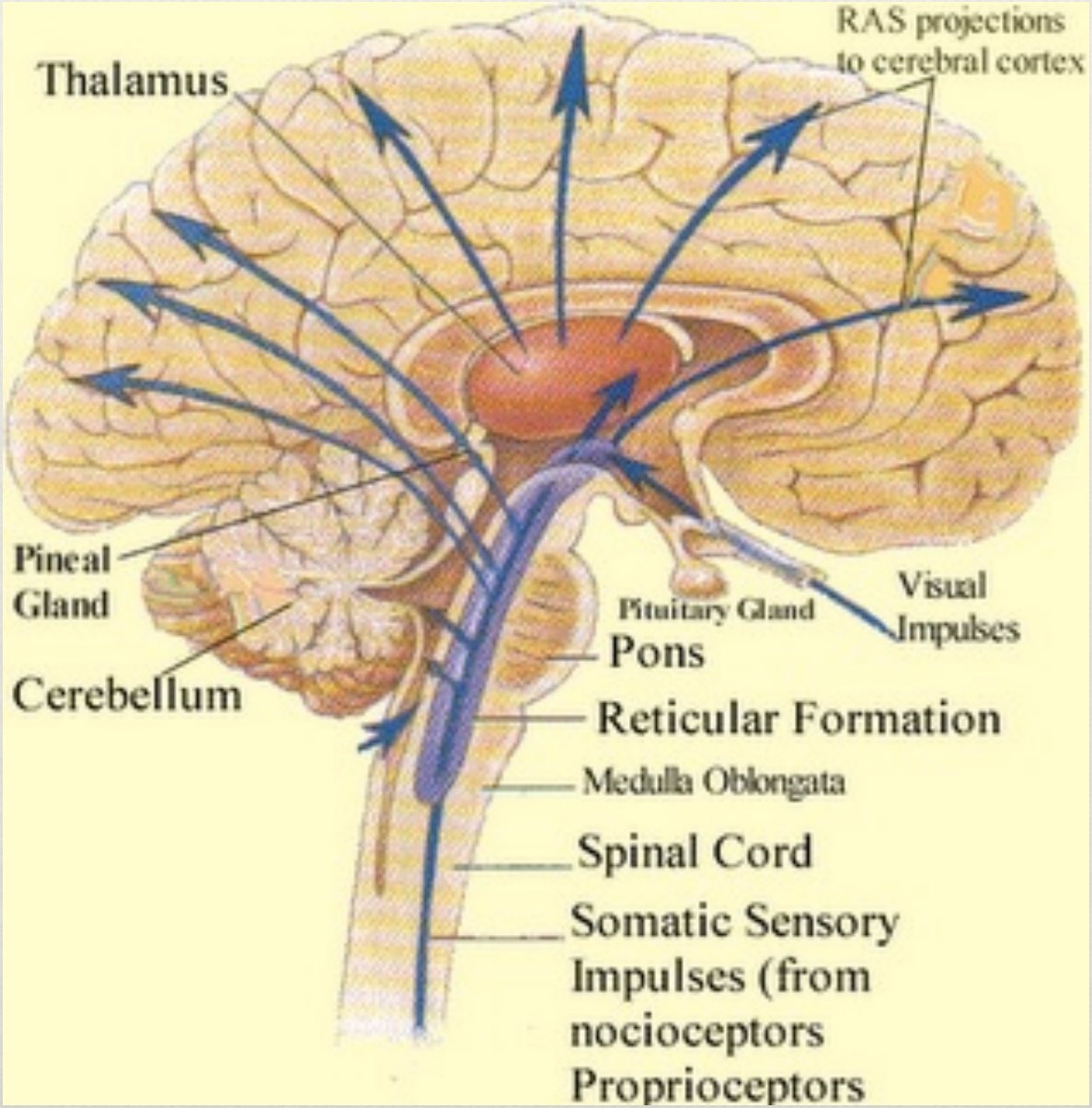
- The Science behind environmental stimulation and behavior
- Addressing Autism via the environment
- Address all levels...starting at the foundational level

Light and Arousal



(Shirani, Afshin & St Louis, Erik, 2009)

Filtering of Sensory Information Affects Arousal



(Joseph, 2017)

- Distractions
- Lightening and Electronics:
- Blue versus Red Lights
  - Blue blocking glasses
  - LavNav^{tm} nightlight
- Decrease TV, computer, phone, tablet brightness
  - F.lux: https://justgetflux.com/

CSI Continued…

Sound:

- Lower the volume on TVs and Radios!
- Flooring and sound

Positioning:

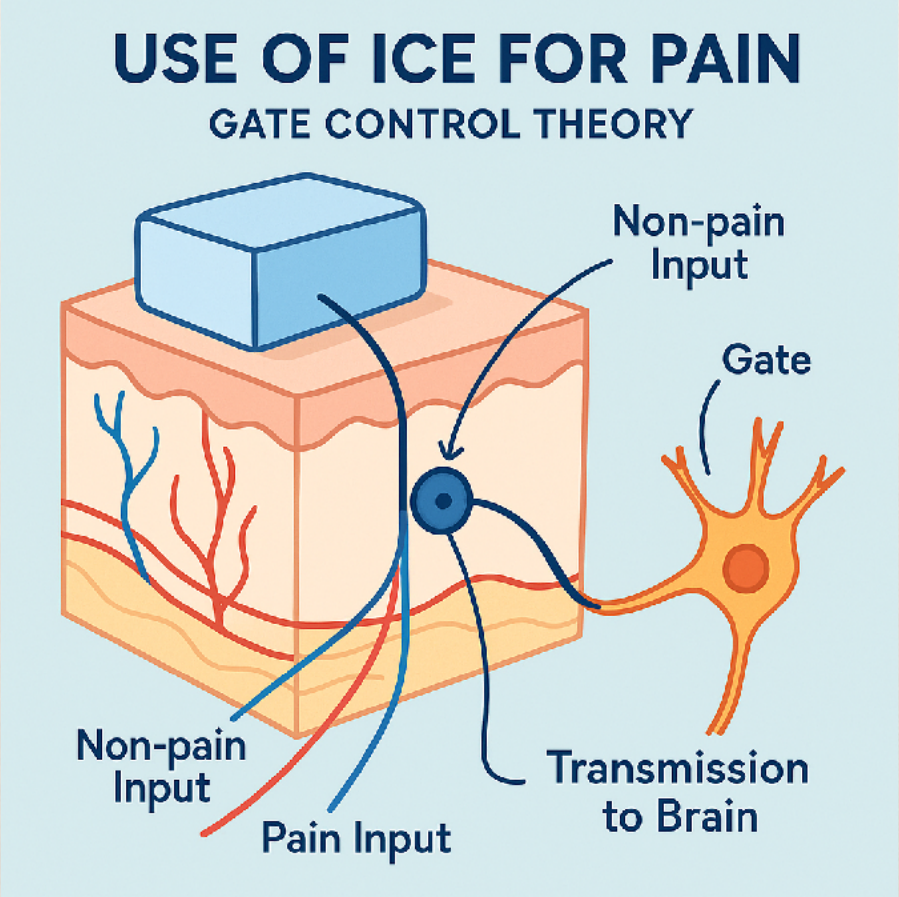
- Seating
- Rest

Smell:

- Don’t underestimate smell!

Endorphin release: head banging, biting, spicy food, crashing

Self-Injurious Behavior and Gate Control Theory



Canbulat N, Ayhan F, Inal S. Effectiveness of external cold and vibration for procedural pain relief during peripheral intravenous cannulation in pediatric patients. Pain Manag Nurs. 2015 Feb;16(1):33-9. doi: 10.1016/j.pmn.2014.03.003. Epub 2014 Jun 7. PMID: 24912740.

Diagnoses

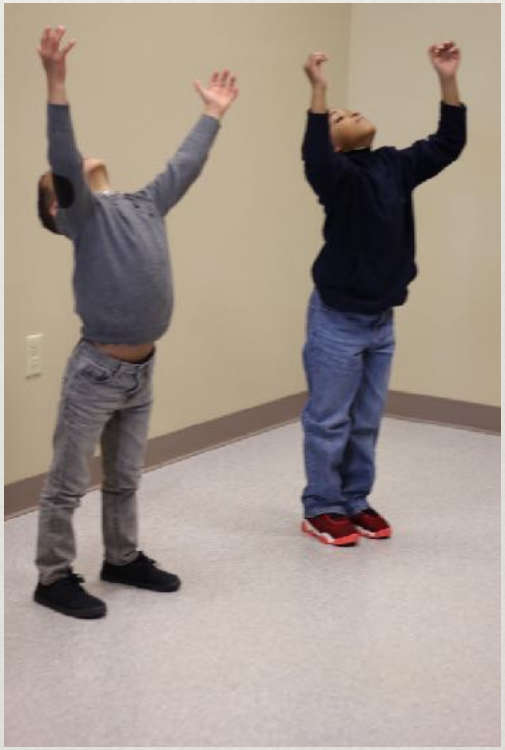
- PTSD/ Complex Trauma
- Autism: Diagnosis and DSM-5® updates
- Sensory Processing Disorder (SPD):
- Sensory modulation disorder
- Sensory-based motor disorder
- Sensory discrimination disorder

Modulation and Vestibular

Preparing the Body for Functional Activity:

Primitive Reflex Interventions

Addressing Primitive Reflexes



Primitive Reflex Intervention Cont'd

Video Case Analyses

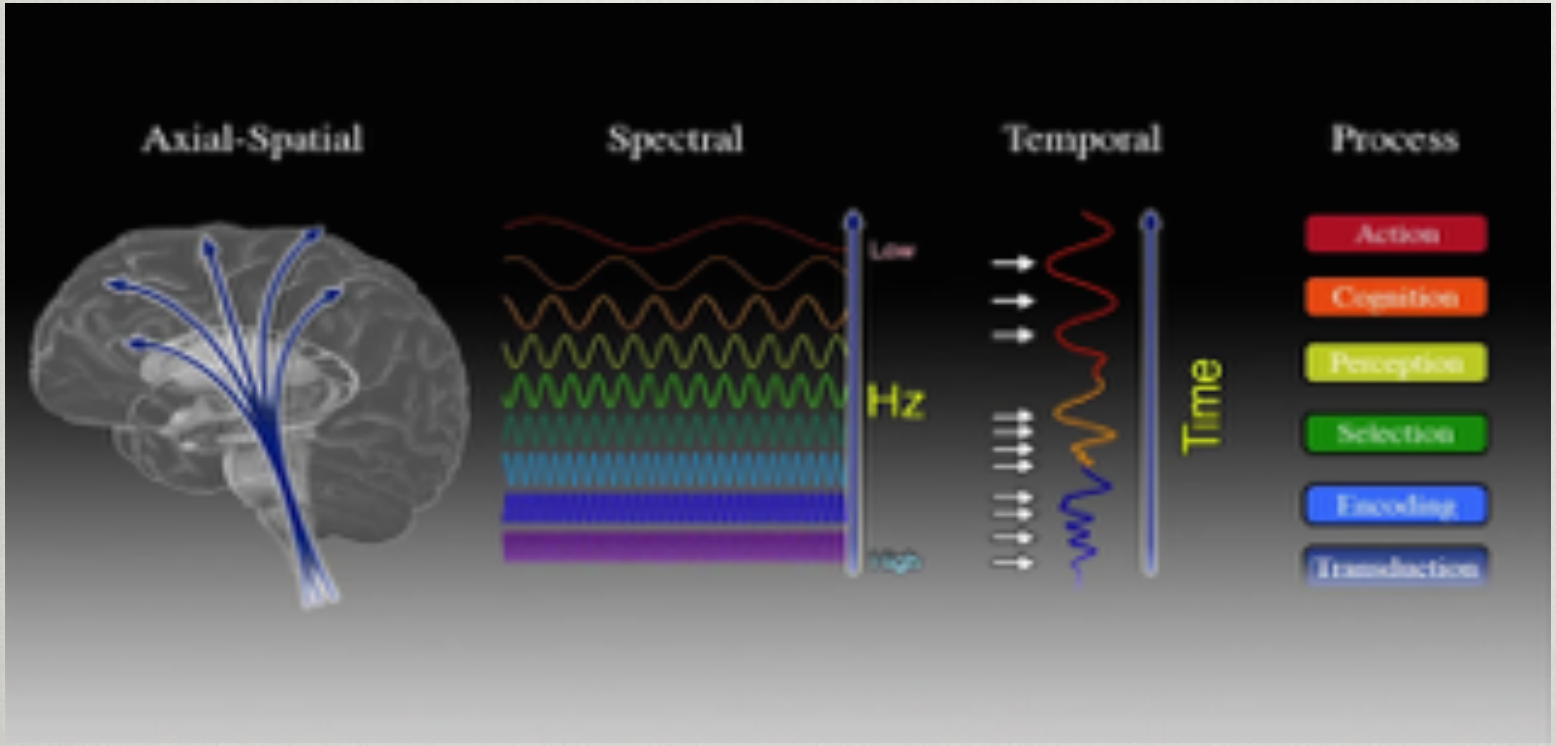
Case Study

- Cole often falls asleep in the swing….. all or nothing
- Modulation and Movement both have a connection to the cerebellum
- Cole has challenges with visual motor activities and attention
- Video: Cole
  - He previously had difficulty with the computer activity. Notice his response when presented with the activity.

Brain Rhythm

Neuronal Oscillations

- Keeping good flow= Feeling of “well being”: Serotonin release
- Lack of rhythm; “Arrythmia” may lead to seeking of Endorphin release: Rocking, tapping, deep pressure



(Gilley, 2014)

Neural Dynamics

"Neural oscillations are a fundamental mechanism that enables the synchronization of neural activity within and across brain regions and promotes the precise temporal coordination of neural processes underlying cognition, memory, perception, and behavior."

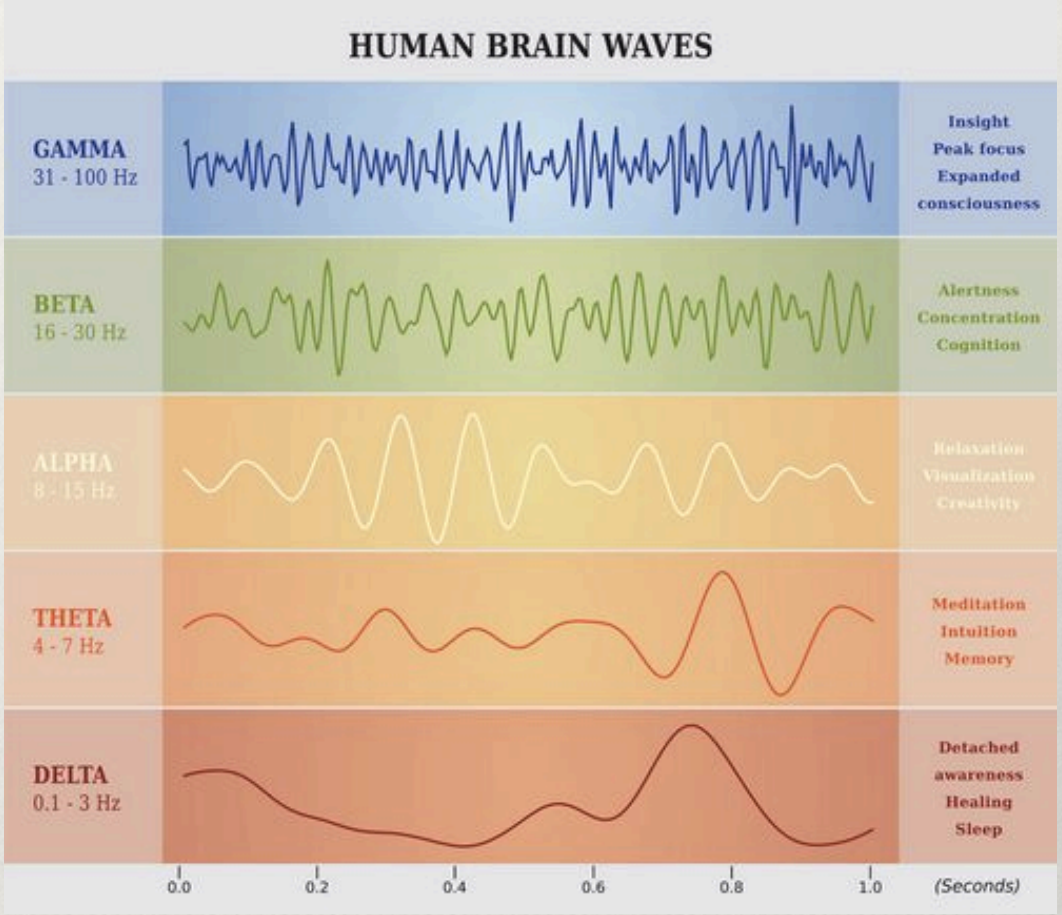
- From: The Neurobiology of Schizophrenia, 2016

Flappy = Happy

Even other animals rock to self-sooth when in distress

Neuronal Oscillations

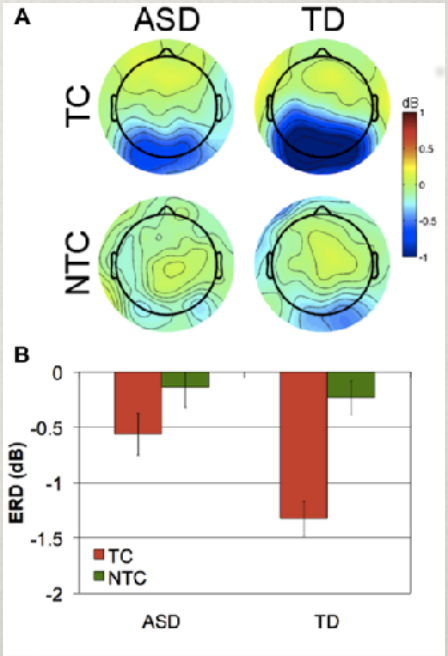
- Lower Gamma waves; and Alpha waves correlated to things versus language
- Waves show a peak with attention to an object versus typically peaking with surprise
- Children with Autism respond to the familiar not novel objects or experiences
- Improve with treatment
- We conclude-> Learning must address the what is familiar first for implicit memory (attending) to occur!



Attar, E. T., Abootalebi, V., & Fazel-Rezai, R. (2022). **Review of electroencephalography signals approaches for neurological status investigation**. *Frontiers in Neuroscience, 16*. https://doi.org/10.3389/fnins.2022.9749579 — this article describes delta, theta, alpha, beta, and gamma EEG waves.

Research

- ASD lacked change in Alpha waves with visual distractors
- Atypical EEG oscillations=atypical arousal levels
- Excitatory/inhibitory imbalance.

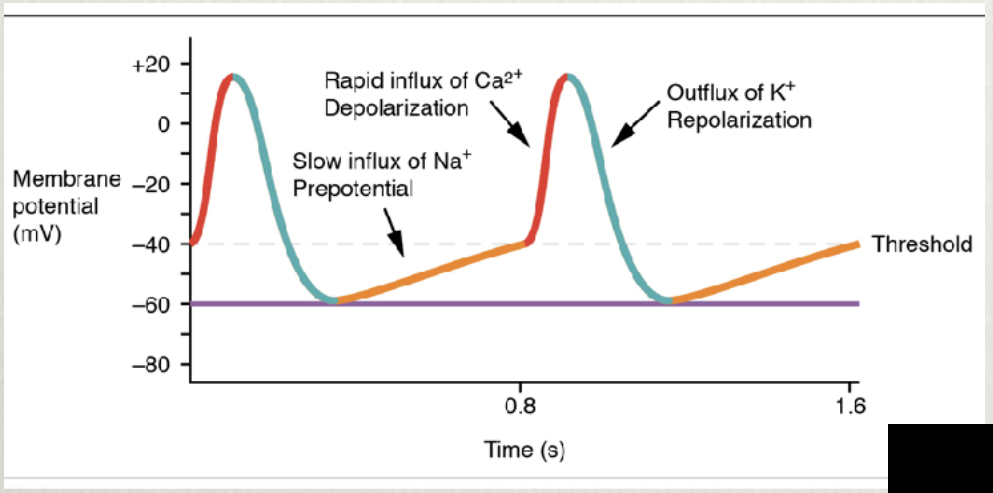


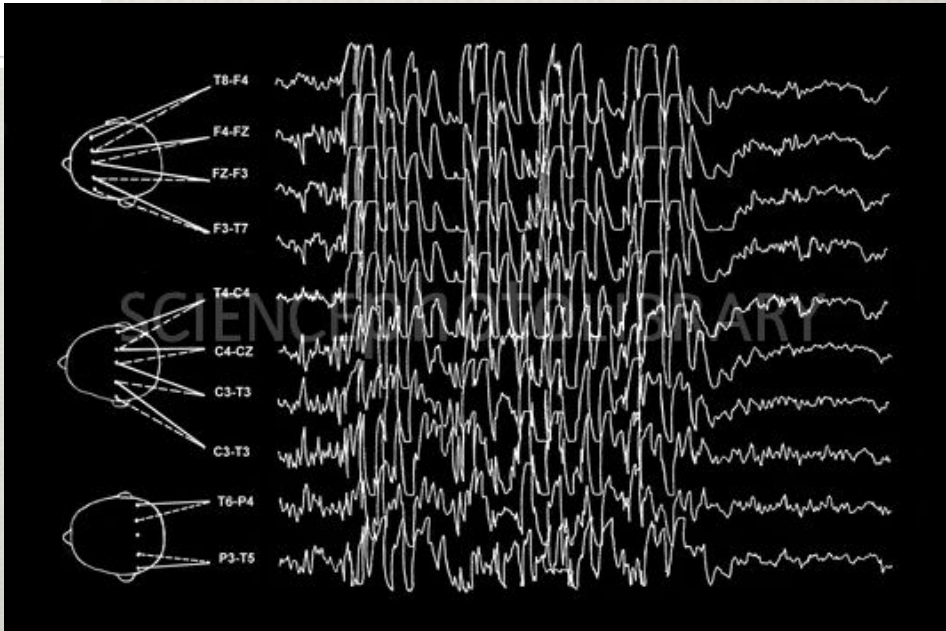
Keehn, B., Westerfield, M., Müller, R. A., & Townsend, J. (2017). Autism, attention, and alpha oscillations: An electrophysiological study of attentional capture. Biological Psychiatry: Cognitive Neuroscience and Neuroimaging, 2(6), 528-536.

Asynchrony = Dysfunction

- Poor Arousal
- Challenges with Attention
- Emotional Dysregulation
- Memory Difficulty

Synchronization versus Over Coupling





- Movement can connect to brain oscillations
- Rocking can effect brain patterns
- Calming the body can occur with

rhythmic breathing

- Brain oscillations affected by
- Enriched activities, oral motor activity

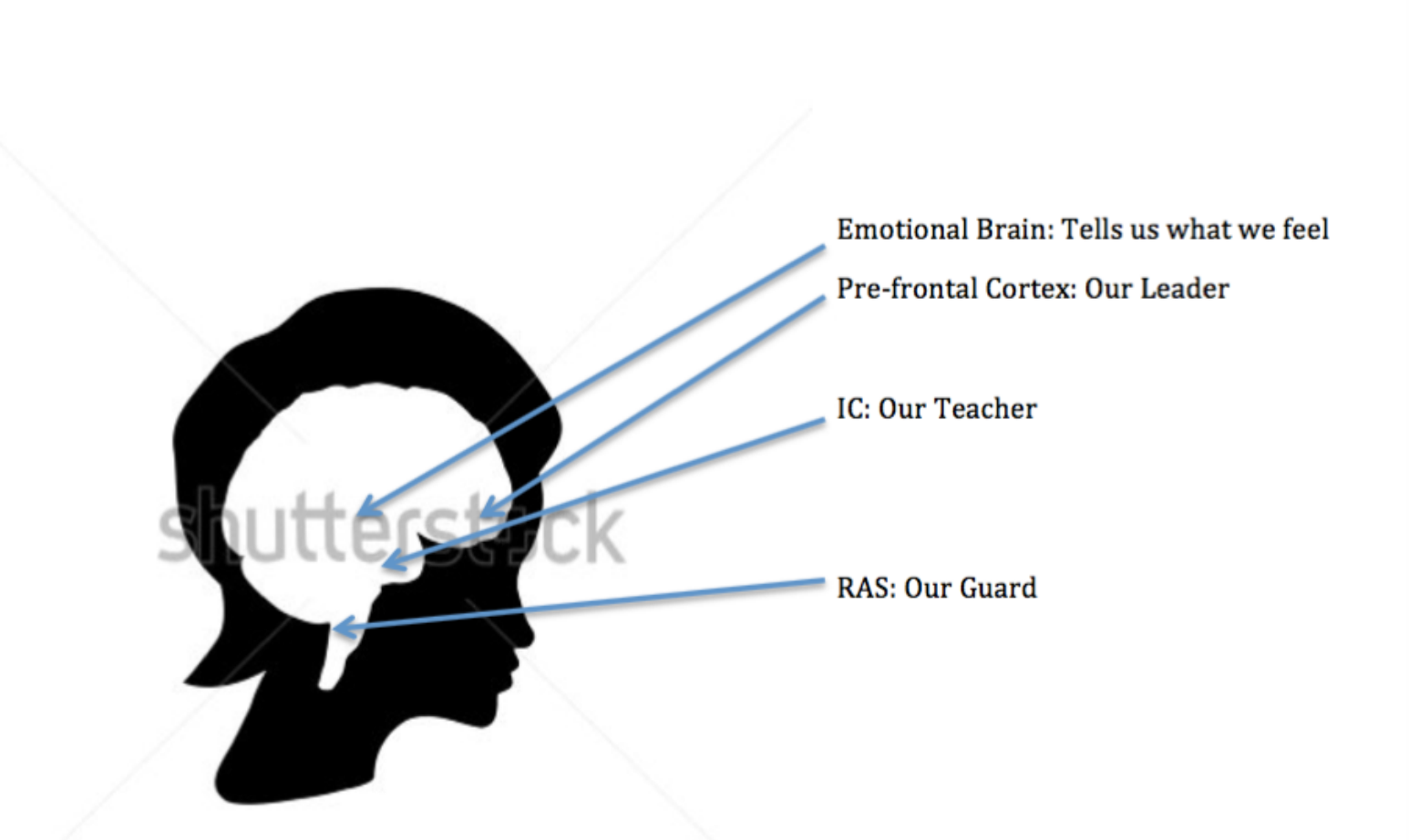
, and novel stimulation

(Bayer, 2011)

Case Study:
Brain Rhythm and Flow

- Two videos: Maddyx
- Poor motor planning, timing and sequencing

Teaching the parents, teachers, and children, about the Brain!



How to Activate Our Guard!

PNS Interventions

Self-Regulation Through PNS Activation!!!

- Valsalva Maneuver
- Oculocardiac Reflex
- Outer Ear Stimulation
- Cold
- Diving Reflex
- Neck Extension Exercises

And massage (Proprioception)

- Gargling, Singing, and 'Om'!!!!

(Fanselow, 2013)

Case Study

- Some activities are preparatory for occupation-based activity!
- Two videos
- Cole: **“Trumpet” blowing and belly breathing**

THE SAM BOX

"TURN DOWN THE VOLUME"

Tap into the Vagus Nerve and the System for Regulation

1. Pretzel Squeezes: (You can use a metronome with all of the four exercises)

Tap into the Vagus nerve through the ears. Cross your arms in front of the body. Grab as much of the the lower half of the ear as possible, primarily on the lobe. Place thumbs towards the front. Gently pull down counting slowly to 10. Repeat 3 times.

2. Blow your trumpet:

Trigger a Parasympathetic Response through a Valsava. Place your the tip of your thumb into your mouth. Without letting any air escape, fill your cheeks as if you were going to blow your trumpet (your thumb). Hold for 5-10 seconds. Repeat 3 times.

3. Hibernate:

Sitting on the floor, or even in your chair, bring your chest and knees close together. Wrap your arms around your legs and squeeze. Hold for 10 seconds counting and breathing slowly.

4. Eyelid Massage:

End by taking two or more fingers. Close your eyes and gently press and move your fingers in a circular pattern 5 times both directions. Be sure to count slowly and take deep breaths.

Inversion!!!

- Stimulate glands, lymphatic drainage, and digestion
- -> Improved immune system
- Blood flow and oxygen to the brain
- Input to the spine
- Decreases SNS Response
- Activates Vagus nerve
- Increase relaxation and muscle release
- Improved sleep

How to Activate Our Teacher

Case Study

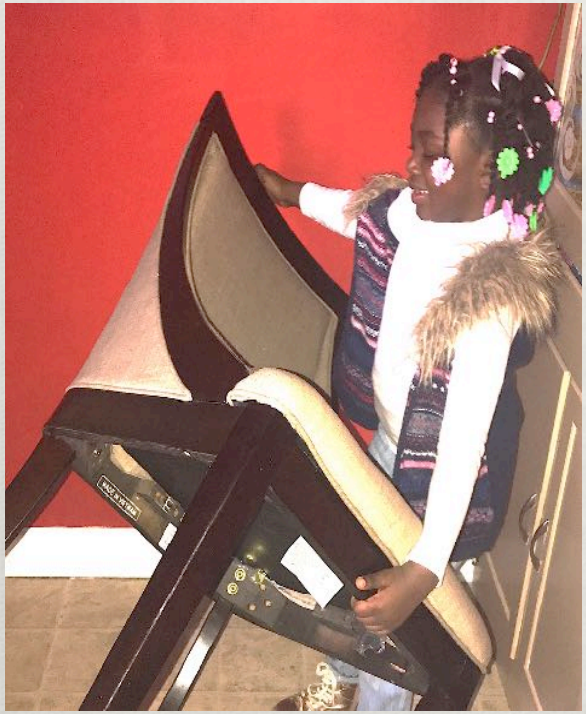
- Two videos: Metronome
- Cross crawl and alphabet board
- Weights: Inhibit unwanted movements and increase control of movement

Eye Yoga

- Ask the child to close their eyes while gently inhaling.
- Have them try moving their eyes with their eyes closed such as looking up and down.
- With the eyes open, have the child extend their arm in front of them, eye level, with their thumb raised.
- Have them use their thumb to visually track while keeping their head static.
- Instruct the child to move their thumb towards their nose and away.
- Have them move their arms slowly away from the center of their body then towards the side, while following their thumb with their eyes.
- Remind them not to move their head.
- Repeat for three or four more times remembering to breath.
- You may use chime or music in the background.

How to Activate the Leader of the Brain

Heavy Work and Proprioception



Bear Walk

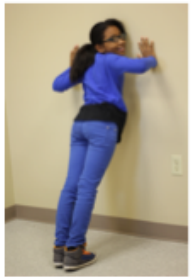
Crab Walk

THE SAM BOX

Exercises for anywhere including the classroom

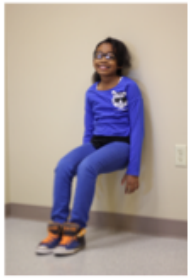
"XYZ" EXERCISE: DO IN ORDER RHYTHMICALLY; 4 TIMES EACH, 2TIMES EACH, THEN 1 TIME EACH

WALL PUSHUPS



WALL POSES

WALL SITS



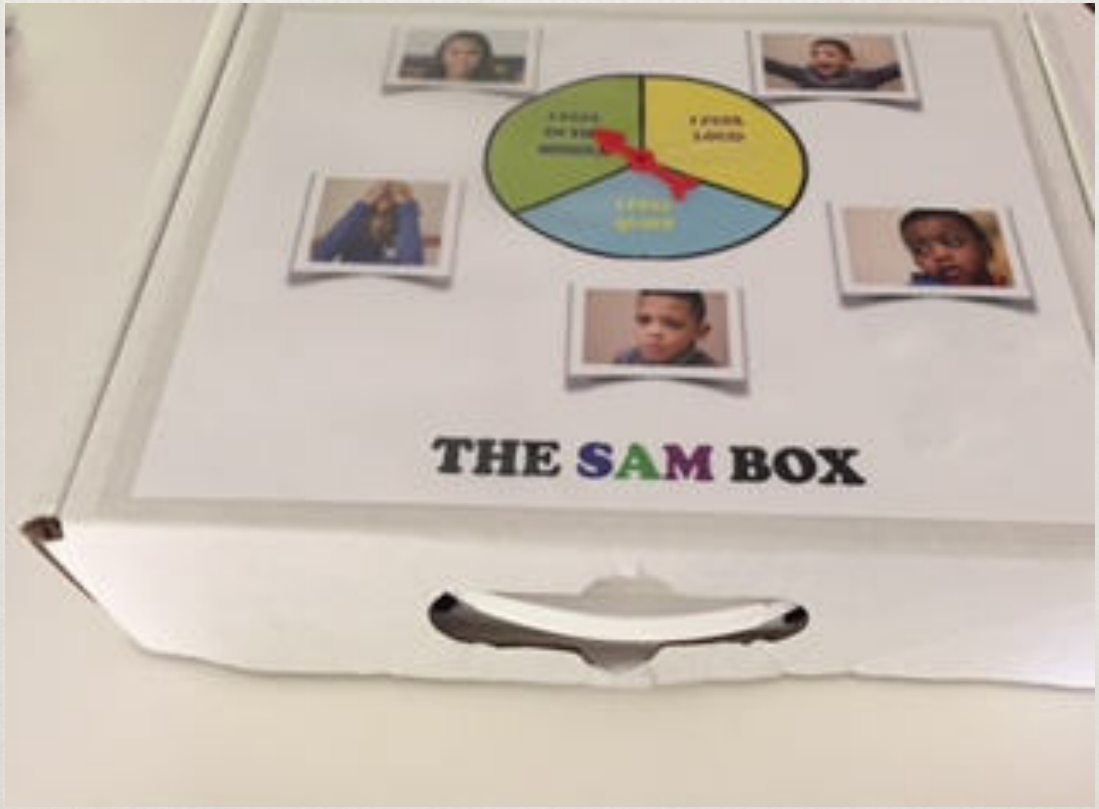
CROSSING

TRUMPET BLOWING

YOGA POSES

Yoga and Pilates

The SAM Box



Assessment to Intervention

Group Case Review

- Emotional Dysregulation
- Aggression towards Peers
- Not receiving services until now
- ID level on the Hierarchy; What activities would you suggest based on your practice area?
- Video group session.....

ASSESSMENTS

- Consult an OT
- Sensory Checklists
- ABC'S!!!

	Over Responsiveness to Sensory Input	Under Responsiveness to Sensory Input	Craving Sensory Input
Threshold	Low; Hyper vigilant	High; Inattentive	High; Hyperactivity
Arousal	High; Overreaction	Low; Lacking a response	High; Energetic
Preferences	Avoiding certain activities and preferring routine and predictable activities	Needs motivation and encouragement to attend to activities especially gross motor play	High intensity activities; Risk taking
Example Treatment Activities	Slowly introducing new activities by pairing with preferred activities in a non-threatening nature, weight bearing activities, deep breathing, yoga and exercises moving from a flexed position to extension due to connection of primitive reflexes	Contrasting activities; fast versus slow; cold versus hot; High-energy activities such as fast swinging; jumping and crashing. Strengthening activities secondary to lack of gross motor activities resulting in decreased muscle activation	Intense activities such as Ice play; stimulating multiple sensory areas; swinging and crashing while listening to music; Weight bearing activities and intense input to the muscles and joints, deep breathing, yoga and meditation

Purpose:
To track application of the daily targets for the SAM program. Take a tally of activities performed.

Child's Name: _____ Person Completing Sheet: _____

Setting (i.e. school, home, clinic): _____ Date: _____

TARGET	AM	LUNCH	AFTERNOON	PM (if applicable)	BEDTIME (if applicable)	NOTES
• TOUCH AND HEAVY WORK						
• HYDRATION AND ORAL MOTOR						
• METRONOME AND TIMING						
• RIGHT AND LEFT BRAIN INTEGRATION						
• PATTERNS AND REPETITION						
• BREATH AND VALSALVA						
• VISION AND SOUND						
• MOVEMENT						
• INHIBITION						

Touch and Heavy work

- Can decrease stress hormones in gut, brain, and body
- Organize brain wave

- Strategies:
- Massage and personal touch
- Carrying weighted objects
- Play with textures (cooking is a wonderful opportunity.)

Hydration and Oral Motor

- Strong Connection to CN X and the RAS

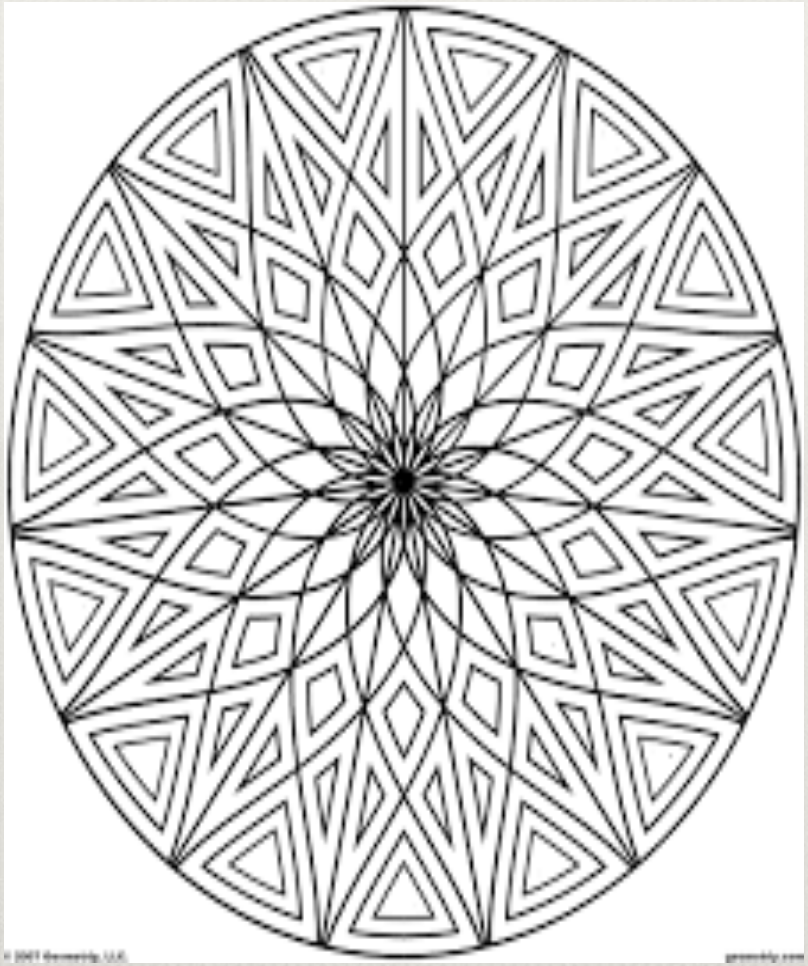
- Start-Stop Metronome and Timing
- Brain Rhythm!

Right-Left Brain Integration

- Crossing Midline

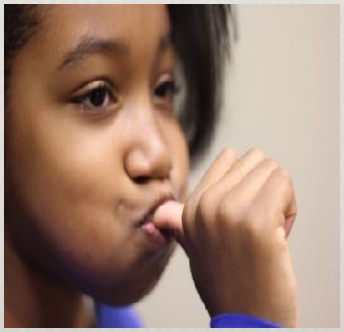
- Primitive Reflex Connection

Patterns and Repetition



Breath and Valsava

- Ice Therapy!
- Connection to the Neuronal Plexus
- Decrease stress neurotransmitters and enhance serotonin and dopamine....in the gut!



Vision and Sound

Strategies

- Use flashlights for scanning activities
- Follow the leader and “I’m thinking of an animal, what could it be” games stimulate the auditory system.
- Use music and visual stimuli together to optimize the multisensory approach.

Movement

Can target the neuronal plexus and primitive reflexes at the brainstem level!

Inhibition

Strategies

- Red light, green light, and freeze tag are great games of inhibition.
- Starting and stopping while swinging
- Staring contests and who can be quiet the longest challenge this ability in a great way.
- Remember multisensory! Use metronomes, change the lighting, and turn on the music.

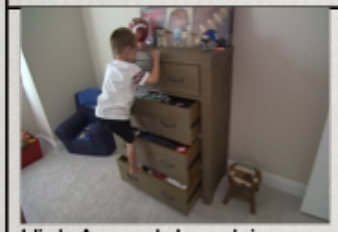
Vestibulo-ocular reflex Test

- Have the child look at a target, such as your penlight, marker, or sticker placed on a pencil.
- Ask the child to look at the target while moving their head to maintain their gaze as the target is moved.
- Move the target from left to right, up and down.
- Observe their ability to maintain their gaze on the target. The eyes should move in the opposite direction of the head movement.
- Repeat the previous steps yet ask the child to not move their head while following the target with their eyes.
- Observe the child's ability to maintain their gaze and follow the target without moving their head.
- Challenges any of the previous steps may indicate challenges with maintaining gaze, stabilizing eye movement with head positioning changes, and balance.

Questionnaire

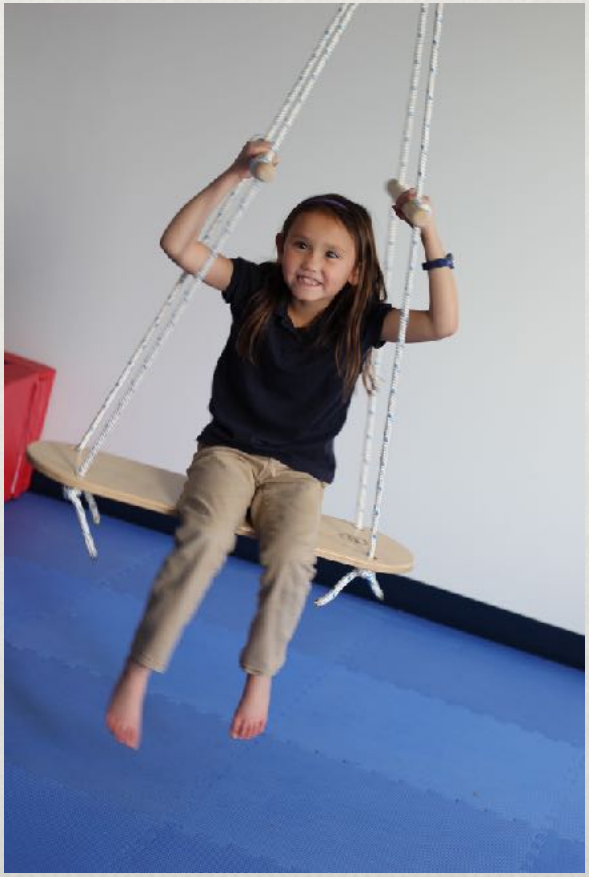
For High Level Child or Caregiver

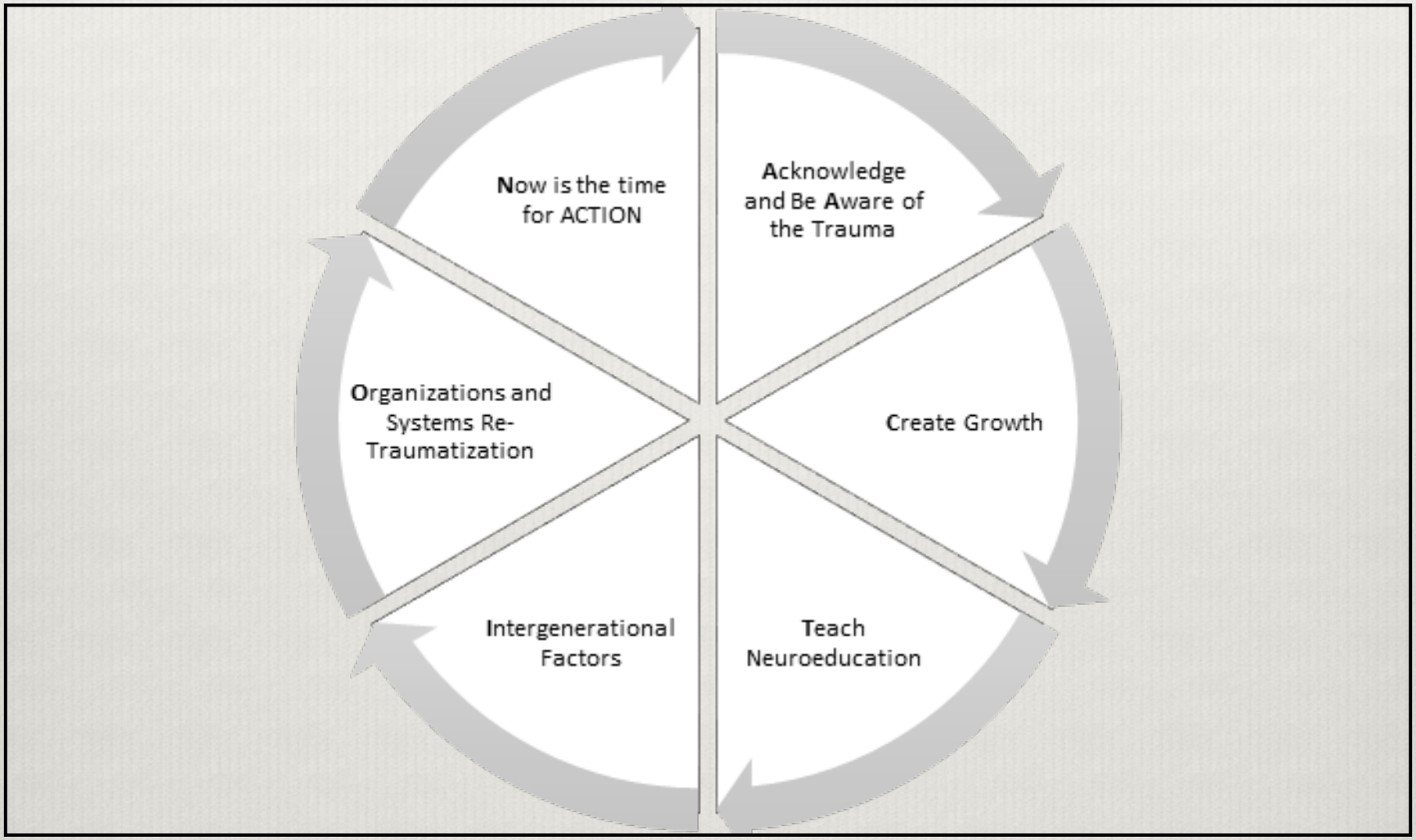
- I would best describe myself as….(circle all that apply)
- Enjoying a lot of activity (movement, running, jumping)
- I avoid physical activity
- A thrill-seeker (enjoy climbing)
- Disliking like loud or irritating sounds (sometimes this may be other people talking)
- Disliking certain lighting such as the lights at school
- Prefer wearing only one type of clothing (sweatpants)
- I would describe my eating as…(circle all that apply)
- Sometimes I have difficulty knowing when I am hungry until the last minute.

Performance Skills	Client Factors/ Body Functions: Connection to the Nervous System	Intervention Activities Targeting Desired Outcomes
 Anxious; Hyper vigilant	• Sympathetic Nervous System over active • Poor Filtering of the RAS • Amygdala hyper-activation	• Vagus Nerve activation (i.e. PNS activation, music, calming context and environment) • Rhythmic breathing • Triggering the Septal region through making task demands pleasurable activities to change focus of the RAS • Exercises targeting the Moro and other primitive Reflexes • Slow rhythmic activities
 Low Arousal; Inattentive	• Lack of attention and arousal correlated to the brainstem area • RAS either allowing in too little stimulation or too much (i.e. shutting down response)	• Enhancing activation of the RAS, Limbic Lobe, and Pre-frontal cortex (i.e. contrasting activities; fast versus slow; cold versus hot; High-energy activities) • Weight bearing, eye exercises/ visual games, and primitive reflex activities to synchronize input to through the RAS • Inhalation activities (i.e. sucking games; using straw to retrieve small objects such as corn cereal to place inside a container or using a straw for resistive substances like yogurt) • Rhythmic activities with changing frequencies
 High Arousal; Impulsive	• Septal region hyper-activity • Lack of activation of the pre-frontal and insular cortices	• Meeting threshold through intense activity • Ice play; multi-sensory stimulation; music; deep muscle and joint input • Exhalation activities (i.e. blowing feathers with a straw)/ Rhythmic breathing • Oral motor stimulation and input • Rhythmic activities combined with weighted objects (i.e. wrist and ankle weights) and visual motor activities
 Clumsy; Poor Coordination	• Lack of integration of primitive reflexes • Disorganization of cranial nerves and neuronal processing	• Primitive Reflex exercises and participation in games crossing midline/ bilateral activities • Visual Activities (including and occluding vision during movement) • Rhythmic activities involving timing and sequencing tasks • Rhythmic breathing

- What to put in a sensory diet….

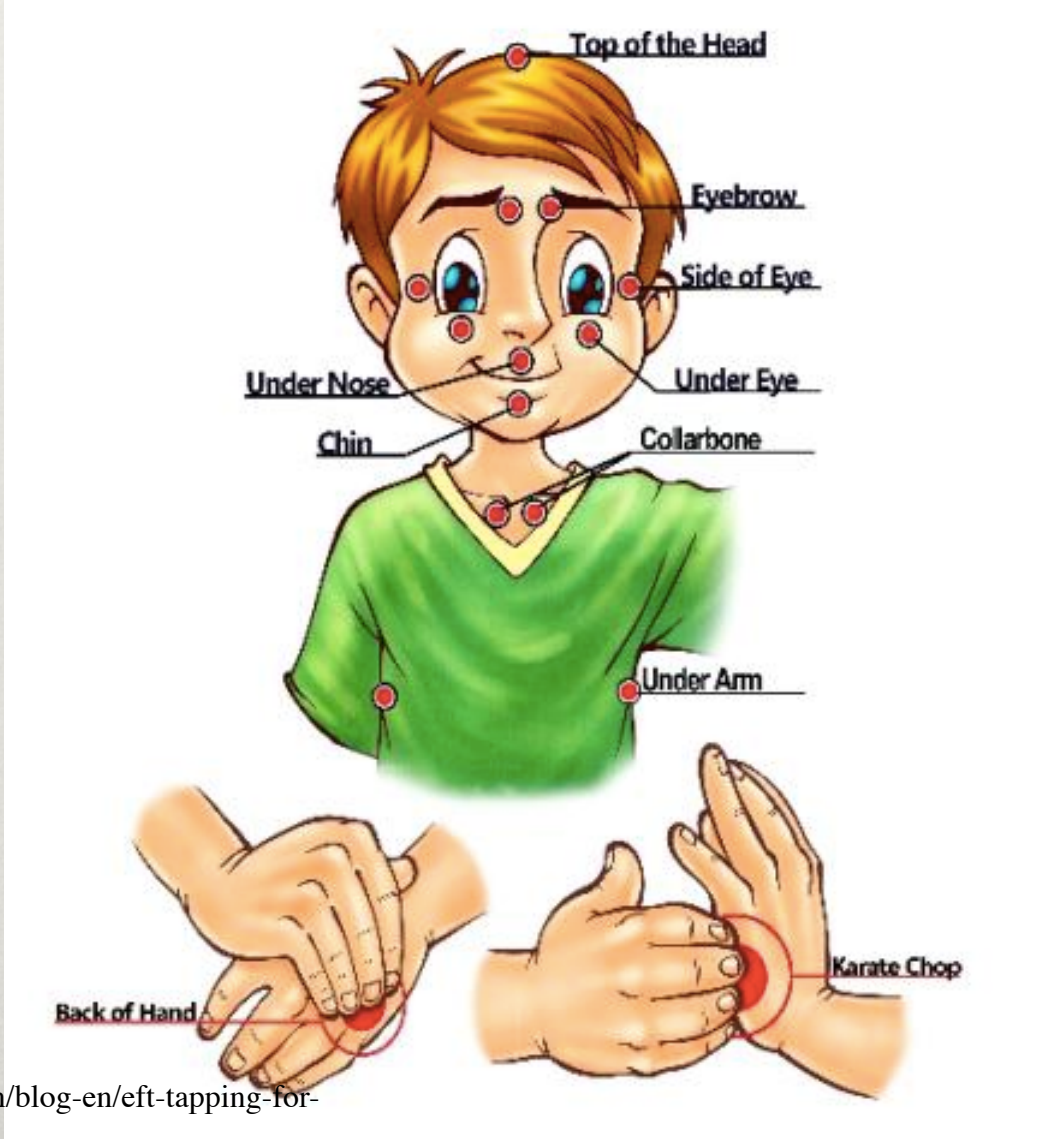
MULTI-SENSORY INTEGRATION!!!





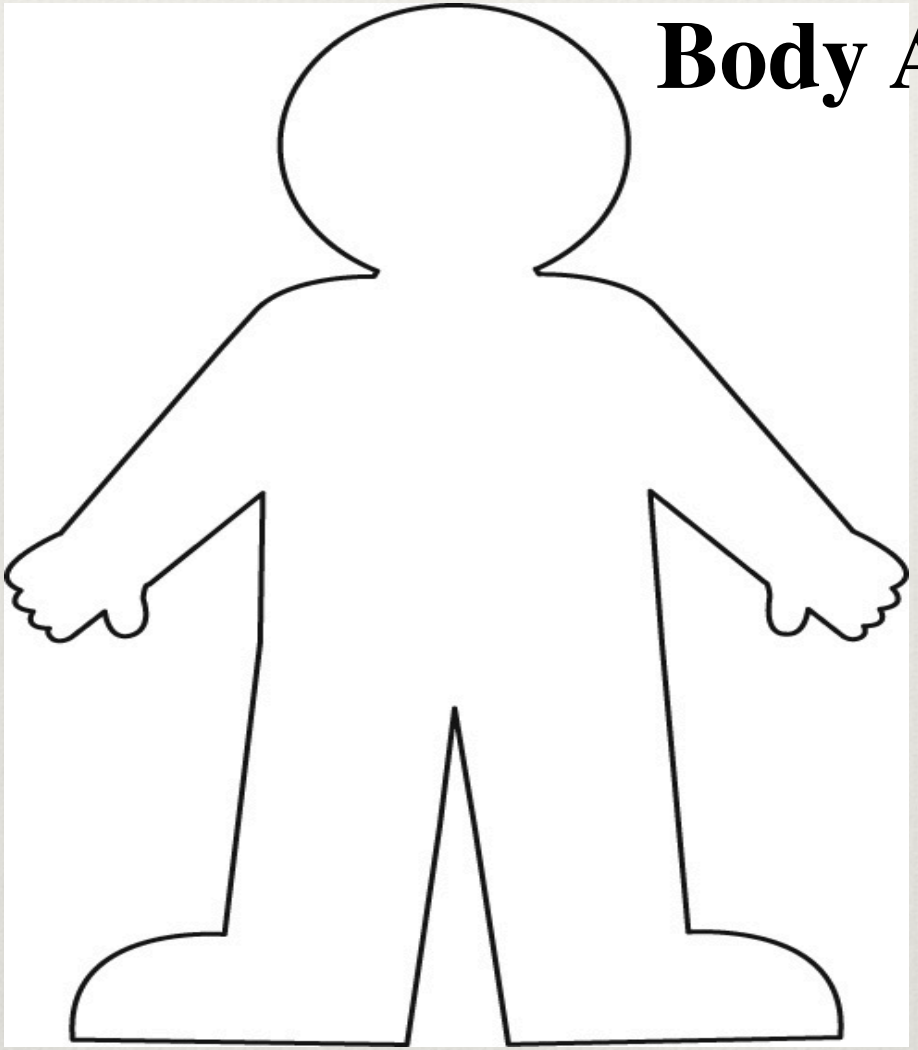
ACTION-from-Trauma Approach (Gibbs, 2020)

Emotional Freedom Technique



Retrieved from:
http://www.andrianiloizou.com/en/blog-en/eft-tapping-for-gaining-patience/

Body Awareness



Let's Try!!!

Think about a client. Where would they color?

What's your theory?

Overview of Strategies

- Interoceptive Defensiveness
  - Eating= Preparation (tactile activities, desensitization with vibration and ice, calming/deep breathing, using smells such as lemon or essential oils to dampen response to food, CBT with pictures and coloring illustrations)
  - Bathroom= Yoga and core strengthening, heavywork, calming/deep breathing exercises, belly massage, rolling on top of a therapy ball, CBT with stories and coloring activities, “Potty watch”
- Interoceptive Under-responsiveness
  - Eating= Scheduling, crunchy food, intense flavors
  - Bathroom= Similar as defensive techniques, also explore smells with aromatherapy to discuss differentiating odors, tactile activities with various textures and temperatures, Ice Therapy to reach their threshold
- Interoceptive Seeking
  - Eating= Meeting threshold through use of crunchy and intense flavors,
  - Bathroom= identify if they child prefers to withhold bowels for internal input or enjoy the sensation of having an accident in their pants; behaviors align with other seeking behaviors. Vibration and Ice!, CBT and social stories

Case Study

Case Analysis

1. Identify their level on the SAM 7-Level Hierarchy.
2. Dissect the child's self-regulation (Sensory Processing, Emotional Regulation, Executive Functioning).
3. Using the findings from #2, make a priority list of concerns, 1 long-term goal, 3 short-term goals.
4. Identify at least 5 activities from the presentation to address his needs....**Go back to the Daily Check List for Guidance**
5. How would you then address goals related to your scope of practice (i.e. Speech, Social work, PT, OT) ?

Appraise your Knowledge

- What challenges do you foresee for the children in the video?
- What neuronal areas are of concern?
- What activities would be most appropriate to meet their needs?

Additional Case Studies for Discussion…

Tracey

- Tracey is a 21-year-old female. She attends a small school specializing in behavioral and intellectual disabilities. She has a diagnosis of Autism and is high functioning. Tracey enjoys music; taking walks, and expresses an interest in Yoga. Tracey also enjoys snacks such as potatoes chips, cakes, and other "junk food".

- At times, she will utilize nausea and evoke vomiting to elope an undesired activity. Tracey's primary challenge is emotional regulation. Her pupils are often dilated. She can become upset quickly and without warning. She is receptive to most services such as social work, group sessions, and occupational therapy. Soon, she will be discharged and may enter into a group home.

Case Study

- 10 y/o with ASD, ADHD, dysgraphia, and anxiety, encopresis
- Dislikes cold food, or sauces
- Hoards items such as rocks and paper
- Emotional Dysregulation

Interventions

- Received ABA therapy
- Behavioral approaches (i.e. having him clean himself after soiling pull-ups)
- Possible recommendations….
  - Seems to desire control over things secondary to being overresponsive to sensory input.
  - Appears to have interoceptive defensiveness
  - Exploring new sensations and experiences in a non-threatening manner.
  - Use of aromatherapy and tactile activities for feeding, music, vibration and ice before introducing a new food, deep breathing, yoga for core strengthening, vestibular activities to regulate his vagus nerve, and social stories
  - SAM Program to identify the signs when his emotions are loud.

Case Study

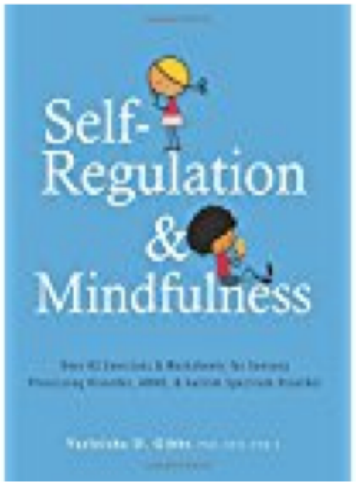
- 8 y/o with ASD, ADHD, dysgraphia, and anxiety
- History of soiling and requiring pull-ups (does not respond to the odor and appears to enjoy the sensation)
- Limited diet (i.e crispy chicken strips, cheese pizza, hot dogs without a bun, and various crackers, cookies, and candy, only drinks water)
- Poor sleep hygiene
- Emotional Dysregulation (i.e. competitive, history of wandering)

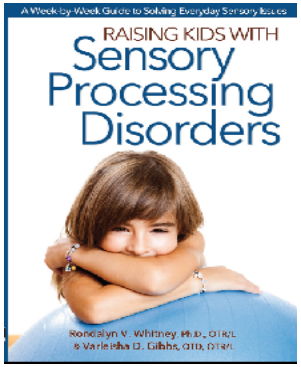
Interventions

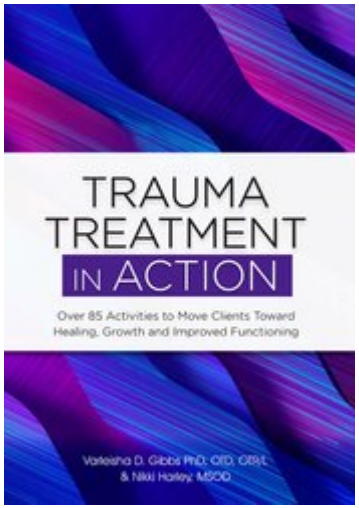
- Received ABA therapy
- Behavioral approaches (i.e. having him shower himself after soiling pull-ups)
- Possible recommendations….
  - Appears sensory seeking
  - Appears to have interoceptive seeking
  - Introduce new sensory experiences that allow him to meet his threshold in a more appropriate manner.
  - Use of intense vestibular and SI approaches, strong flavors with candy, music, and activities with ice before introducing a new food, and social stories
  - SAM Program to identify the signs when his emotions are loud.

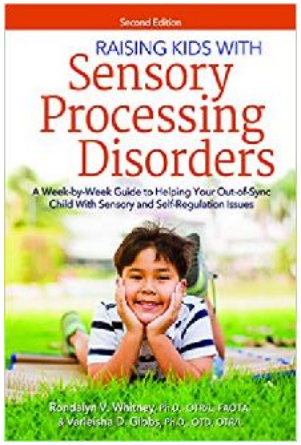
visit me @ LinkedIn, Instagram,
Twitter & Facebook
@DrVarleisha

Email:
DRVARLEISHA@WASUTSANCTUARY.COM









WEBSITE: HTTPS://DRVARLEISHA.COM/

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