ADHD and Self-Regulation



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B.C. PROVINCIAL ADHD CLINIC AT B.C. CHILDREN'S HOSPITAL
ADHD PARENT EDUCATION DAY – OCTOBER 26, 2026

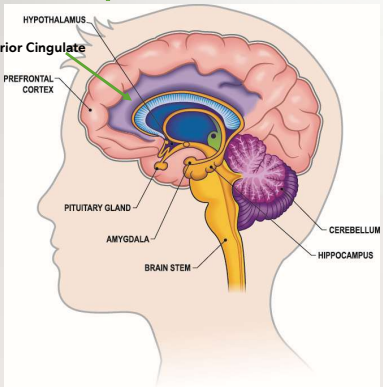
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Learning Objectives

- ✓To understand the science behind self regulation and ADHD
- ✓To define self-regulation
- ✓To learn some sensory and motor self-regulation strategies

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Neuroscience of Self-Regulation

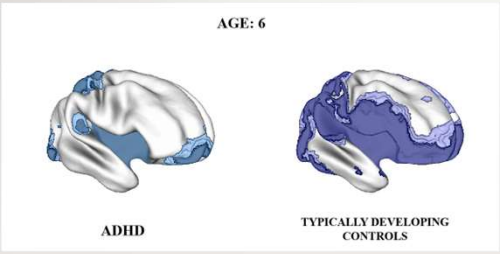


- **Prefrontal cortex** – Executive Functioning
  - Dorsolateral PFC working memory, cognitive flexibility, motor planning
  - Inferior PFC- inhibitory control, suppress distractions and irrelevant thoughts
- **Limbic System** - Emotions/feelings
  - Anterior cingulate recognizes temptation and need for self-control
  - Amygdala – processes emotions, fear, anxiety, identifies stressor
- **Brain Stem** - Reptilian brain - for survival

Kim et al., 2016; Hedgcock et al., 2012. Image from https://qbi.uq.edu.au/brain/brain-anatomy/limbic-system

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The ADHD Brain

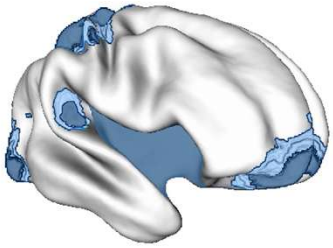


- 2-5 year delayed cortical maturation
- Most prominent delay in **lateral prefrontal cortex**
- Ability to suppress inappropriate responses and thoughts
- Executive control of attention
- Evaluation of reward contingencies
- Working memory

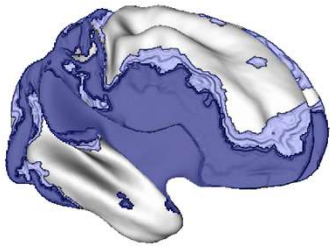
Shaw et al., 2007

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AGE: 6



ADHD



TYPICALLY DEVELOPING CONTROLS

Shaw et al., 2007. https://pmc.ncbi.nlm.nih.gov/articles/PMC2148343/

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Important Neurotransmitters in Regulation

ADHD - lower levels of Norepinephrine, Dopamine, and Serotonin

Serotonin
Well-Being
Relaxation
Contentment
Eating Sleep

Appetite

Endurance
Intuition

Stable Mood

Attention Focus

Dopamine
Alertness
Reward
Pleasure
Motivation
Drive

Norepinephrine
Stress Response
"Fight or Flight"
Energy
Arousal

Guiard et al., 2008; da Silva et al., 2023

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Self-Regulation Defined



SELF-REGULATION = the ability to attain, maintain, and change arousal appropriately for a task or situation. (Williams & Shellenberger, 1996)

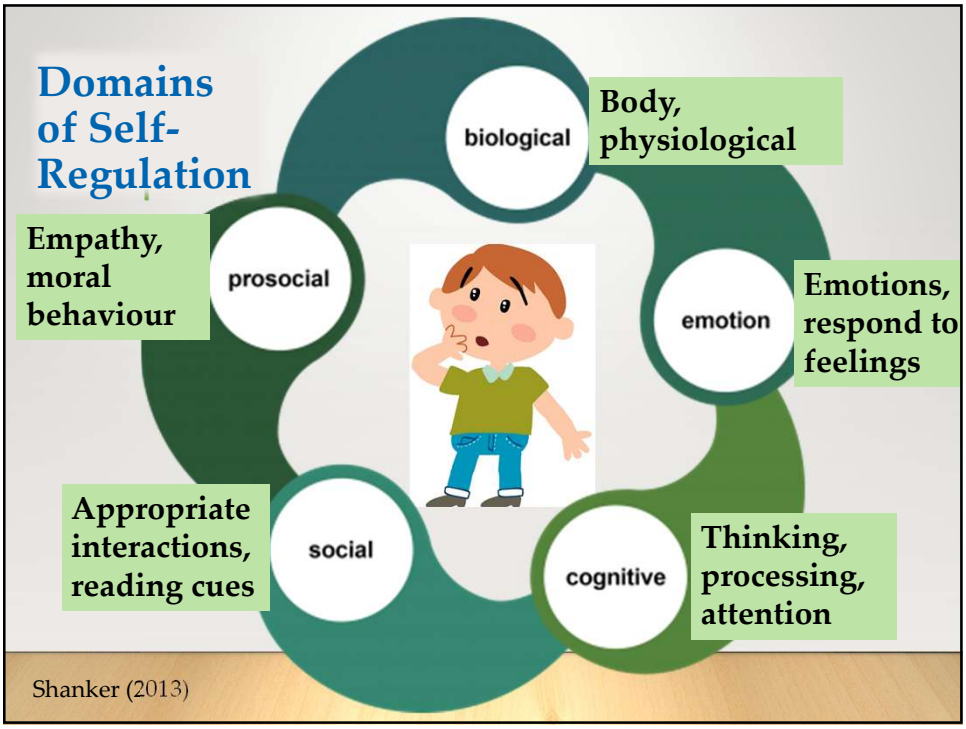
AROUSAL = a state of the nervous system, how alert one feels

How people manage stressors, how much energy we expend and how well we recover (Shanker, 2013)

To be able to understand and respond to others and ourselves

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Domains of Self-Regulation



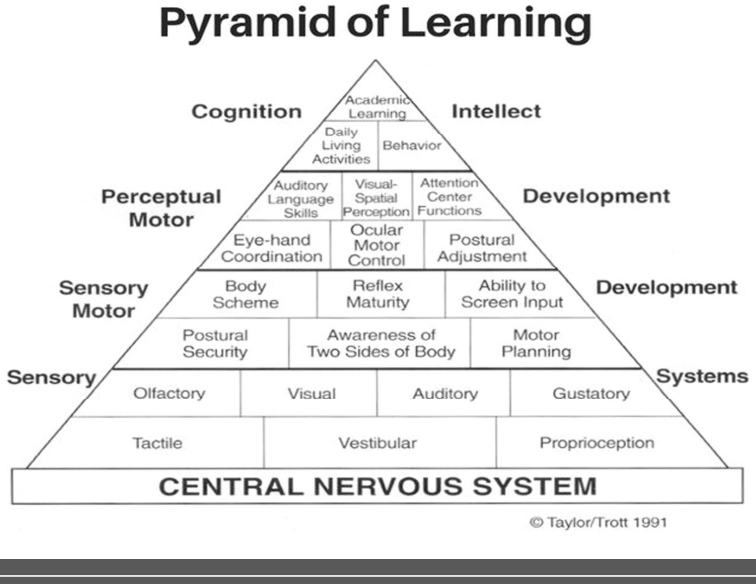
Shanker (2013)

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Biological Domain

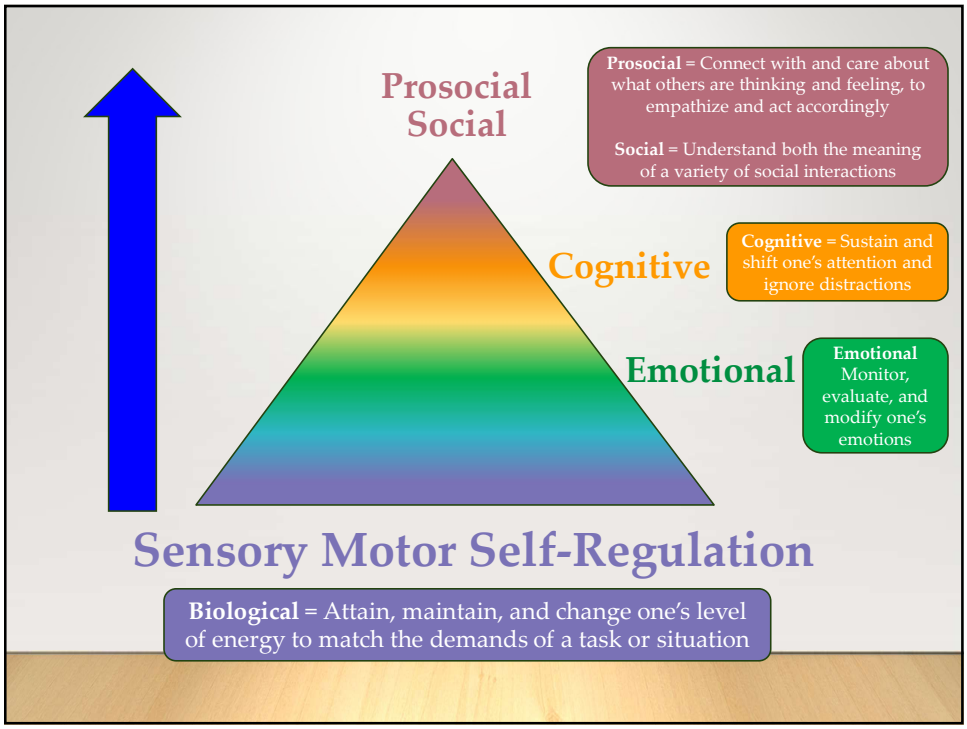
- Physiological regulation
- Body systems – motor, sensory, digestive, cardiac, respiratory, etc.
- All individuals have sensory and motor preferences
- No Right or Wrong
- Our preferences influence the strategies we choose to help us regulate our biological domain

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Pyramid of Learning (Taylor/Trott, 1991)

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The Foundation of Self-Regulation

Social Emotional Learning (SEL) is built on the foundation of Biological Self-Regulation (Williams & Shellenberger, 2025)

Many SEL programs assume that a child has already *achieved these biological (Sensory Motor) self-regulation skills. (O'Grady, 2024)*

Emotional regulation relies on the ability to recognize internal states and adjust. Recognition is impossible if a child cannot reliably interpret the signals within their body. (Ng, 2024)



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Eight Senses

MOUTH – GUSTATORY (TASTE) AND ORAL TACTILE (TEXTURE)

MOVE – PROPRIOCEPTION AND VESTIBULAR

TOUCH - TACTILE

VISUAL - SIGHT

AUDITORY - HEARING

OLFACTORY - SMELL

INTEROCEPTION – INTERNAL SIGNALS, HUNGER, THIRST, OR A RACING HEART

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Sensory Motor Tools



Interoception

MOUTH

MOVE

TOUCH

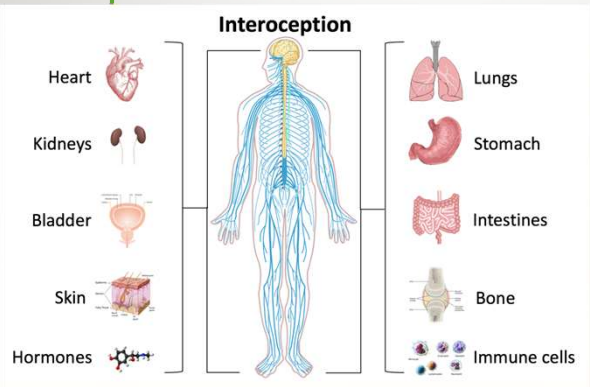
LOOK

LISTEN

Based on the Alert Program for Self-Regulation. *"How Does Your Engine Run?"*

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Interoception
= awareness of internal sensations



Three Dimensions of Interoception:

1. **Interoceptive accuracy** - performance
2. **Interoceptive sensibility** - self-report
3. **Interoceptive awareness** - metacognitive

Garfinkel et al., 2015

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Interoception and ADHD

- Interoception is reduced in individuals with ADHD **(systematic review, Burton et al, 2025).**
- Children with ADHD may experience **interoception accuracy and awareness difficulties** such as:
  - Poor accuracy – have trouble recognizing when they are hungry, thirsty, tired, bathroom break, or need a break
  - leads to challenges in managing their emotions and bodily needs.

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Self-Regulation Programs for Children with ADHD

(Prosperi, 2025)

Evidence of self-regulation programs for ADHD

Best Evidence identified for children with ADHD:

Better home-based outcomes, parent engagement and scaffolding	Alert Program® for Self Regulation	The Incredible Years®

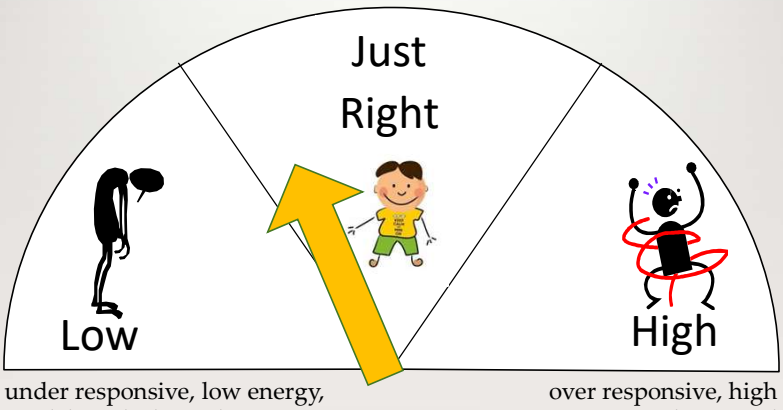
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Alert Program for Self-Regulation®

(Williams & Shellenberger, 1996, 2025)

BC Children's Hospital

"How Does Your Engine Run?"



under responsive, low energy, tired, bored, sluggish

over responsive, high energy, excited, stressed

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Co-Regulation

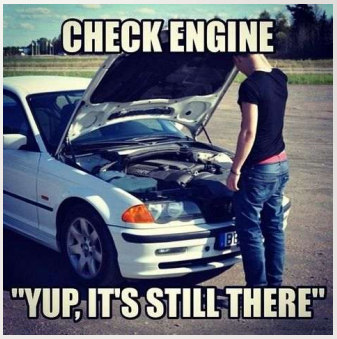


- "Back and forth exchanges with each person adjusting their response based on the response of the other"
- Parent engagement and scaffolding
- Parent Modeling
- Body Doubling

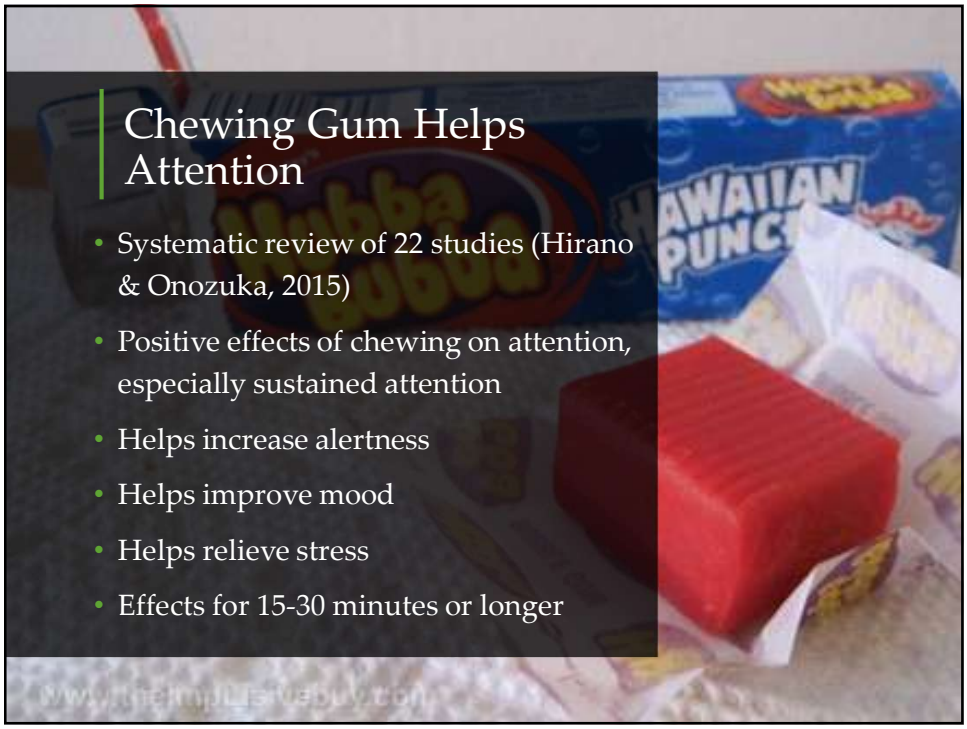
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Self-Regulation Process

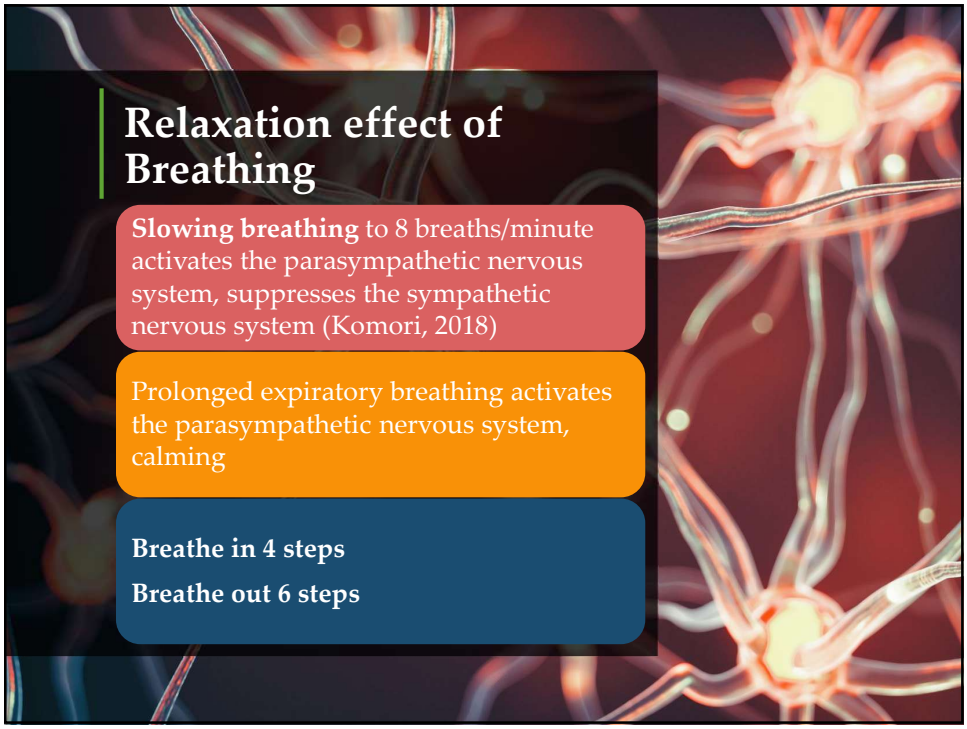
1. **Check Engines (interoception)**
2. **Recognize that Engine not Just Right**
3. **Determine Right tools** to get to "Just Right" for the situation
4. **Choose and Use to Regulate**
5. **Re-Check Engines**



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Chewing Gum Helps Attention
• Systematic review of 22 studies (Hirano & Onozuka, 2015)
• Positive effects of chewing on attention, especially sustained attention
• Helps increase alertness
• Helps improve mood
• Helps relieve stress
• Effects for 15-30 minutes or longer

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Relaxation effect of Breathing
Slowing breathing to 8 breaths/minute activates the parasympathetic nervous system, suppresses the sympathetic nervous system (Komori, 2018)
Prolonged expiratory breathing activates the parasympathetic nervous system, calming
Breathe in 4 steps
Breathe out 6 steps

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Movement Tools

- Dynamic Seating (Disc O Sit, Movin' Sit, ¼ inflate a beach ball, therapy ball, Kore stool)
- Movement Breaks
- Classroom Helper Jobs
- Hallway Wall activities
- Heavy Work
- Theraband across chair legs
- STAND UP



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Physical Activity Evidence

Physical activity before school, 30 minutes	Parent and teacher reports improved ADHD symptoms, moodiness, and peer functioning	Easily accessible, low risk, low cost, and has potential health benefits
Regular exercise increases dopamine, serotonin, and norepinephrine	Moderate to vigorous intensity	Chronic moderate exercise can enhance brain plasticity.

Hoza et al., 2014; Lin & Kuo, 2013

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Heavy Work



- Walk or Run
- Climbing, Hiking, Biking
- Sports
- **Heavy work = Push, Pull, Lift, Carry**
- **longer lasting effect with dopamine, norepinephrine, and serotonin**

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Touch Tools

- Deep Pressure tools: Hugs, Massage, Leaning, Blankets
- Warm, Cold
- Something in your hands, Fidget tools
- Lap weights – Manimos, Hugimals, weighted blanket





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Fidgets





Tangles



Needs to be small, quiet, and have a moving part.

ARE THEY TOYS OR TOOLS?

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More Fidget Tools



Fidget Newton

Calm Strips





Speks



Lifelines Grounding Stones

- Needoh Cubes, Slime
- Doodling, Colouring
- Fidget Cubes, Infinity Cubes, Rubiks cubes
- Picking and tearing at objects
- Fidget rings, Spin rings, bracelets



Stimagz

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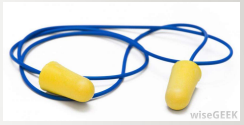
Eye Tools

- Lamps
- Blinds
- Hoodies and Hats
- Sunglasses
- Reduce visual
- Close eyes
- Leave room
- Sensory Safe space



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Ear Tools



- Music
- Silence - Ear plugs, noise cancelling
- Leave room, quiet space
- White noise, radio, fan, waves, wind



Noise filtering:


Loop


Flare Calmer


Vibes


Hoodies

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Natural boosters

Physical activity	Hugs, physical connection	Social Connection
Laughter	Breathing	Getting enough sleep
Eating enough protein and food	Listening to music or doing something that brings you joy	Spending time Outdoors

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Key Points



- Co-Regulation is key
- Biological Domain is the Foundation of Self-Regulation
- Sensory Motor Tools are just "things", until they are embedded into routines
- Engine Speeds Analogy for Internal Awareness
- Biological Self-Regulation is a process of Interoception and Mindful awareness
- Mouth, Move, Touch, Look, Listen, and Interoception together

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