MindFulChoice Institute℠
Destination-Awareness-Choice

STRESS

WHAT DOES THIS WORD MEAN TO YOU?

Dr. Robert W. Lebovits, PhD Dr. Gerard S. Meyer, PhD

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Objectives

- Understand how stress affects the body and how those processes work
- Understand why stress is detrimental to the body & mind in our everyday lives
- How to combat stress

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Stress: The Breakdown

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What is Stress?

- **Stress is not a sickness**, while anxiety and depression are pathological
- **Signs of stress occur when** the stressor is present
  - The farther the person is from the stressor, the better one will feel
  - For example is work is a stressor, when one goes on vacation they will be far away from the stressor thus feeling more at ease.
- **Anxiety**
  - The symptoms of stress occur when the stressor is nowhere near the person.
  - The person has internalized the stress.
- **Depression**
  - Incapable to take action, everything seems difficult and insurmountable, a feeling of acute, tense, frustration, sadness and discouragement.

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Stress: The Break Down

- As much the stressed or anxious persons are still in action and capable of efforts to adapt, as much the depressed person renounce all efforts to fight and to think that any attempt to regain some control over the environment is unnecessary. (53)

- These can succeed one another. Stress may result in anxiety which may result in depression.

- Seyle General Syndrome of Adaption
  - After exposure to an acute stressor, the human organism first receive the blow, the time to mobilize resources (alarm phase), then enter in a phase of resistance where all the physiological reactions are turned against the aggression, to then later drawn in power shortage when the energetic reserves are exhausted. (53)

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Stress: The Break Down

Biological & Physiological Processes

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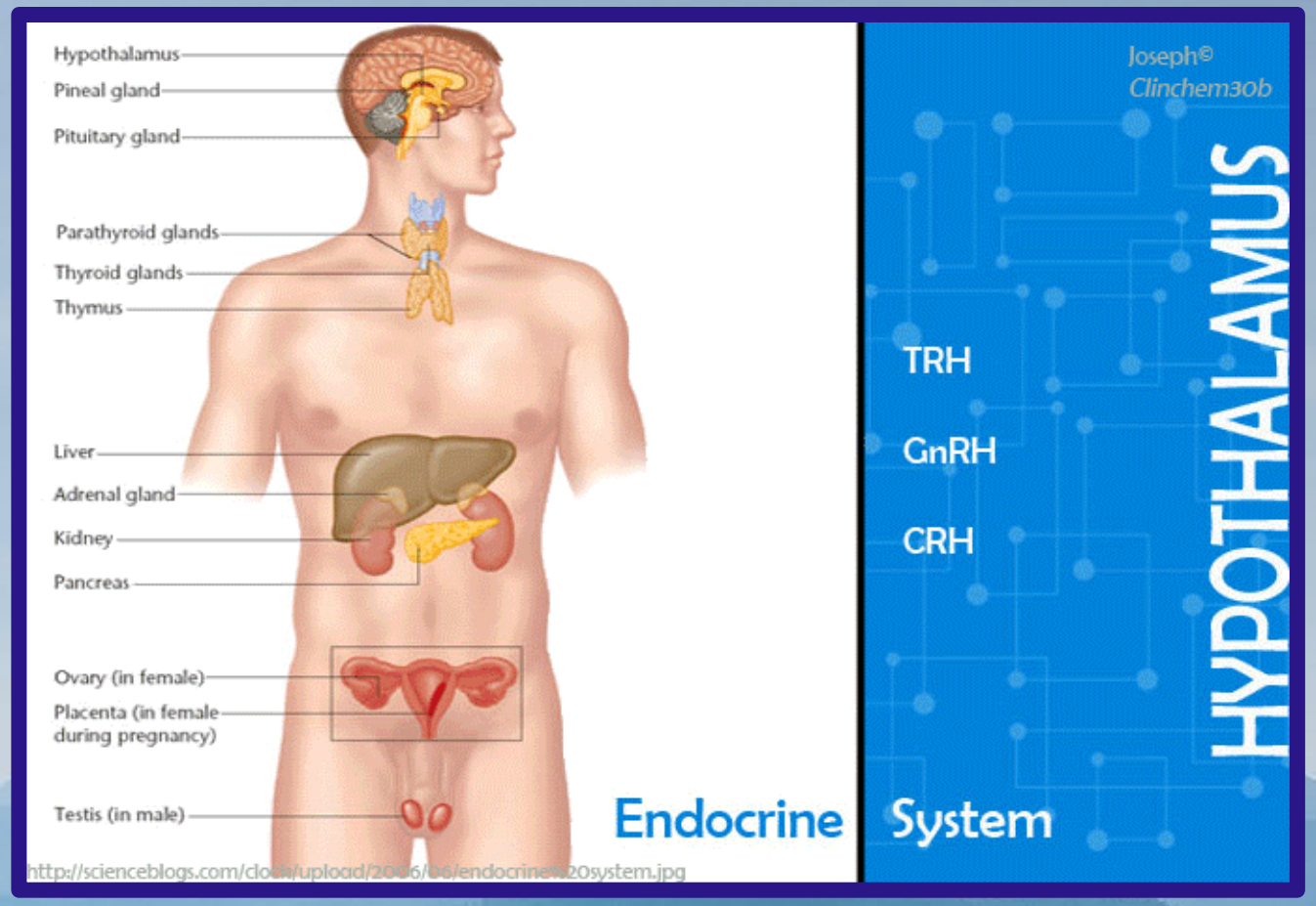
Endocrine System



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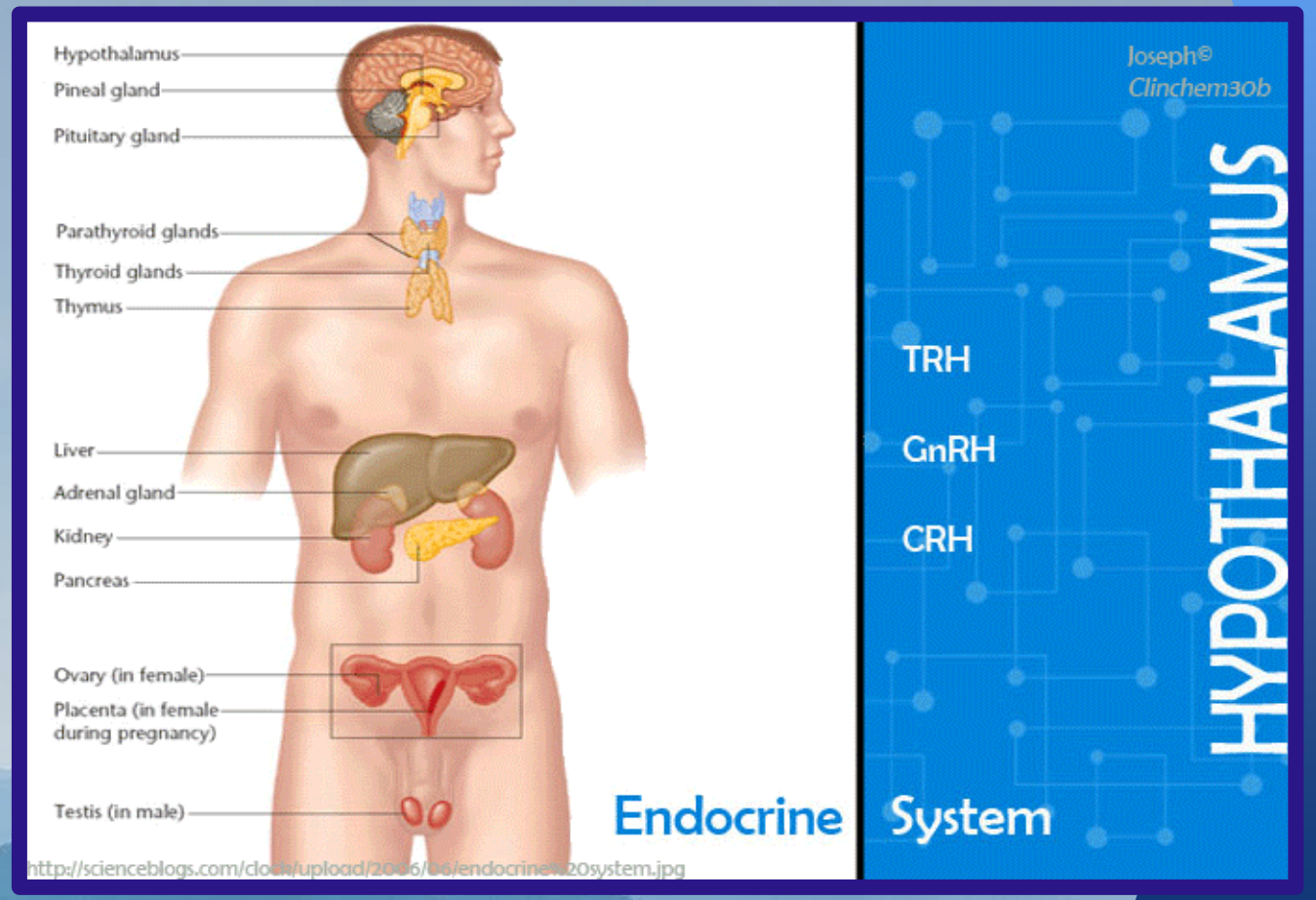
What is the endocrine system?

A collection of glands that produce and secrete hormones

Hypothalamus, pineal gland, pituitary (anterior and posterior) gland, thyroid gland, thymus, liver, adrenal gland, kidney, pancreas, ovary, and testes



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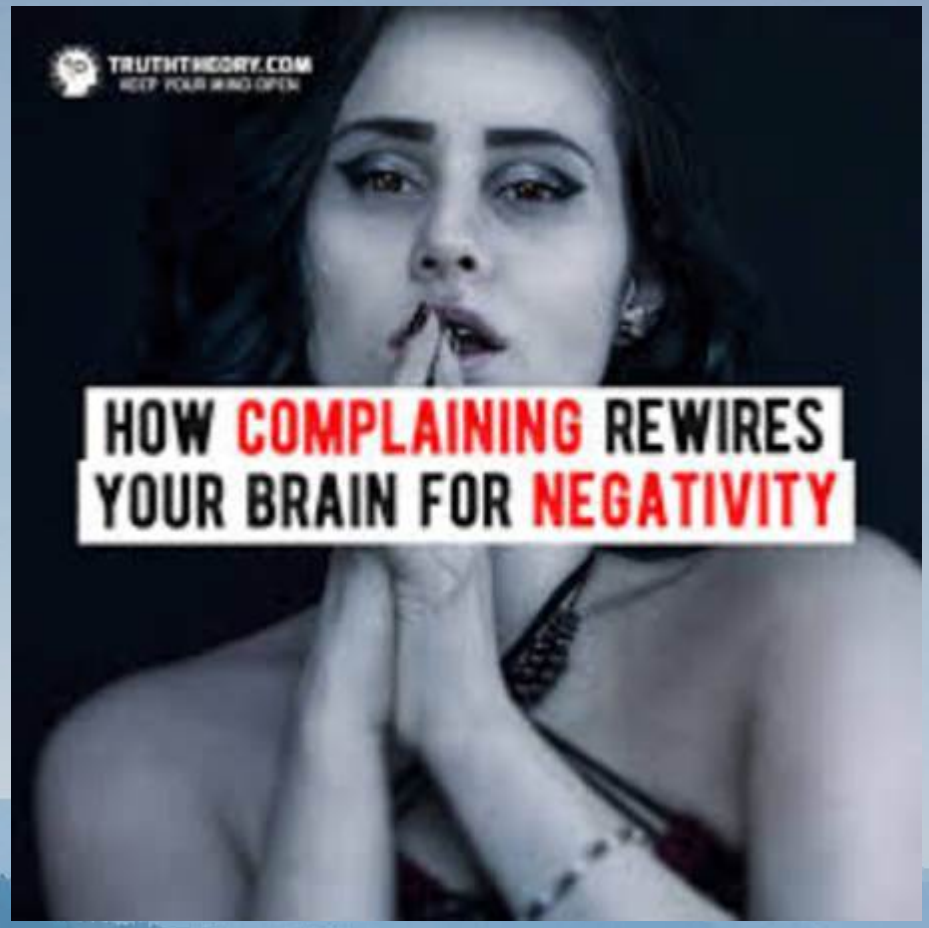
Hormones Response First, Then YOUR Emotions



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Hormones

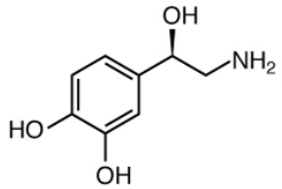
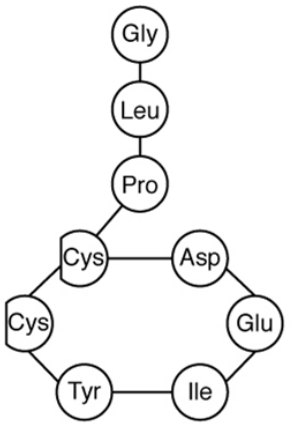
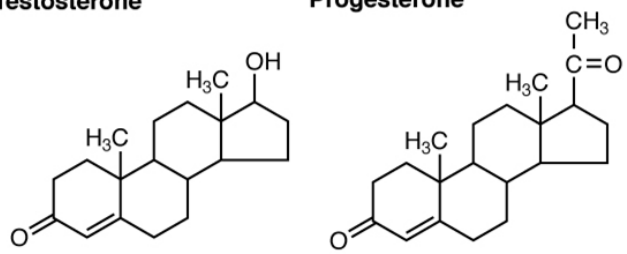
Most animal hormones belong to one of three chemical families

1. Steroids
2. Peptides and polypeptides
3. Amino acid derivatives

Differs in structure and lipid solubility

Coordinate the activities of cells during three situations

1. Development, reproduction, growth
2. Environmental Changes
3. Homeostasis

Hormone Class	Components	Example(s)
Amine Hormone	Amino acids with modified groups (e.g. norepinephrine's carboxyl group is replaced with a benzene ring)	**Norepinephrine** 
Peptide Hormone	Short chains of linked amino acids	**Oxytocin** 
Steroid Hormones	Derived from the lipid cholesterol	**Testosterone** **Progesterone** 

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Pathways for Hormones

Endocrine	Neuroendocrine	Endocrine-Neuroendocrine
• Signals carried to distant cells by blood and/or body fluids • Glands specifically generate cells that produce endocrine signals • Endocrine glands include: the pancreas, pituitary glands, ovaries, testes, thyroid gland, and adrenal gland • Regulated by negative feedback	• Neuroendocrine signals are also known as neurohormones • Act on distant cells similar to endocrine cells • Stimulus effects and sensor cells which results in a neural signal being sent to the central nervous system. • A neurohormone is released and sent to an effector cell for a response	• A stimulus first acts upon a sensor cell and goes through the steps of the neuroendocrine pathway but rather than the neurohormone affecting the effector cell, it goes to an endocrine cell to complete the endocrine pathway

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Pathways for Hormones

Endocrine

- Signals carried to distant cells by blood and/or body fluids
- Glands specifically generate cells that produce endocrine signals
- Endocrine glands include: the pancreas, pituitary glands, ovaries, testes, thyroid gland, and adrenal gland
- Regulated by negative feedback

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Pathways for Hormones

Neuroendocrine

- Neuroendocrine signals are also known as neurohormones
- Act on distant cells similar to endocrine cells
- Stimulus effects and sensor cells which results in a neural signal being sent to the central nervous system.
- A neurohormone is released and sent to an effector cell for a response

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Pathways for Hormones

Endocrine-Neuroendocrine

- A stimulus first acts upon a sensor cell and goes through the steps of the neuroendocrine pathway but rather than the neurohormone affecting the effector cell, it goes to an endocrine cell to complete the endocrine pathway

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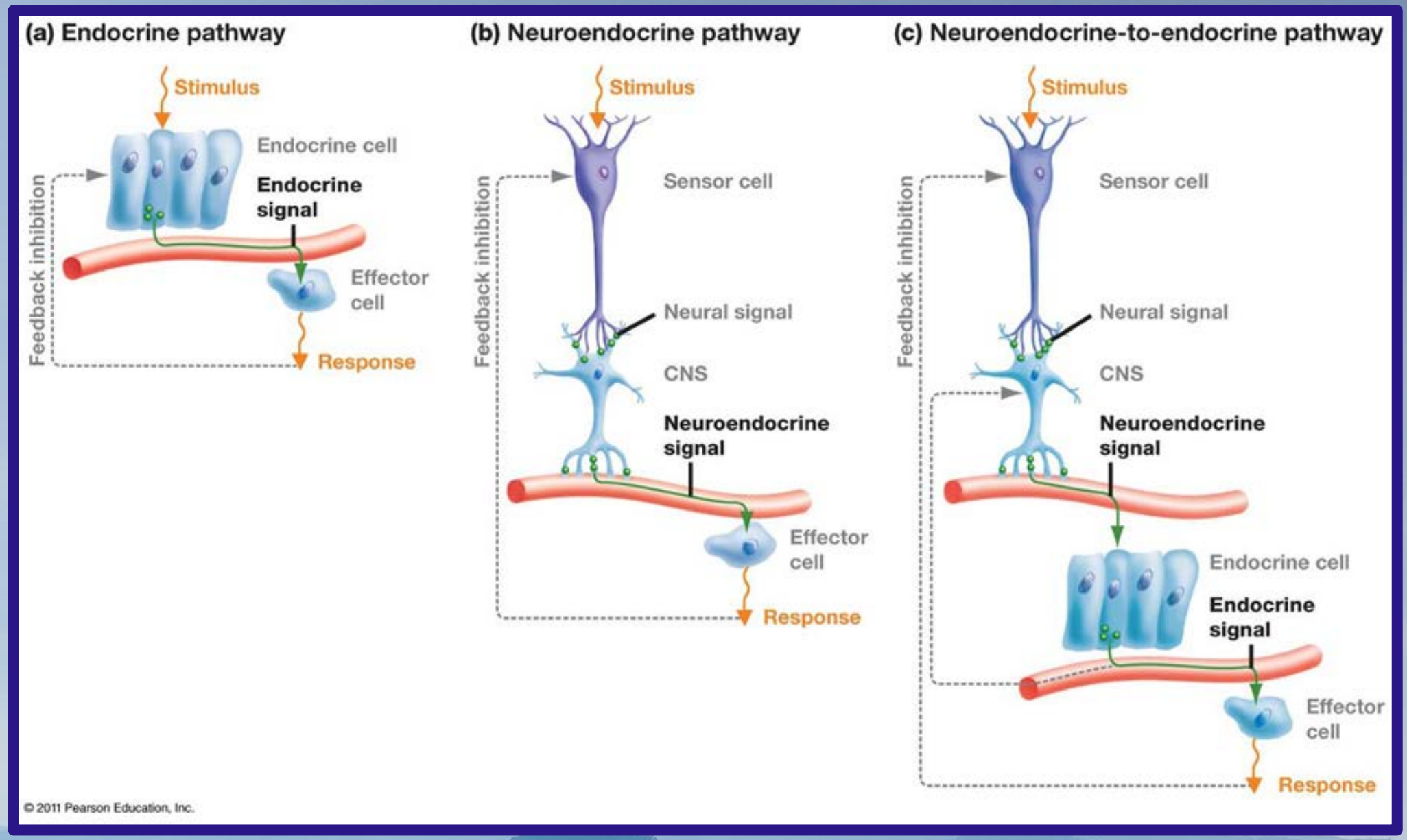
(a) Endocrine pathway
Stimulus
Endocrine cell
Endocrine signal
Effector cell
Response
Feedback inhibition
(b) Neuroendocrine pathway
Stimulus
Sensor cell
Neural signal
CNS
Neuroendocrine signal
Effector cell
Response
Feedback inhibition
(c) Neuroendocrine-to-endocrine pathway
Stimulus
Sensor cell
Neural signal
CNS
Neuroendocrine signal
Endocrine cell
Endocrine signal
Effector cell
Response
Feedback inhibition
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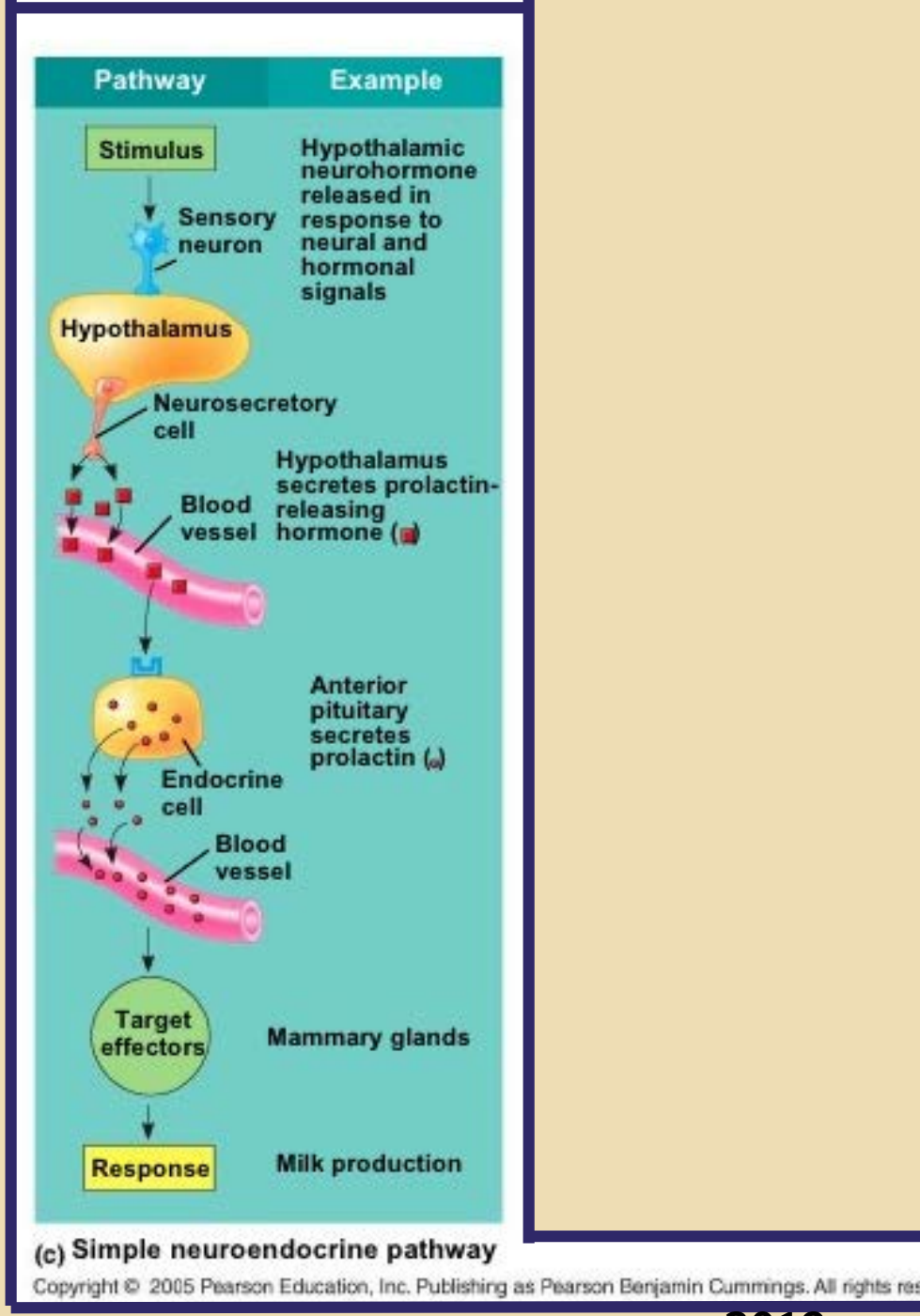
Pathways for Hormones

Neuroendocrine Pathway



(c) Simple neuroendocrine pathway

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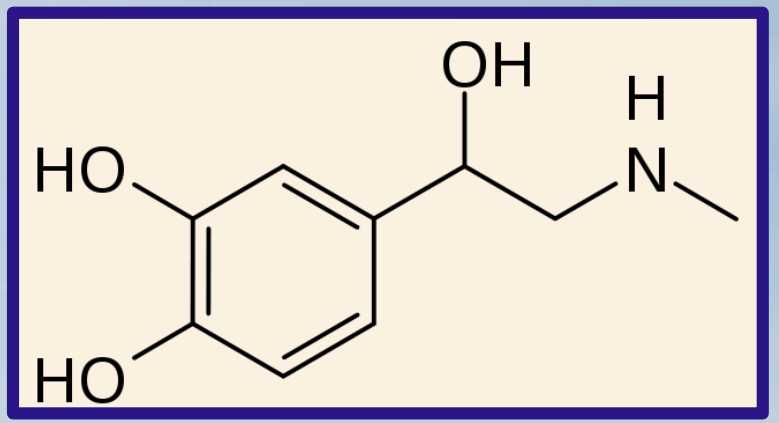
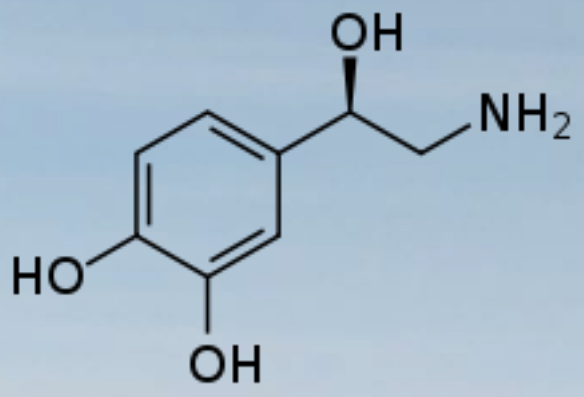
Hormones you'll hear a lot about today...

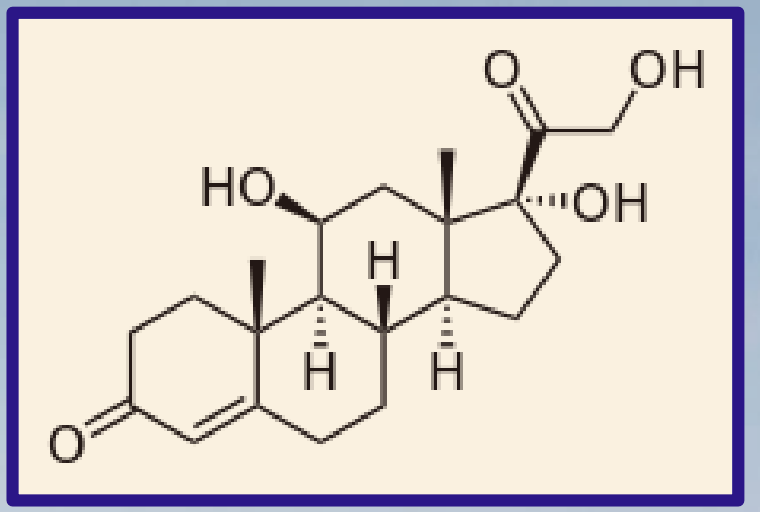
Epinephrine



Norepinephrine



Cortisol



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Comparing the hormones ....

Epinephrine	Norepinephrine	Cortisol
• More commonly known as ”Adrenaline” • Produced by the adrenal medulla • Hormone and neurotransmitter • Strong emotions such as fear or anger cause it to release • Responsible for increased heart rate, blood pressure, glucose levels, muscle strength and metabolism • Relaxes smooth muscles in airways • Responsible for the “heart thumping” and “shakes you feel during a freeze-fight-or-flight situation	• Also known as noradrenaline • Produced in adrenal cortex • Hormone and neurotransmitter • Vasoconstrictor • Helps shift blood flow to places it is needed like the brain rather than the limbs	• Steroid Hormone • Normally fluctuate throughout the day in pace with one’s circadian rhythm • Essential to maintaining homeostasis • Regulates blood sugar, immune responses, anti-inflammatory actions, and central nervous system activation • Too much can be bad but so can too little

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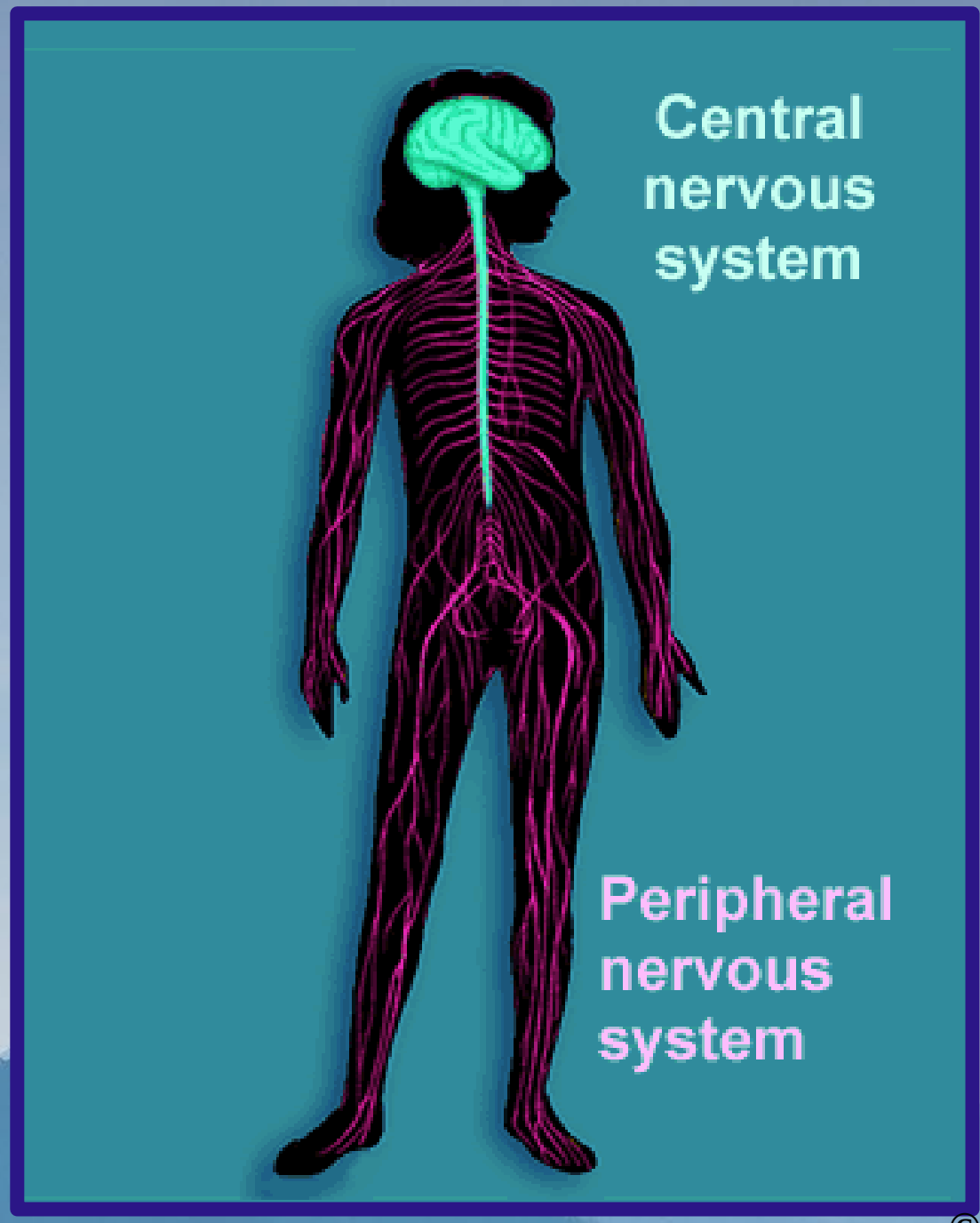
Sympathetic Nervous System



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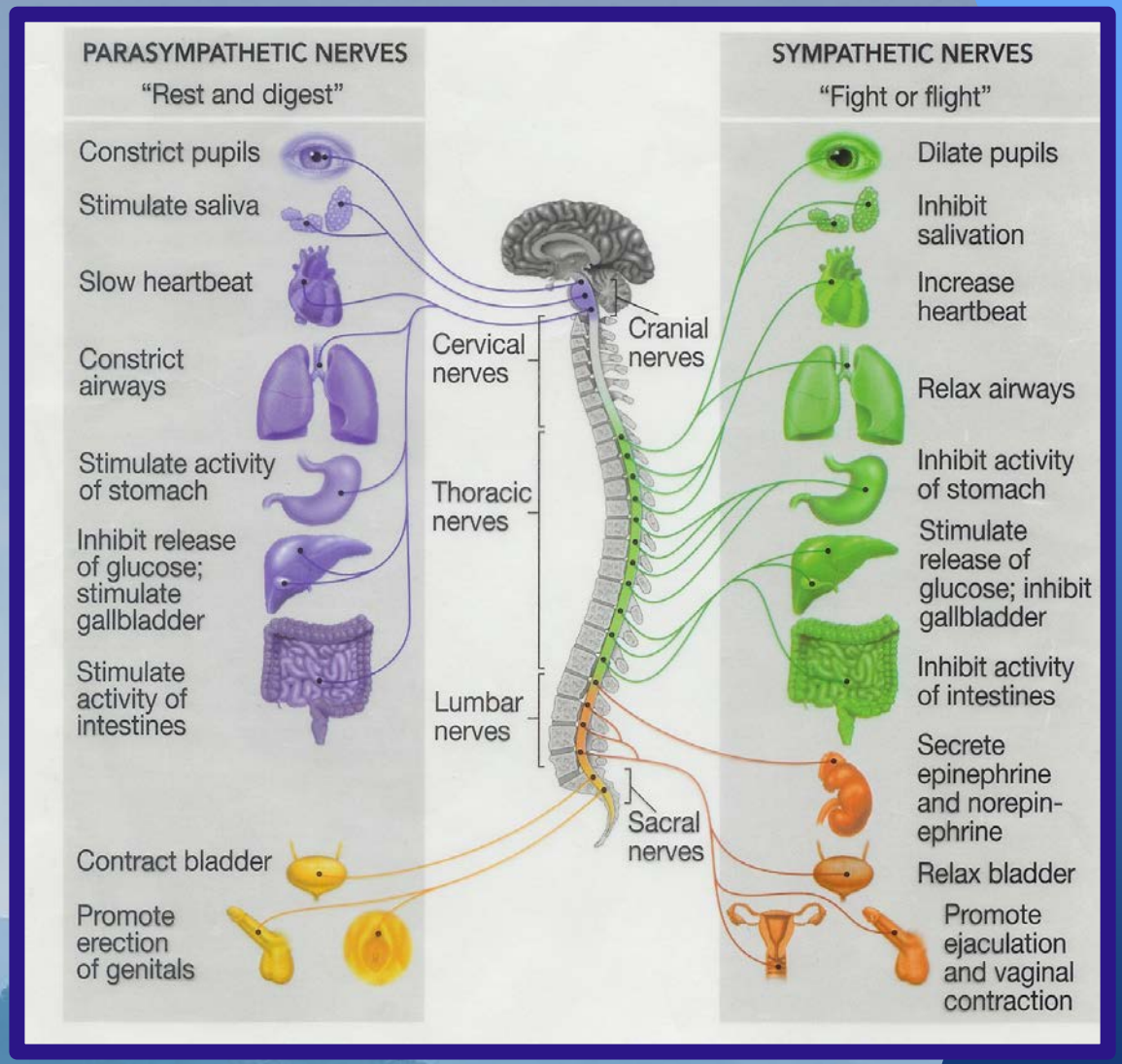
What is the Sympathetic Nervous System?

A part of the autonomic nervous system, controls internal processes such as digestion and heart rate, which is a part of the efferent division, carries commands from the CNS to the body, of the central nervous system.

Nerves in the SNS prepare organs for “fight or flight” situations. They speed up heart rate, stimulate release of glucose from liver, and inhibit actions of the digestive organs.



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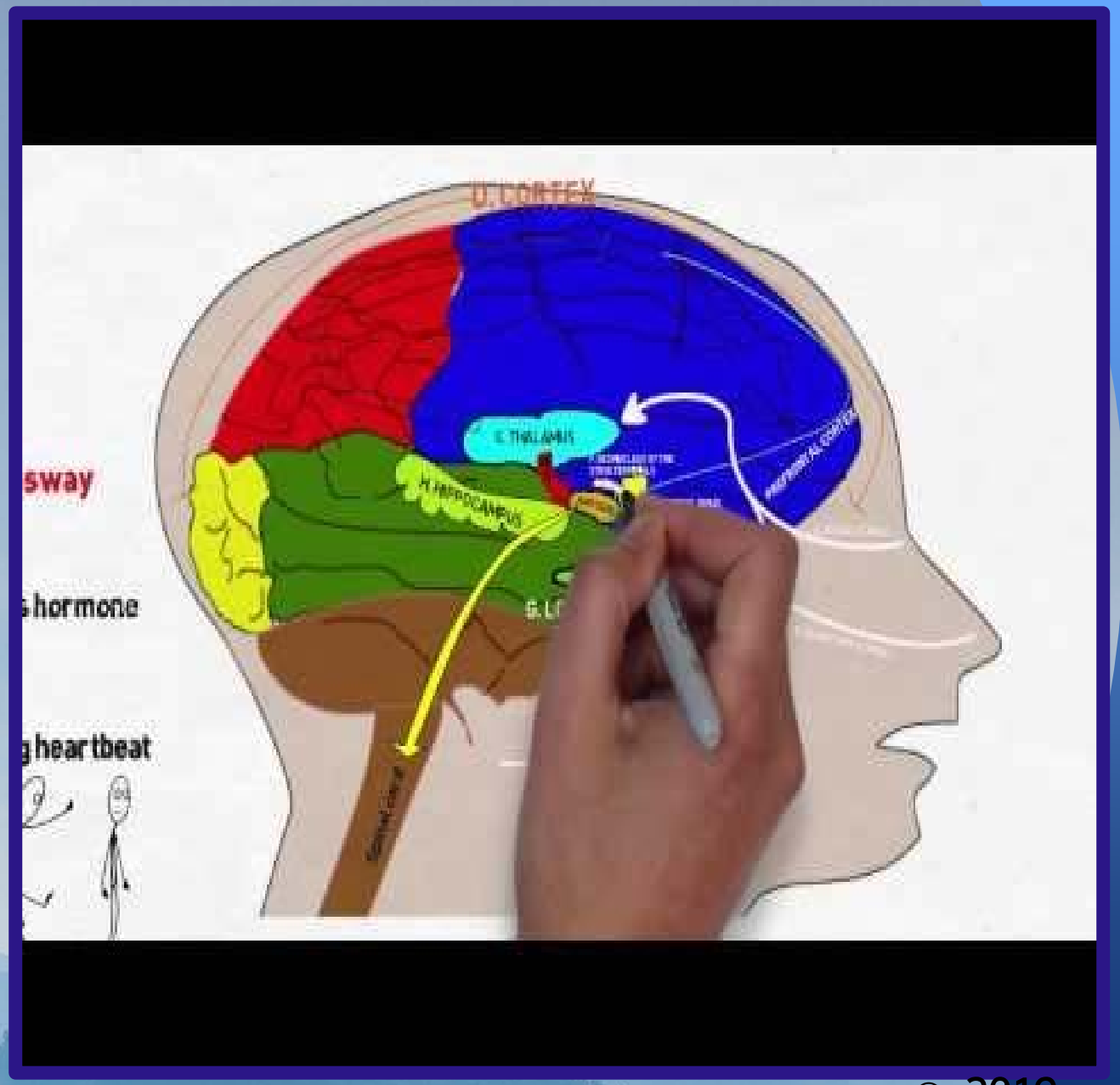
Your brain on anxiety and stress

Thalamus - Process incoming stimuli
Prefrontal Cortex - Makes sense of the stimuli
Hippocampus - Memory center
Amygdala - Fear and emotion
Brain Stem - Pathway to the SNS



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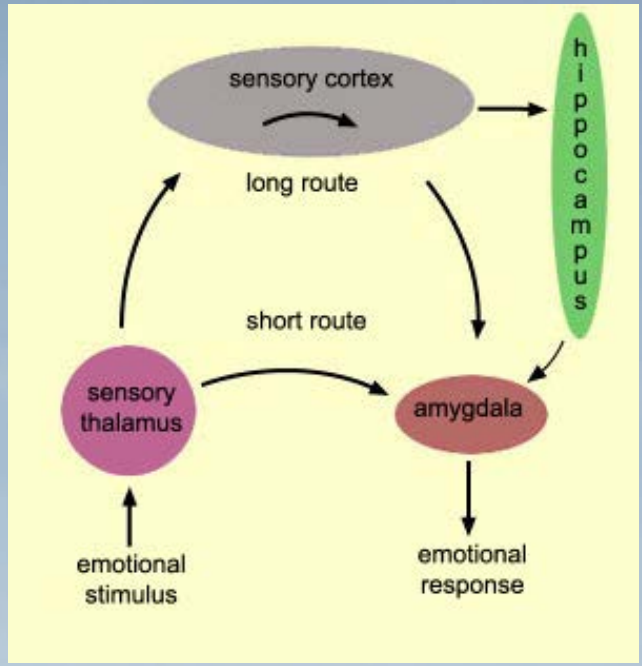
Two pathways of fear:

- Emotional stimulus (auditory or visual) is first processed by the sensory thalamus and determined if it is important enough to continue past that point
- Short Route
  - Stimulus goes right from the thalamus to the amygdala triggering a fear response before the brain can even process what is happening
- Long Route
  - Stimulus continues to the sensory cortex to process what exactly the stimulus is. Occasionally the stimulus will pass through the hippocampus if a memory is triggered



All of this occurs BEFORE you are consciously aware of it

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Short-Term Stress

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What is Short-Term Stress?

- Acute stress
- Comes from stressors from current past and anticipated stressors of the near future
- Can be positive in small doses

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Symptoms

- Emotional Distress
- Muscular Problems
- Digestion Issues
- Transient Arousal

  Increased heart rate and blood pressure, dizziness, migraines, cold hands and feet, shortness of breath and chest pain

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Fight-or-Flight-or-Freeze

https://www.youtube.com/watch?v=jEHwB1PG_-Q

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All mammals have only three innate response mode to alarming events:

But only humans can chose an alternative to not act that way!

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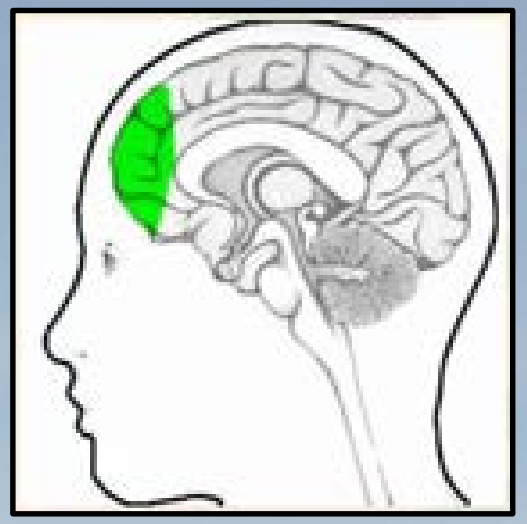
Fight - Flight - Freeze

- Primacy of frontal lobe cortex function over forebrain, impulse-driven reactivity.
- Animals are constrained by “fight or flight”
- Humans posses “new brain”, cortical reasoning to guide emotions.



Reason Vs. Emotion

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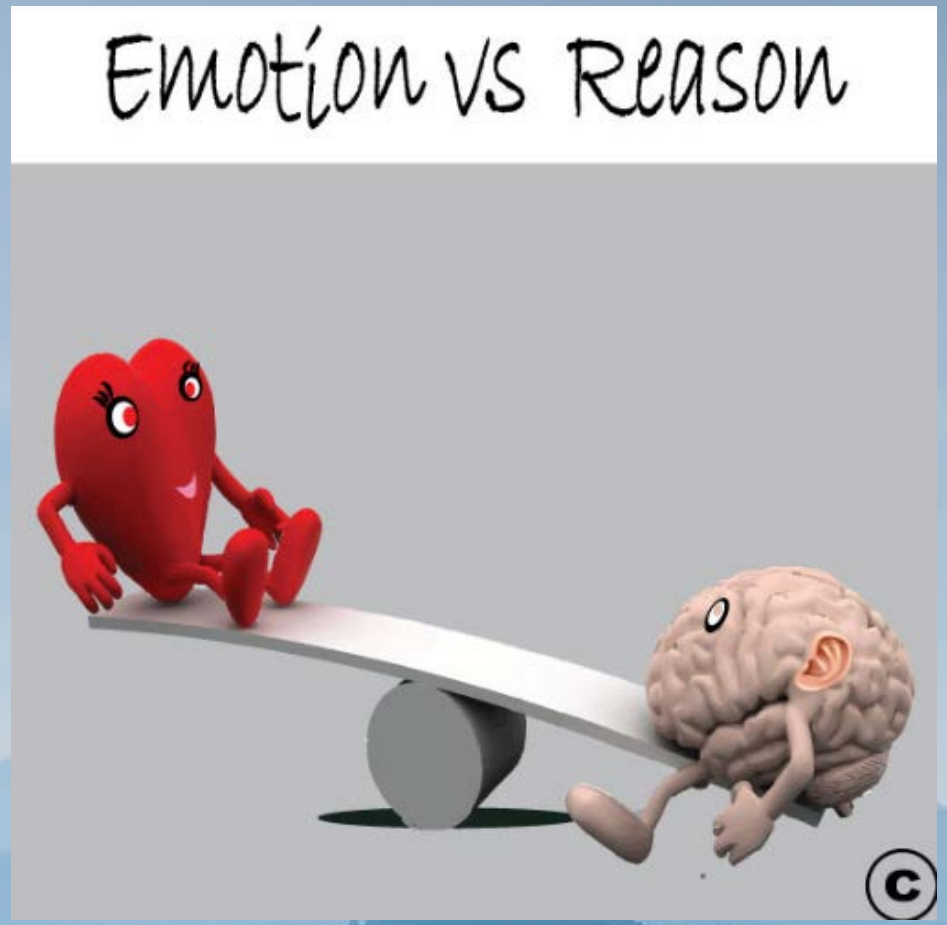
MFC is teaching to follow the reason rather than emotional impulses:



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What happens during fight or flight?

Brain sees fear and reacts to it

- SNS is triggered by the hypothalamus and pituitary glands
- Sympathetic nerves stimulate the adrenal gland to release epinephrine (adrenaline) and norepinephrine
  - Free fatty acids, glucose in blood, pulse, blood pressure and oxygen consumption are increased
  - Pupils dilate
- Blood is redirected from skin and digestive system towards the heart, brain, and muscles.
- Epinephrine relaxes smooth muscle (vasodilation) in blood vessels increasing blood delivery

Also vasoconstricts minor blood vessels

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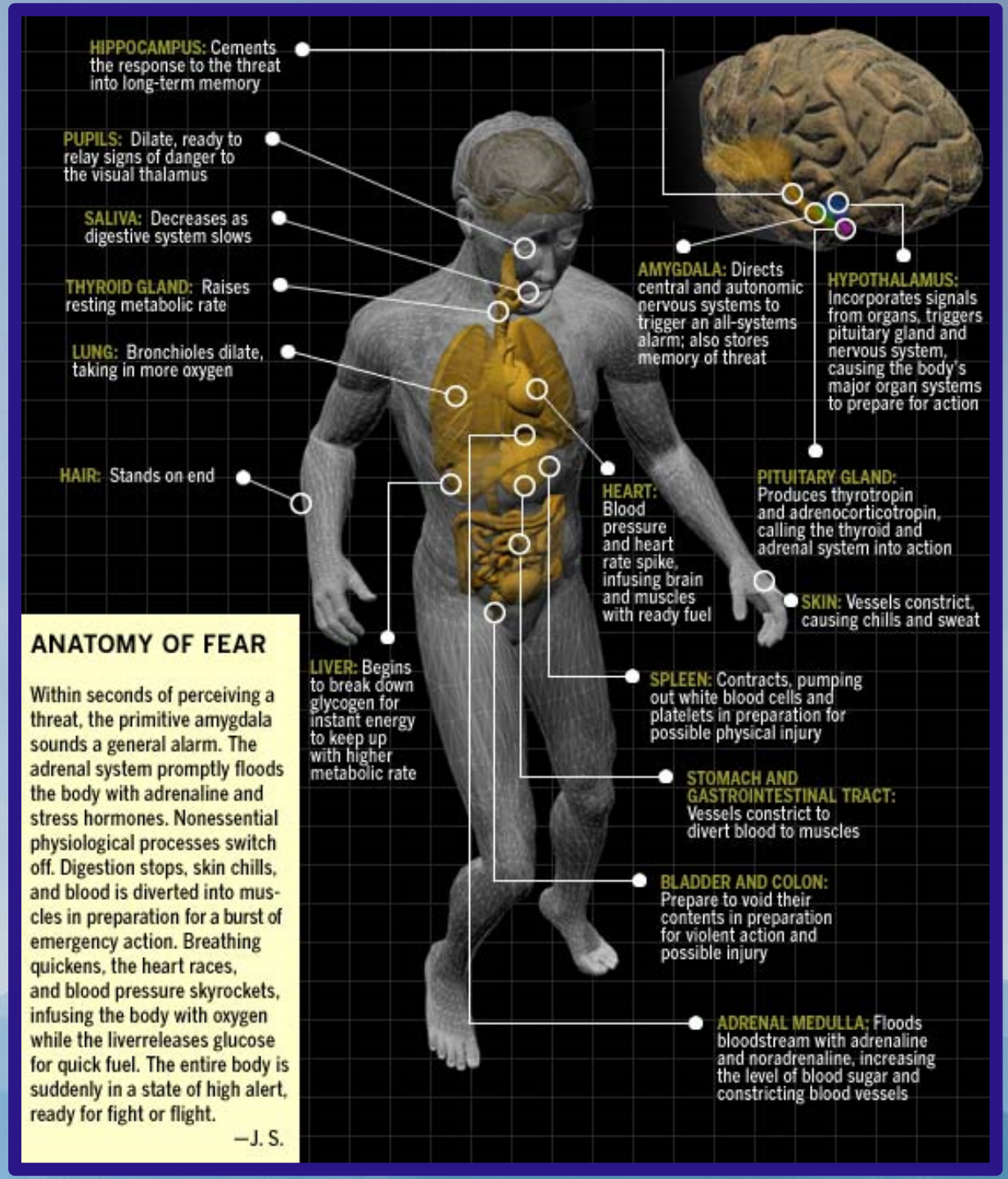
HIPPOCAMPUS: Cements the response to the threat into long-term memory
PUPILS: Dilate, ready to relay signs of danger to the visual thalamus
SALIVA: Decreases as digestive system slows
THYROID GLAND: Raises resting metabolic rate
LUNG: Bronchioles dilate, taking in more oxygen
HAIR: Stands on end
AMYGDALA: Directs central and autonomic nervous systems to trigger an all-systems alarm; also stores memory of threat
HYPOTHALAMUS: Incorporates signals from organs, triggers pituitary gland and nervous system, causing the body's major organ systems to prepare for action
PITUITARY GLAND: Produces thyrotropin and adrenocorticotropin, calling the thyroid and adrenal system into action
HEART: Blood pressure and heart rate spike, infusing brain and muscles with ready fuel
SKIN: Vessels constrict, causing chills and sweat
LIVER: Begins to break down glycogen for instant energy to keep up with higher metabolic rate
SPLEEN: Contracts, pumping out white blood cells and platelets in preparation for possible physical injury
STOMACH AND GASTROINTESTINAL TRACT: Vessels constrict to divert blood to muscles
BLADDER AND COLON: Prepare to void their contents in preparation for violent action and possible injury
ADRENAL MEDULLA: Floods bloodstream with adrenaline and noradrenaline, increasing the level of blood sugar and constricting blood vessels
ANATOMY OF FEAR
Within seconds of perceiving a threat, the primitive amygdala sounds a general alarm. The adrenal system promptly floods the body with adrenaline and stress hormones. Nonessential physiological processes switch off. Digestion stops, skin chills, and blood is diverted into muscles in preparation for a burst of emergency action. Breathing quickens, the heart races, and blood pressure skyrockets, infusing the body with oxygen while the liverreleases glucose for quick fuel. The entire body is suddenly in a state of high alert, ready for fight or flight.
—J. S.

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Problems with fight or flight

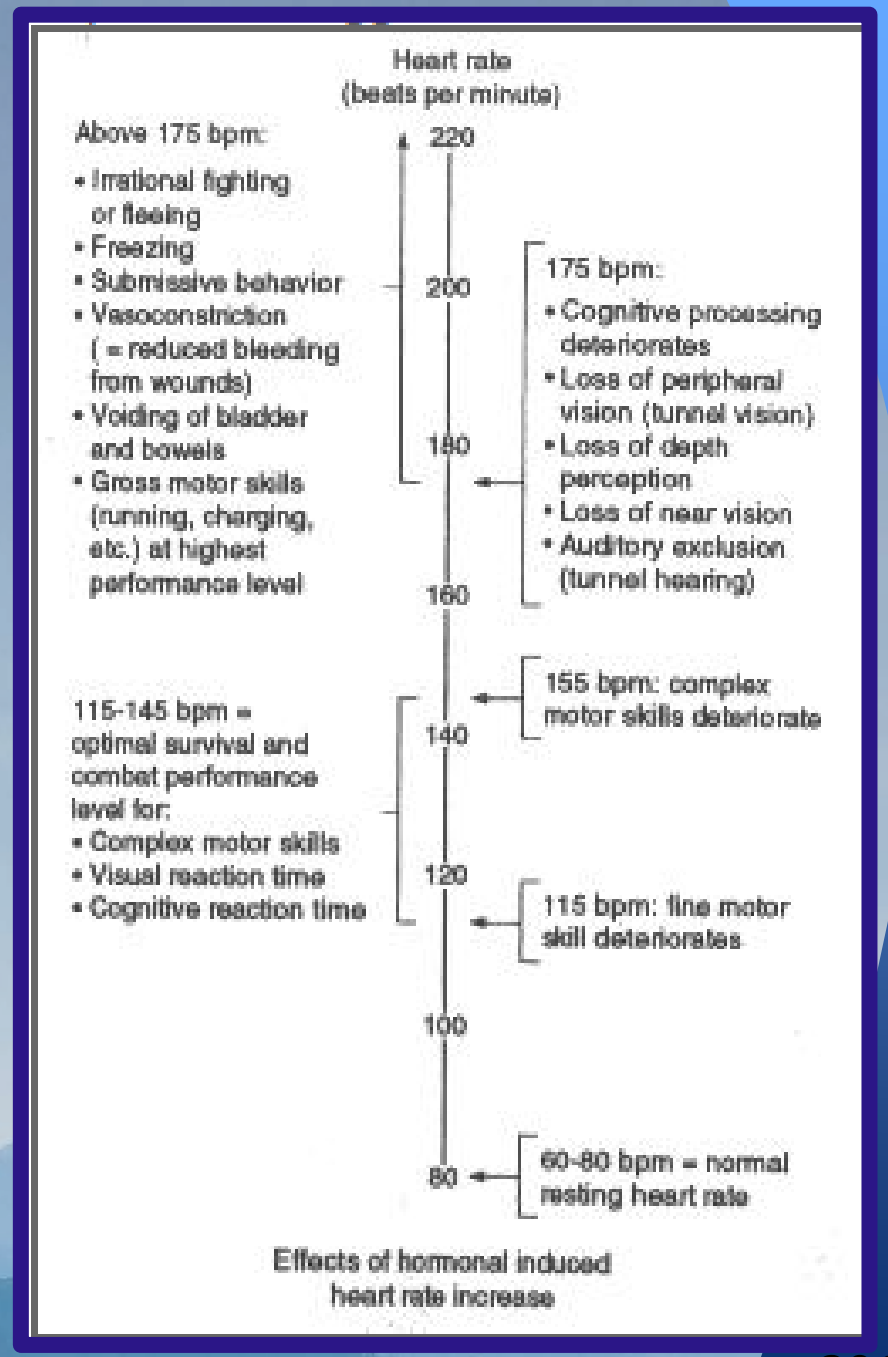
SNS activation can increase heart rate from 70 BPM to 200 BPM

Will stay at this rate until threat is no longer apparent

Why is this a problem?

Above 175 BPM your frontal lobe is no longer working

Midbrain takes over which is responsible for FFFM



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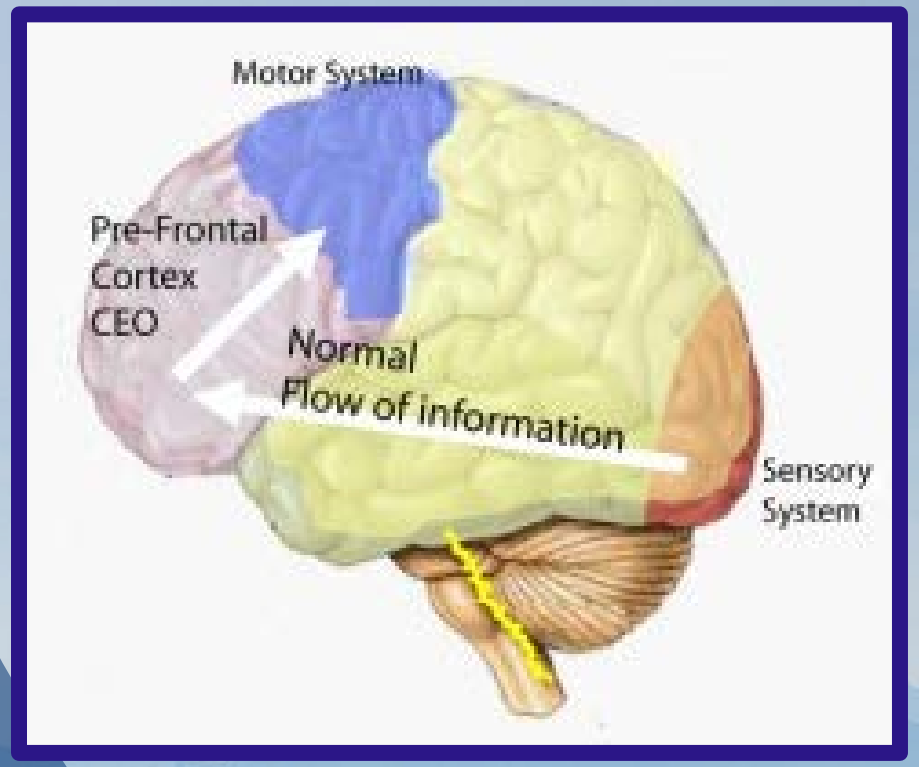
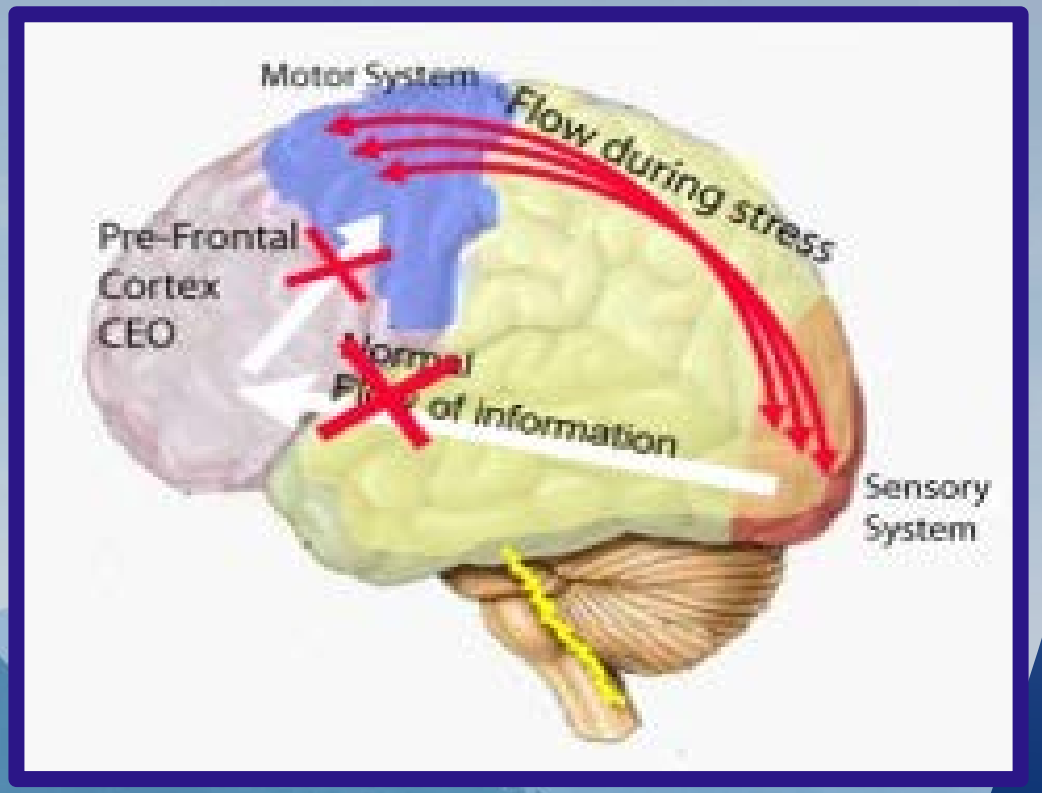
Blood Flow to the Brain

Normal Blood Flow



Blood Flow Under Stress



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Brain Blood Flow: What this Means

When under normal conditions the brain's blood goes from the sensory system to the frontal cortex to the motor system: The brain senses something and sends it to the frontal cortex (the information processing center that is responsible for decision-making and forethought) so that a person can analyze a situation and decide what to do

When under stress the brain's blood goes from the sensory system directly to the motor system and blood flow to the frontal cortex is limited.

Why?

survival mode: if a car is swerving toward you, you do not have time to analyze a situation, you only have time to move out of the way

the brain is trying to shove its resources to only most primal functions for survival

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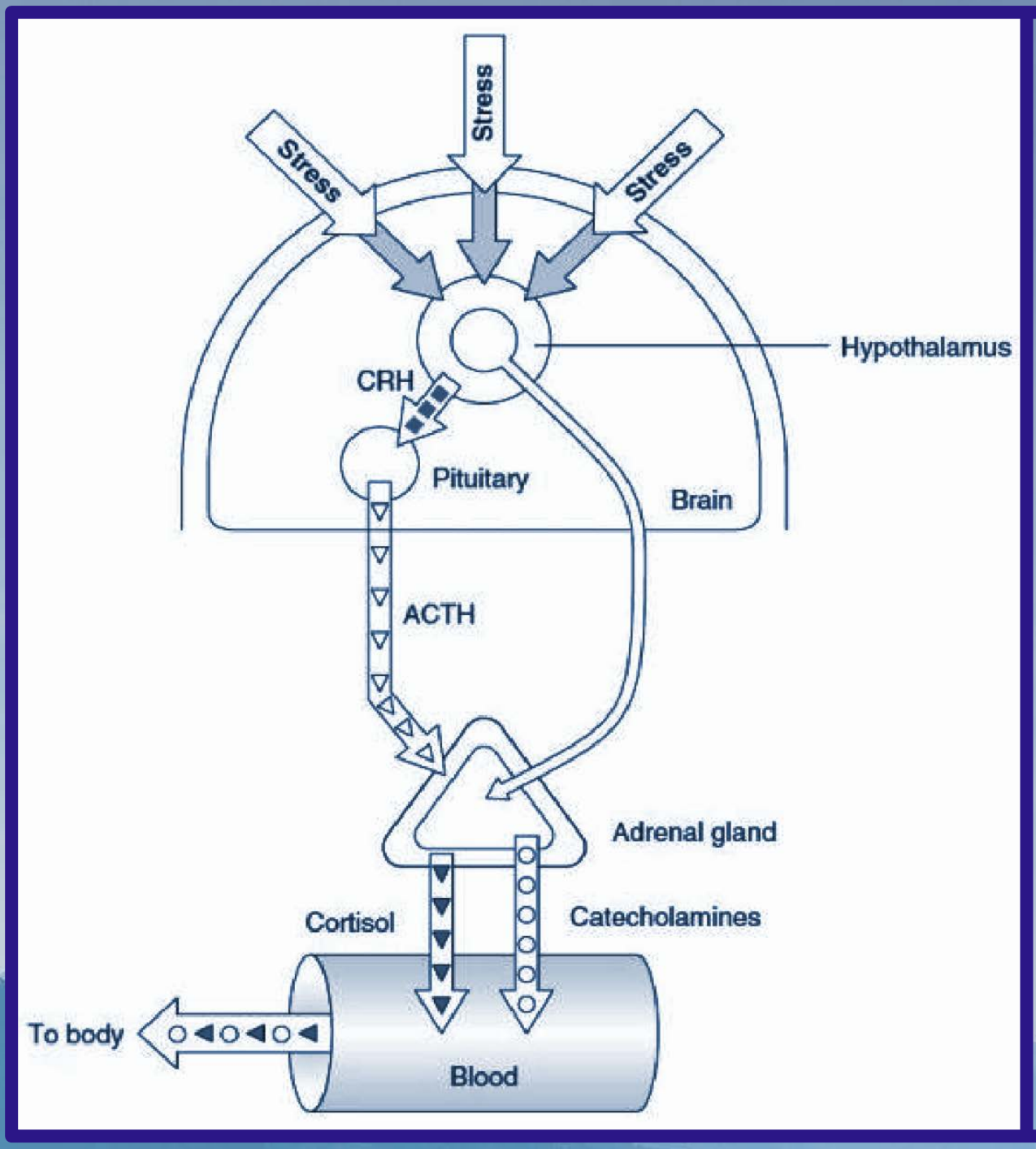
Long-term Stress



What is long-term stress?

Chronic Stress

Unrelenting stressors with little to no way out of the situation

Can stem from traumatic experiences

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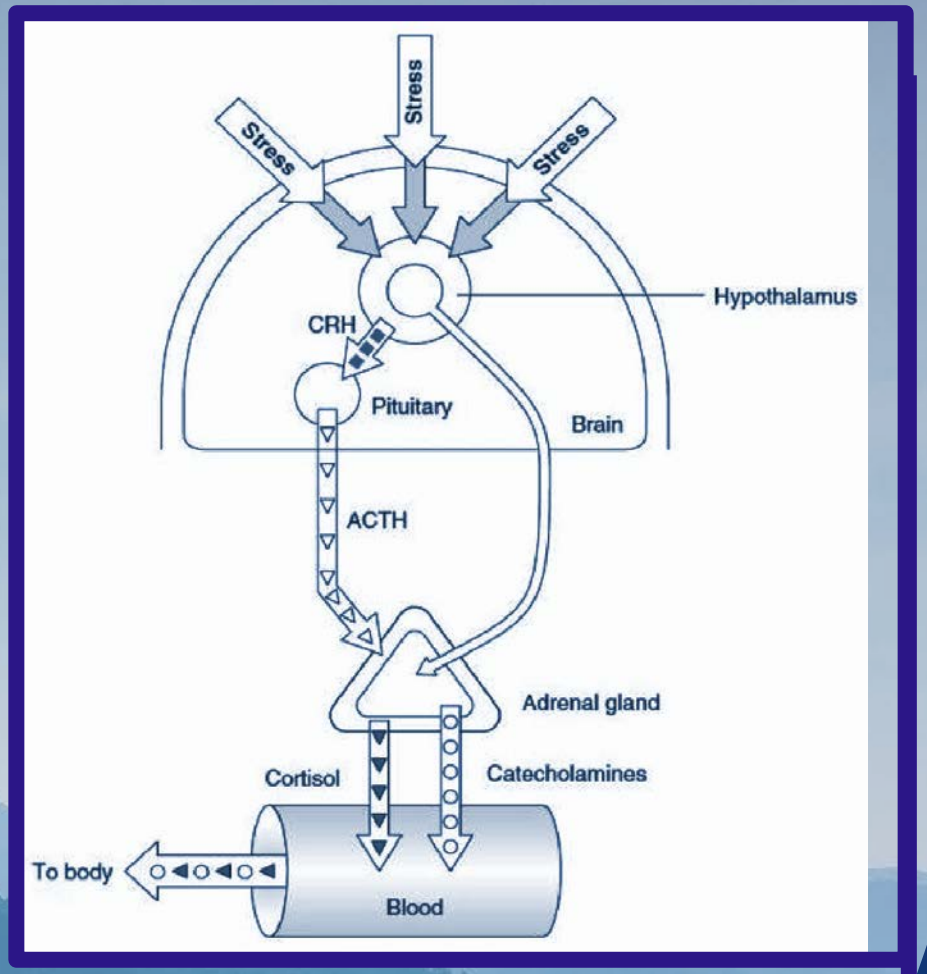
What is the HPA Axis and Why is it Important?

Hypothalamic-Pituitary-Adrenal Axis

Set of direct influences and feedback interactions between three different glands in which the ultimate goal is the stimulate the adrenal gland to release cortisol

Chain Reaction



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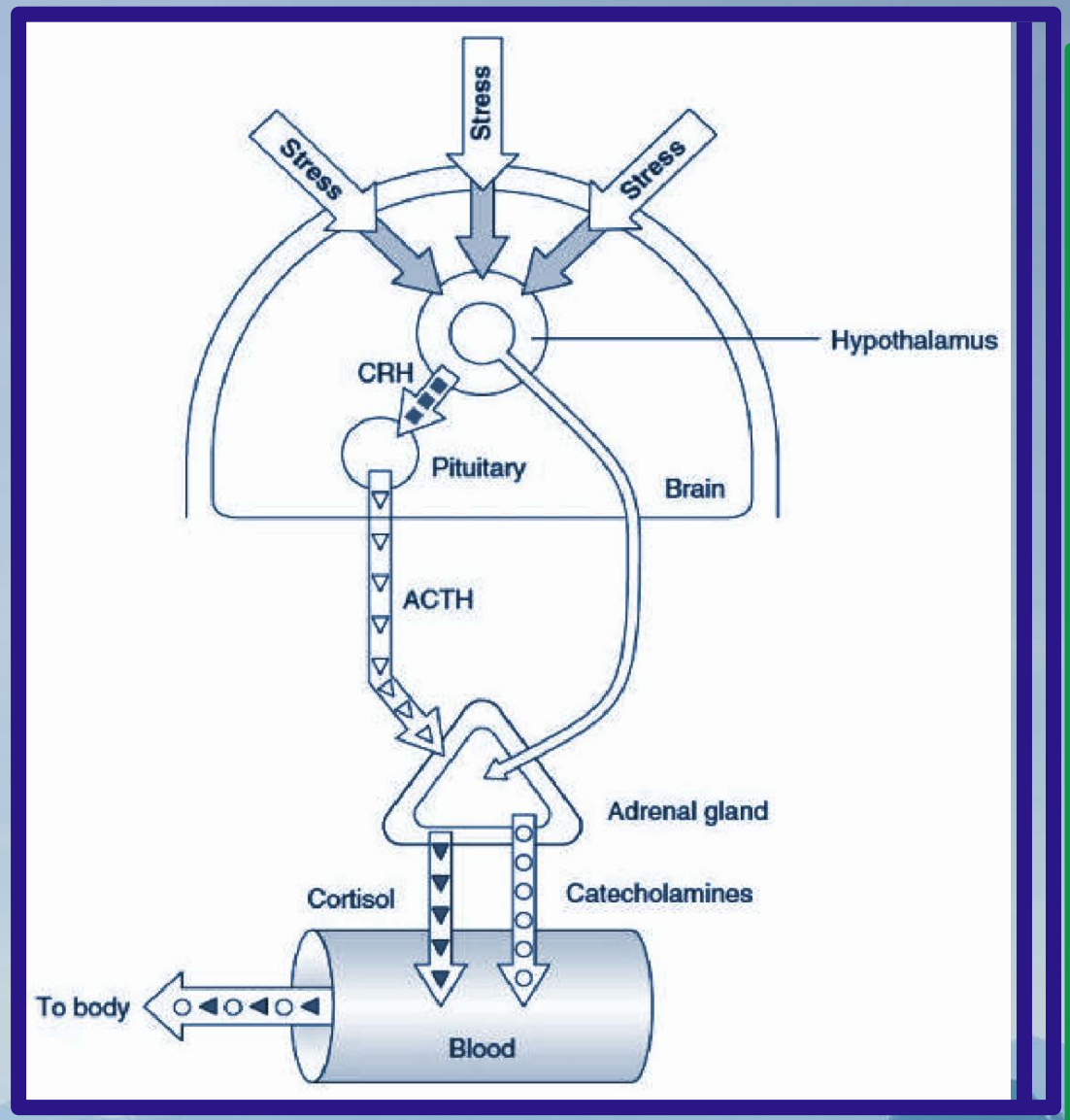

Chain Reaction

Corticotropin-releasing hormone (CRH)

- Neurons in the hypothalamus secrete this hormone
- Transported to the anterior pituitary
- Stimulates the release of corticotropin
  - This stimulates increased production of corticosteroids such as cortisol

Arginine-vasopressin (AVP)

- Neurons in the hypothalamus secrete this hormone
- Increases reabsorption of water by kidneys and induces the contraction of blood vessels increasing blood pressure

CRH and AVP together activate the HPA (hypothalamus-pituitary-adrenal) axis

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What does cortisol do?

PRIMARY SOURCE OF LONG-TERM STRESS

- Main function is restore homeostasis in response to stress
- Primary target is metabolic, it also affects ion transport, immune response and memory
- Encourages higher blood sugar by stimulating gluconeogenesis
- Detrimental to immune system by blocking T-Cells from proliferating

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What does cortisol do?

Why can it be detrimental?

- The glucose synthesis is done by degrading muscle protein in which results in a loss of muscle mass
- Impairs wound healing by suppressing the immune and inflammatory responses

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Long-Term Effects of Stress

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Why is Stress so bad for the body?

Years of untreated stress can result in several different health issues such as:

- Can lead to anxiety and depression
- Result in a “burn-out” in which a person is emotionally and physically drained
- The constant release of adrenaline and cortisol can result in issues such as...
    - High blood pressure
    - Hypertension
    - Higher risk of stroke and heart attack
    - Increase chance of diabetes
    - Tighten muscles causing aches and migraines
    - Weakened immune system

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Stress CAN be good

A small amount of stress if kept in check, can be beneficial and help with production

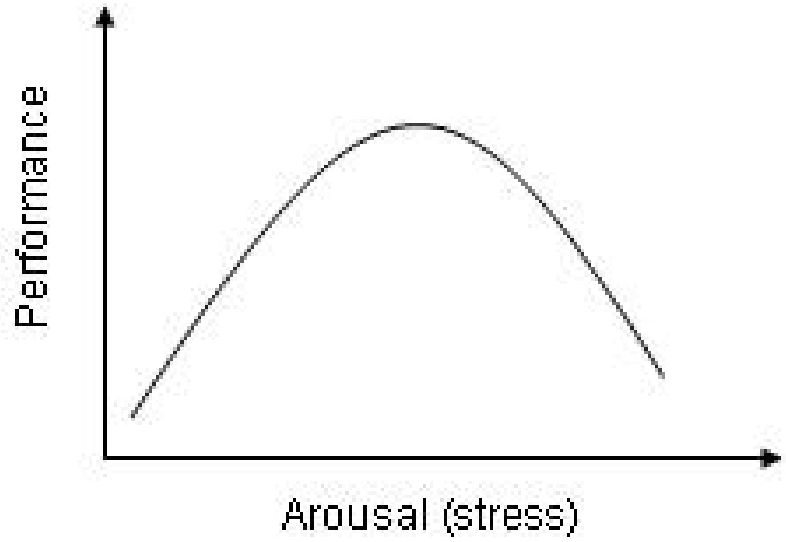
Yerkes-Dodson Law

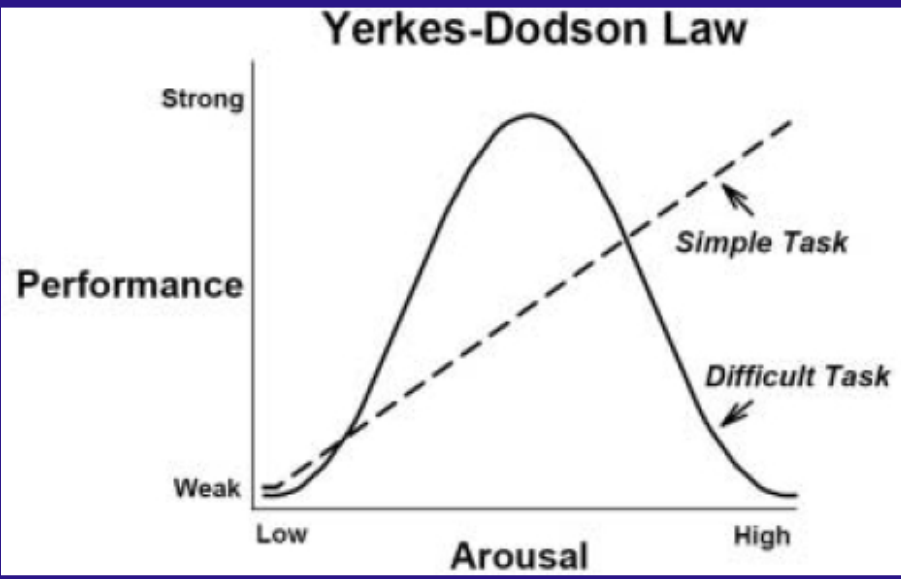
"Good Stress"

Get's us engaged in whatever tasks we are completing

Three Stages

1. Disengagement
2. Frazzle
3. Flow





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Dealing with Stress

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Remove all the noises to focus on the significant details

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Fear is real & can be useful, but Anxiety is just the fear of virtual future events

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Relaxation

- Relaxation is the opposite of stress
  - Cardiac and respiratory responses are reduced
  - Lower muscular tones
  - Warmer extremities due to deeper skin dilation
  - Lower artery pressure
  - Lower circulating cathecolamines level (no adrenalin)
  - Reduced activity in the limbic system (56)

- Person is awake but can voluntary interrupt the state of relaxation at any point
- Is voluntary and must be learned as a reaction to stress

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Learning to deal with stress

- Learning to react and deal with stressful situations
- Focusing on health
  - Exercise
  - Diet
- Focusing on efficiency
- Action centered on stressor
- Action centered on the reaction to the stress
- Increasing stress resistance
- Different Approaches
  - Relaxation various methods
    - Breathing
    - Meditating
  - Behavior approach
  - Cognitive approach
  - Stress moderators

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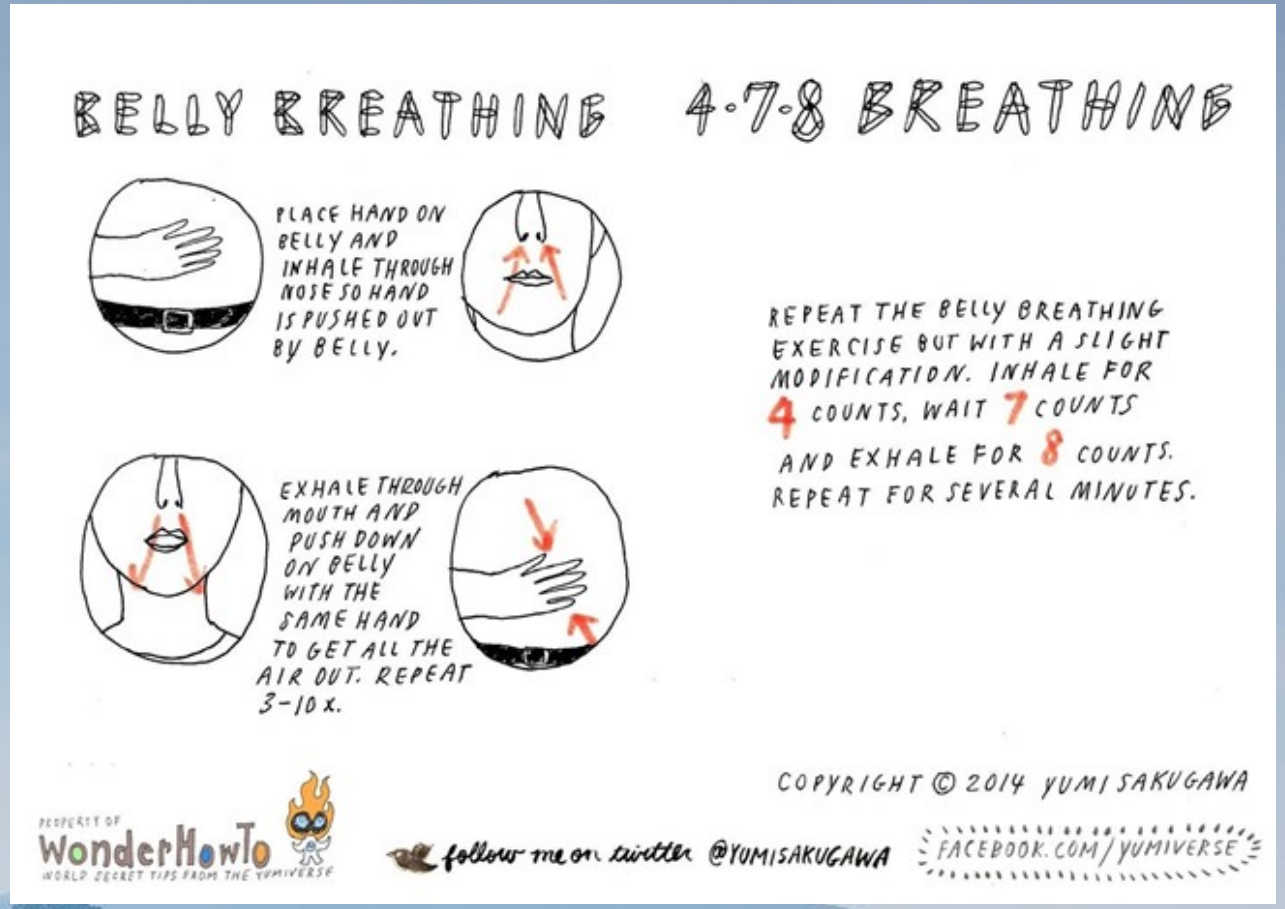
Breathing

One way to deal with stress is learning to not only breathe, but to breathe properly

Deep breaths using diaphragm. In through the nose and out through the mouth



Proper breathing exercise to strengthen lungs to keep healthy - Dr. Mandell:

https://www.youtube.com/watch?v=y3LUlag7W1s

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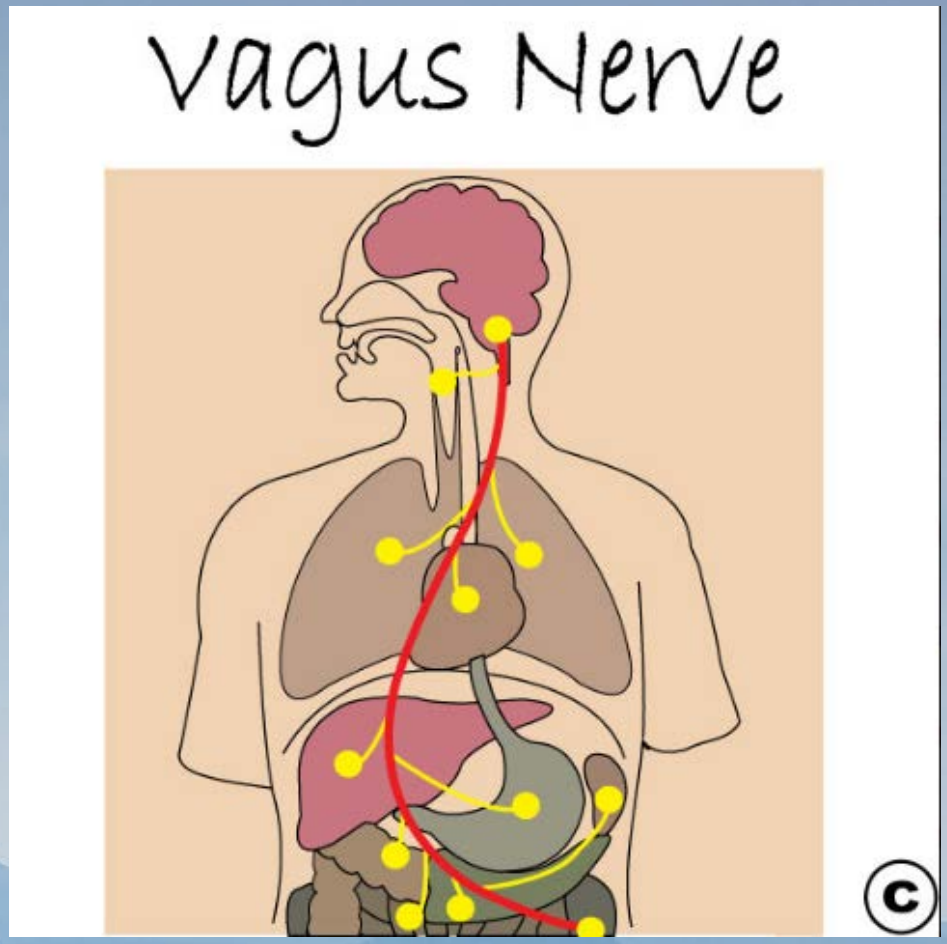
Diaphragmatic Breathing Stimulate the Vagus Nerve & Limbic System



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MFC developed B.E.S.T.

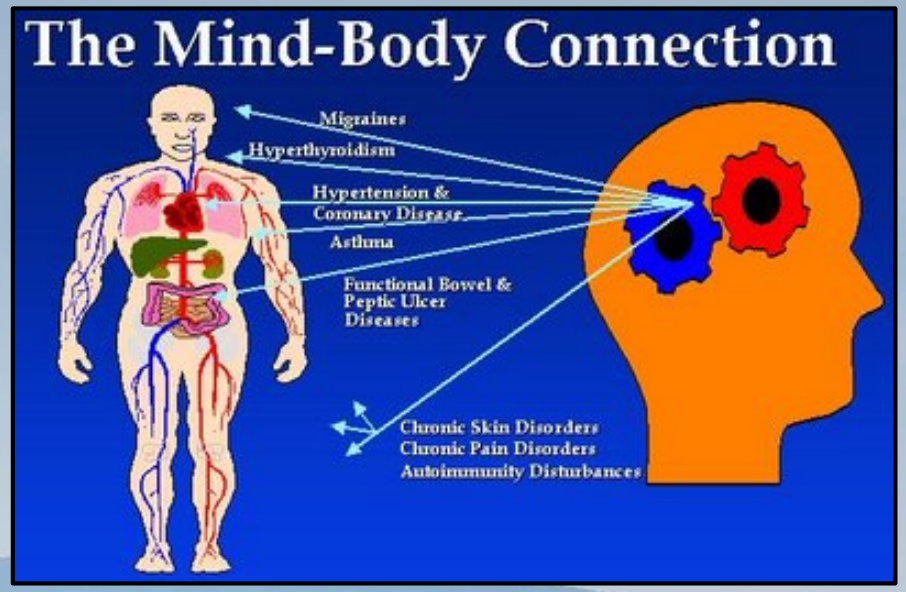
Bio-Ergonomic Safety Theory For Mind & Body

MFC is a Wholistic approach

Research into MFC concluded that difficulties arise from an absence of awareness of how to think and therefore react.

Inadequate attention to mind-body link:

- Stress
- Fatigue
- Sleep
- Channel capacity
- Tunnel-vision effect
- Drugs and alcohol
- Breathing
- Food and beverage



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Exercise

- Creates more endorphins
  - Feel good neurotransmitters
  - Natural painkillers
- Meditation in motion
  - Focusing on how your body is moving
- Improve sleep
- Improve alertness and concentration
- Improve self-esteem

What do you do to decrease stress ?

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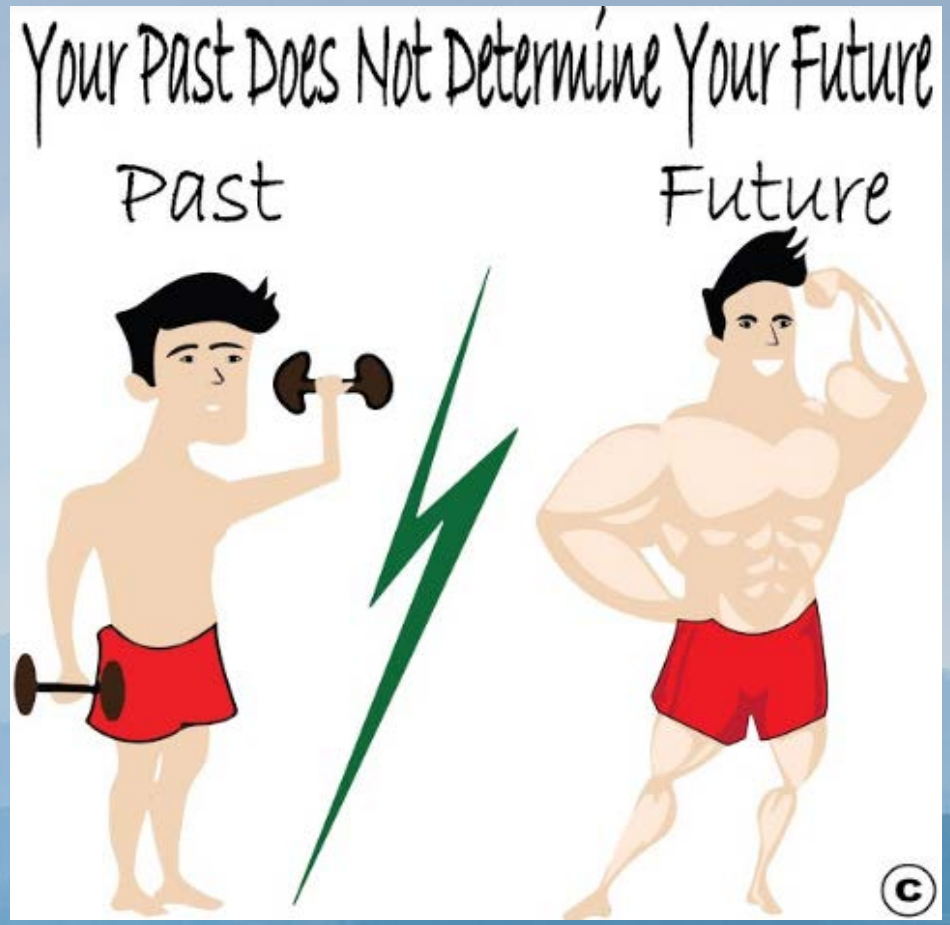
EXERCISES!

Making present decisions to ensure a better future



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- John is going 15 miles over the speed limit when he passes a cop. Suddenly, his hands and legs becomes numb. What is happening?

Short term stress.
Adrenaline causing the veins to vasoconstric.

- John has had a credit heavy semester. He is taking several exams a week and is lacking sleep. John now finds himself having difficulty in eating and digesting food, as well as having constant migraines. What is happening ?

Long Term stress
Cortisol is wreaking havoc on his body

- What types of things can John do to calm himself down and cope with this stress?

Remove the stressor from his life, breathe, focus on becoming more efficient

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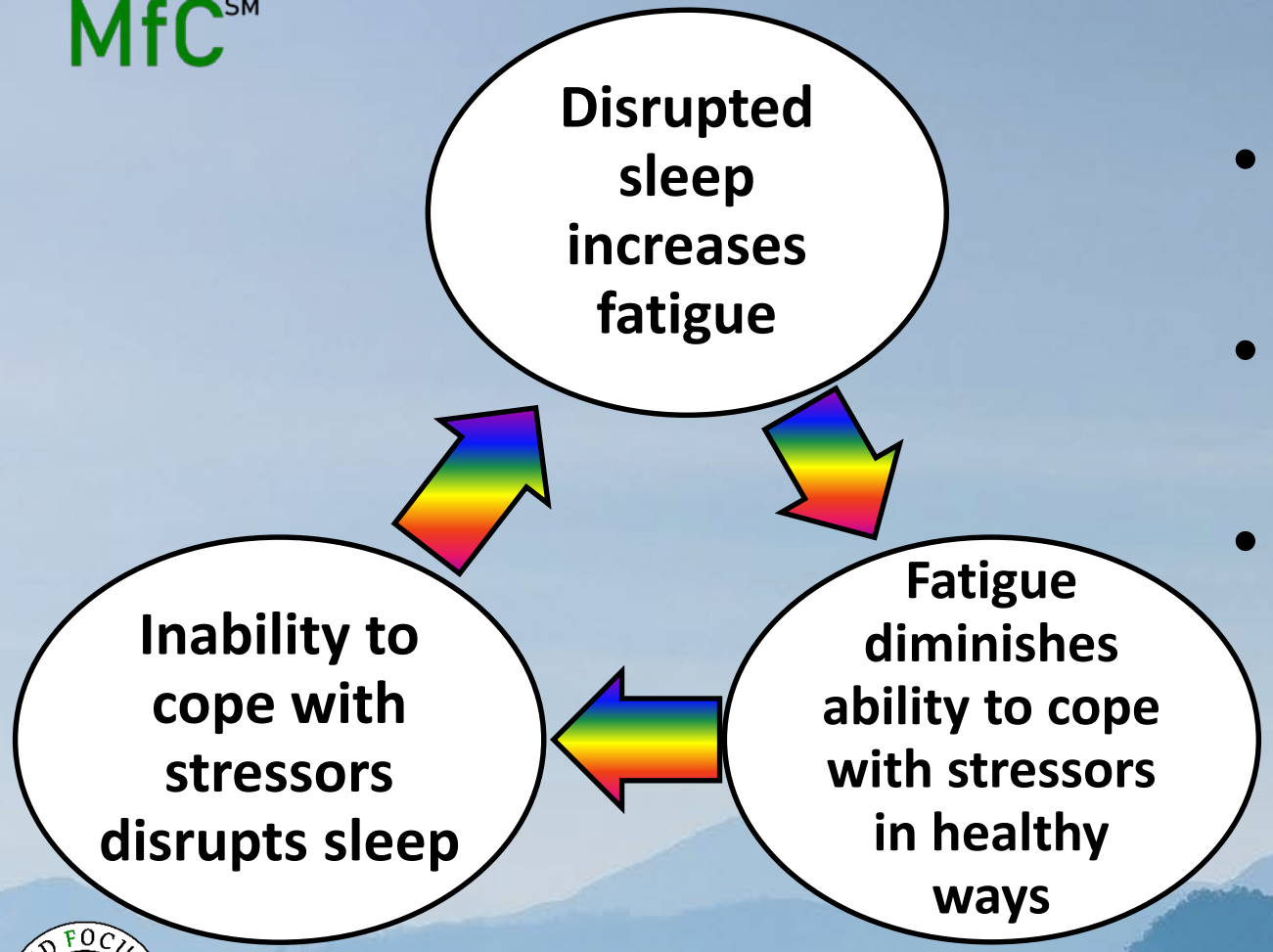
Stress and Fatigue



- Impact on Emotions and Feelings, Judgment and Behavior .
- Behaviors and reactions when fatigued mimic substance abuse.
- When very fatigued, a person may act intoxicated.
- Alcohol consumption greatly increases the level of fatigue and resistance to stress.

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MFC Wholistic Approach, Where Body and Cognition are Synergetic:

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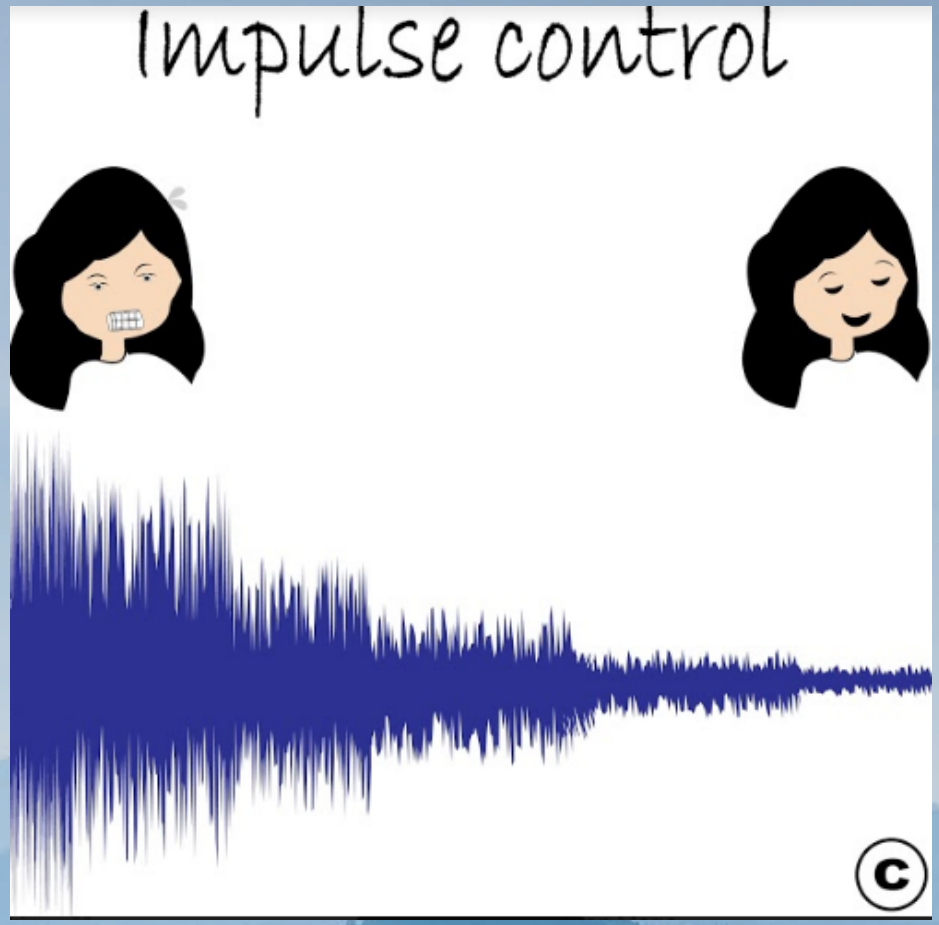
MFC first about impulse control:



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Chose to remain non impulsive at all times:

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Remain poised and calmly in control:

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MFC is Meta-Cognitive Positive Psychology

Stay Motivated & Proactive

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Thank you for your active participation!

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