

Neurobiology and Neuropsychological Aspects of Trauma RECAMFT

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Neurobiology of Trauma

Three Areas to Address:

Diagnosis Dilemma

The Neuroanatomy of Trauma

The Neurobiological Treatment of Trauma

- Treatment of Emotional process of Trauma
- Treatment of Neuro Cognitive processes following trauma: Executive Function Skill Training.

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Diagnostic Summary

| PCS DSM | PCS ICD | PTSD | Frontal Lobe: Executive Dysfunction | MDD |
|--|--|--|--|---------------------------------------|
| Anxiety, depression, or lability | Anxiety, depression or mood lability | Anxiety and fear | Diminished self-control, foresight, creativity and spontaneity | Diminished interest or pleasure |
| Headache | Headache | Can't recall all aspects of the trauma | Selfishness and lack of concern for others | Feelings of worthlessness |
| Easily fatigued | Giddiness | Diminished interest in activities | Increased irritability | Fatigue or loss of energy |
| Disordered sleep | Fatigue | Insomnia | Diminished attention and/or memory | Insomnia or hypersomnia |
| Dizziness | Insomnia | Difficulty concentrating | | Agitation |
| Irritability | feeling of impaired cognition | Irritability | | Diminished concentration |
| Changes in personality | exaggerated fear | Detachment or estrangement | | Indecisiveness |
| Dysfunction of attention/ memory | Intolerance to exertion | Restricted range of affect | | |
| Anxiety | Sensitivity to noise | | | |

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Diagnoses

- The key to an accurate diagnosis is the etiology and history of the symptoms.
 - When did the symptoms begin/exacerbate
 - What event triggered the symptoms or exacerbation of the symptoms
 - History of previous traumas?
 - History of previous symptoms?
 - Apportionment to personal history
 - Family history

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Neurophysiology

- Human Constitution: how we develop
 - 50% is genetic disposition
 - 30% experiences (conception to today)
 - 20% how we respond interpersonally and intrapersonally

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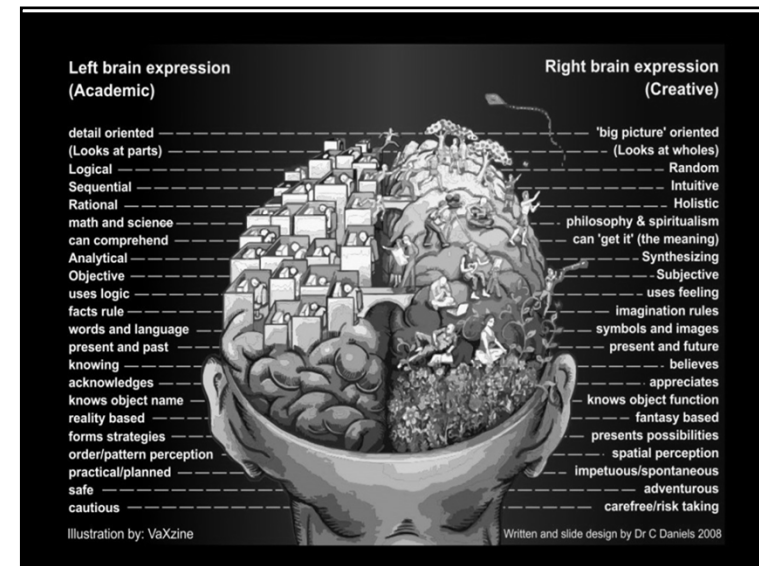
Neuroanatomy

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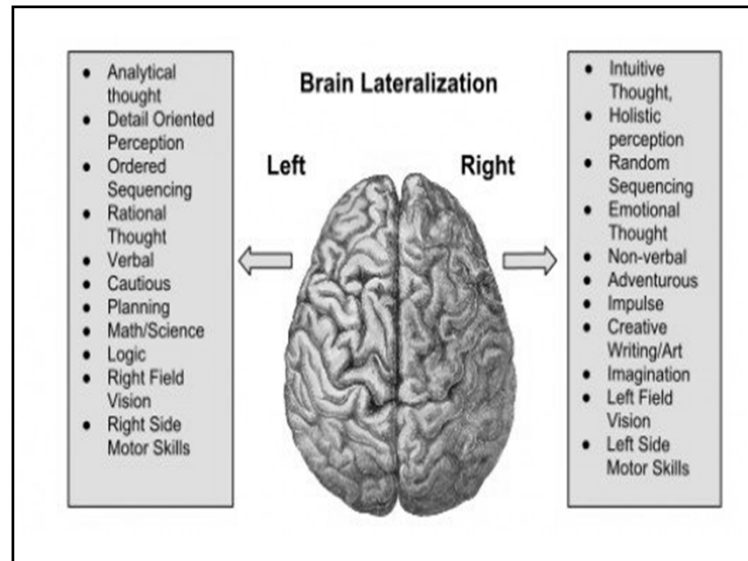
What to do

- Believe in yourself
- Comes down to faith
 - Not in chemistry
 - Not in medication
 - BUT IN YOURSELF and your
 - SPIRITUAL BEING

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Neuropsychology of Emotions

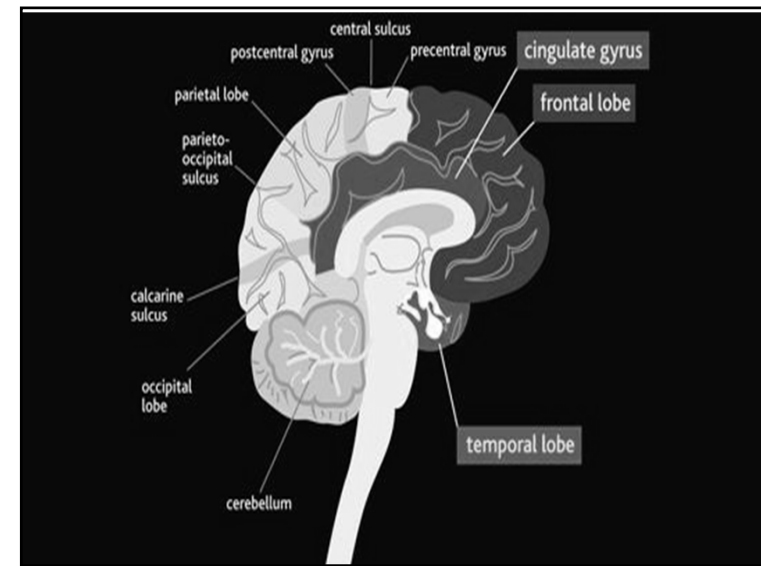
- Right Hemisphere:
 - Visual spatial in nature
 - Thinks holistically
 - Emotional Experience
 - “Being” in the moment
 - No judgment
 - No right and wrong
 - Just me experiencing “this present moment”

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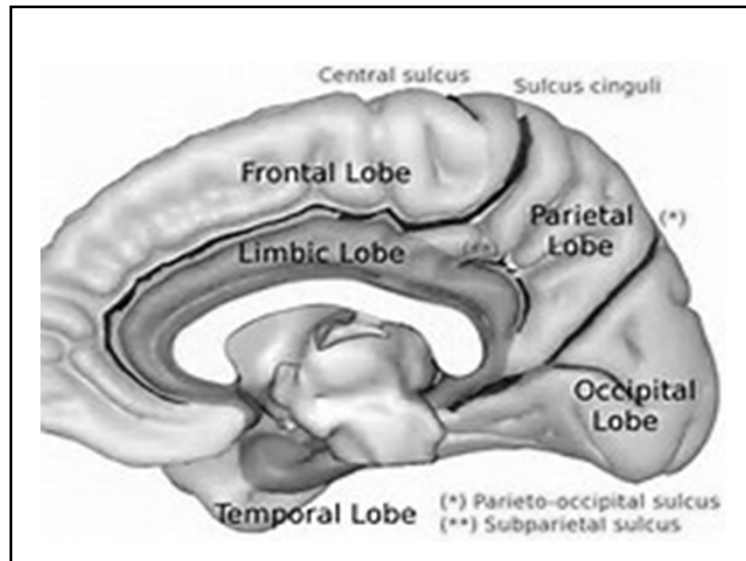
Neuropsychology of Emotions

- Left Hemisphere
 - Linear Sequential in process
 - Analyzes and labels
 - Logical
 - “Doing”
 - Getting things done (sequentially)
 - Judging effort, self and others

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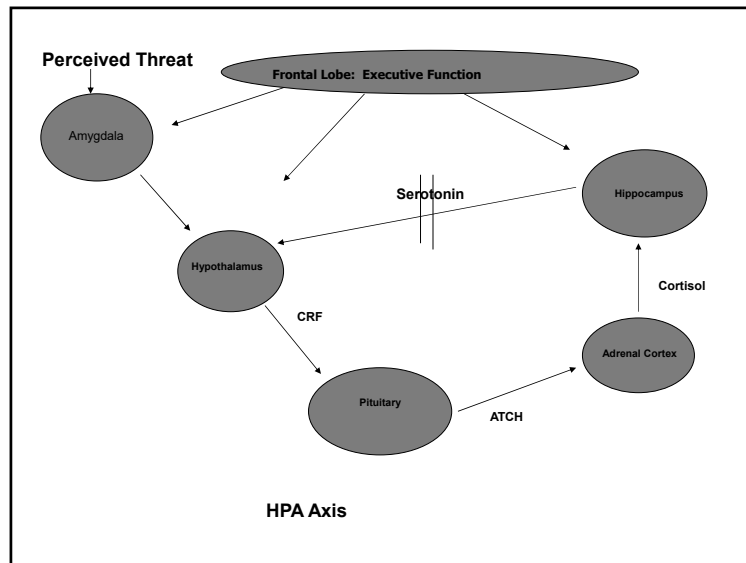


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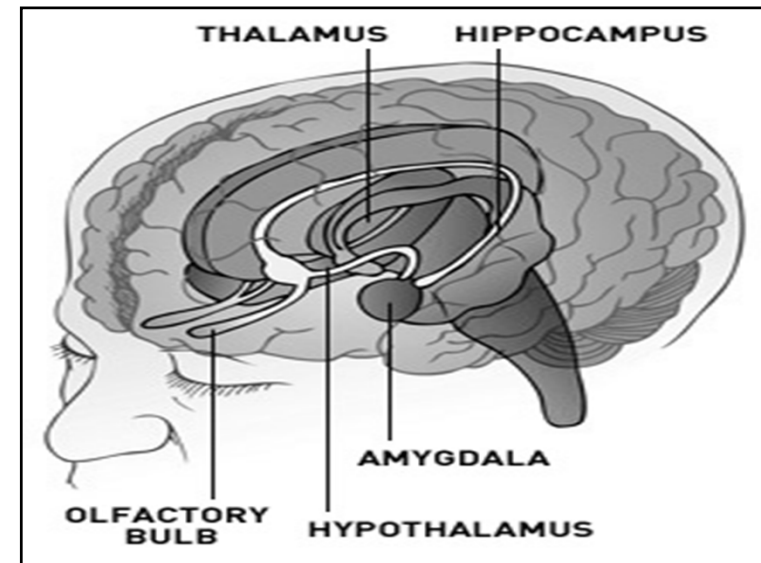
Neuroendocrine Trauma Response

- There is a neuroendocrine cascade that occurs whenever we are under distress and/or traumatized
- This is the inflammatory process

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The Neuroendocrine Response to Stress

- Inflammation: Our first protective defense
 - Natural response to stress on the system
 - Infection
 - Sprained ankle
 - Trauma: Car Accident
 - Post Traumatic Stress Disorder
 - Post Concussion Disorder
 - Sprains and strains
 - Emotional Stress: Depression/Anxiety

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Neuropathways of Depression, Anxiety and Concussion

- The Neuropathways of Depression and Anxiety are the same as those found disrupted in a concussion
- The executive functioning (frontal lobe) links directly with the limbic system

Jonathan M. Silver, MD. Neuropsychiatry of Persistent Symptoms After Concussion Psychiatr Clin N Am 37 (2014) 91–102

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Neuroanatomy and the Neurobiology of Trauma

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Concussion and anxiety

- Concussive Brain Injury Enhances Fear Learning & Excitatory Processes in the Amygdala

Reger, Poulos, Buen, Giza, Hovda, & Fanselow (2012); Biological Psychiatry 2012; 71; 335-343

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Neuropsychology of Emotions

1. Emotional Experience-right hemisphere activates
2. Then left hemisphere activates:
 - When did I experience this before
 - What did I *label* it
 - What did I do about it
3. Must continue:
 - Was it successful
 - What should I do now

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Chemistry is time limited

- The chemistry of an emotion is subconscious and instantaneous
- Only lasts NO MORE than a few seconds
 - No matter the emotion
 - Anger
 - Frustration
 - Sadness
 - The Chemistry only lasts a few seconds-TOPS

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Why does it “feel” longer

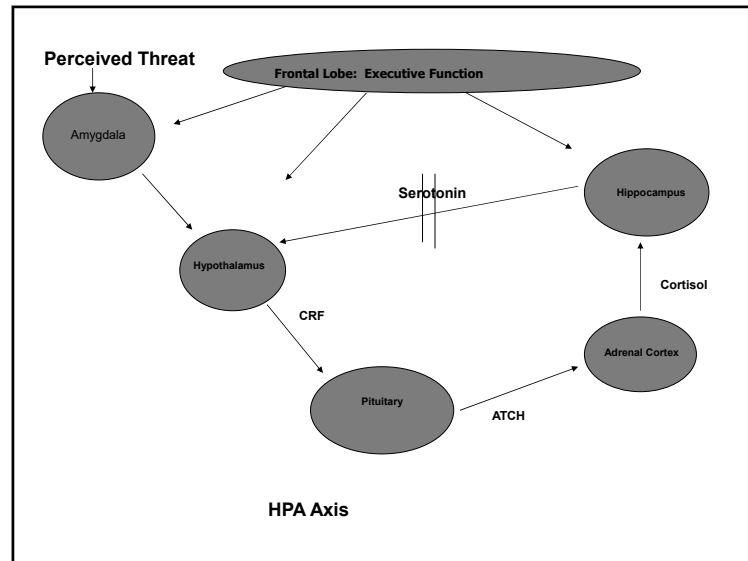
- If we experience an emotion longer than a few seconds it's because:
 - Our cognitive mind *chooses* to hold onto it
 - Why?
 - Primitive protective mechanisms
 - Protecting against a perceived threat/Vigilance
 - Self-Judgment
 - (“they will think”)
 - (“they will do”)

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HPA

- Trauma and HPA
 - Can get stuck in the loop
 - Cortisol continues Inflammatory process
 - Emotions “inflammе”
 - Cognition interprets fear and anxiety

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Vigilance

- Daniel Seigel, MD explains:
 - Presence: Being “present” and receptive to all stimuli with no judgment (right hemisphere)
 - Attention: attending to stimuli (usually includes screening out non-target stimuli)-sequence
- Vigilance

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Fight Vs. Flight

- Over time the “perceived threat” evolves
 - May be anxiety over forgetting words in conversation
 - May be assuming “they will know ...”
- Vigilance takes over presence: “I am not safe”

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Vigilance

- Vigilance: Usually after trauma; being so sensitive to threat that we vigilantly are searching for it
- Results in reading into stimuli threat, even if it is not present. Breaks down trust, of self and of “attacker.”

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Consider...

We cannot solve our problems
with the same thinking we used
when we created them.

Albert Einstein
<http://www.brainyquote.com>

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Consider...

- Learn from yesterday, live for today, hope for tomorrow. The important thing is not to stop questioning. Albert Einstein
- http://www.brainyquote.com/quotes/authors/a/albert_einstein.html

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Treatment

- Neurobiological Approach:
- Somatic, Mindful, and CBT
- Address inflammatory process with nutrition and, if necessary, medication
- Re-establish rhythm of daily life: 24 hours per day
- CBT addressing Executive Functioning Skills

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Neurobiological Treatment of Trauma

- Neurobiological Treatment Considerations
 - Healing nutrition vs. “comfort foods”
 - The effects of exercise on neurobiological healing
 - The effects of Mindfulness Stress Management meditation on Neurobiological Healing
 - Executive Functioning Skills

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Neurotransmitters and Hormones

- | | |
|---|---|
| <ul style="list-style-type: none"> ▪ Excitatory: ▪ Dopamine NT <ul style="list-style-type: none"> – Norepinephrine <ul style="list-style-type: none"> ▪ Fuel (energy) ▪ Acetylcholine <ul style="list-style-type: none"> – Gas pedal | <ul style="list-style-type: none"> Regulatory: Serotonin <ul style="list-style-type: none"> – Melatonin <ul style="list-style-type: none"> Cruise Control GABA <ul style="list-style-type: none"> Brake system |
|---|---|

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Foods and chemistry for the Dopamine system

- Lean Proteins
 - Leafy Green Vegetables (Spinach, broccoli)
 - Nuts (walnuts, almonds)
 - Fish (salmon, tuna, etc.)
 - Fish oil, flaxseed
 - Beans (red beans, kidney beans, pinto, etc)
 - Soy, Dairy, Poultry, lean red meat
- Broadbean, Copper, Ginseng, B3
- Eliminate
 - Caffeine
 - Nicotine

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Food and supplements for dopamine

- Protein is what we use to manufacture dopamine and norepinephrine.

| | |
|----------------|------------|
| Apples | Bananas |
| Beets | Watermelon |
| Chicken | Cheese |
| Cottage Cheese | Eggs |
| Fish | Wheat Germ |
| Beans | Legumes |

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Food and supplements for dopamine

- L-Tyrosine
- L-Carnatine
- Taurine
- Vitamins B3 and 6

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Substances not to use for dopamine regulation

- Caffeine
- Nicotine

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Interventions: Nutrition food and supplements for Serotonin

- Serotonin is a neurotransmitter
 - Sleep
 - Anxiety
 - Mood stability
 - Stress management
 - bliss

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Food and supplements for Serotonin

- Serotonin: complex carbohydrates
 - Veggies, Fruits, total whole grains
 - Turkey
 - B3, B6, B9
 - Flaxseed and Flaxseed oil; Omega 3
- Eliminate
 - Refined sugar
 - alcohol

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Food and supplements for Serotonin

- Serotonin is synthesized from the amino acid tryptophan. Therefore you want to consider eating foods containing sufficient levels of tryptophan to help replenish your serotonin levels each day. The following is a list:

Cottage cheese.
Brown rice.
Avocados.
Bananas.
Walnuts.
Tomatoes.
Soy protein.
Meat, especially Turkey

Starchy Carbohydrates (pasta, potato, rice)
Whole Grain Breads and Cereals

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Food and supplements for Serotonin

- L-Tryptophan
- St. John's Wort
- Sam-E
- Vitamin B-6, B-3
- Gamma-Linolenic Acid (Evening Primrose Oil)

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Interventions: Nutrition food and supplements for Gamma-aminobutyric acid (GABA)

- It is proposed that GABA neurons play key roles in maintaining meaningful communications within and among neural units by making possible variability generation in relation to demand.
- GABA is a neurotransmitter used for stress management and anti-anxiety. Helps us make meaningful decisions in stressful times

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Food and supplements for GABA

- Foods rich in Glutamine or Glutamic Acid:
 - Citrus
 - Green Tea
 - Beef liver
 - Broccoli
 - Lentils
 - Halibut
 - Nuts

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Foods to increase GABA

- beans, beef liver, beets, broccoli, cantaloupes, figs, grapefruit, halibut, kale, lentils, mangoes, nuts, oats, oranges, spinach, wheat and wheat bran.
- Vitamin B
- Read more: <http://www.livestrong.com/article/518707-foods-to-increase-gaba/#ixzz29rx9M1zm>

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Food and supplements for GABA

Vitamin B-6
Calcium
Magnesium

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Nutrition

- Mediterranean "Way of Life"
 - 60% Veggies
 - 20% Non-Veggies Proteins
 - 20% Fruits and 100% Whole Grains
- **The Rainbow Diet: A Holistic Approach to Radiant Health Through Foods and Supplements (Nutrition, Healthy Diet & Weight Loss)** Deanna Minish, Ph.D.

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Positive Effects of Exercise

- 30-60 minutes of cumulative exercise per day
- Exercise is considered
- **"Miracle Grow For the Brain"**
grows dendrites.

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Exercise and the Brain

- Optimal maintenance of brain health might depend on exercise and intake of natural products.
- **Exercise and the brain: something to chew on**
- Henriette van Praag
- Trends Neurosci. 2009 May; 32(5): 283–290.

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Exercise

- Recent research indicates that the effects of exercise on the brain can be enhanced by concurrent consumption of natural products such as omega fatty acids or plant polyphenols. The potential synergy between diet and exercise could involve common cellular pathways important for neurogenesis, cell survival, synaptic plasticity and vascular function.

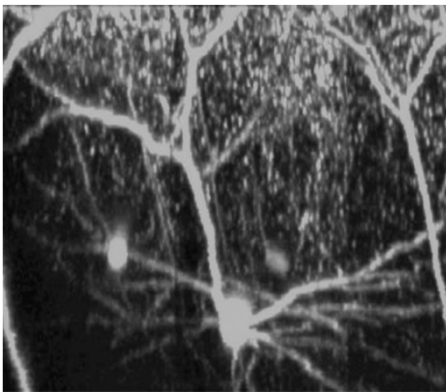
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Evidence is accumulating that exercise has profound benefits for brain function.

- Evidence is accumulating that exercise has profound benefits for brain function. Physical activity improves learning and memory in humans and animals. Moreover, an active lifestyle might prevent or delay loss of cognitive function with aging or neurodegenerative disease.

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Neural dendrites



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“Exercise to Grow Dendrites”

- Learn Something New
 - Musical Instrument
 - Dance
 - Chess, cards
 - Jigsaw Puzzles, crossword puzzles
 - Social Interaction
- Aerobic Exercise
 - Swimming, Tai Chi, Yoga, Qi Gong

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Treatment of MBI: Medications

- Prefrontal Cortex
 - Short attention span
 - Impulse control
 - Lack of self-control
 - Poor follow-through
 - Poor judgment
 - Poor time management
 - Disorganization
 - Conflict for self-stim
 - Lack of insight
- Dopamine/
- Norepinephrine
- Stimulant Medication
- atomoxetine
- bupropion-SR
- SNRI
- L-Tyrosine

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Treatment of MBI: Medications

- Anterior Cingulate Gyrus and Basal Ganglia
 - Worry/rumination
 - Hold onto past hurt
 - Perseveration
 - Argumentativeness
 - Uncooperativeness
 - Addictive behavior
 - Anxiety/panic
- Serotonin
- SSRIs venlafaxine XR, duloxetine
- New antipsychotics
- St. John's Wort
- Sam-E
- L-Tryptophan

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Treatment of MBI: Medications

- Basal Ganglia
 - Anxiety/panic
 - Hypervigilance
 - Conflict avoidance
 - Catastrophic thinking
 - Shyness/timidity
 - Excessive motivation, e.g., can't stop working
 - Muscle tension
 - Movement disorders
- Anti-anxiety Meds
 - Benzodiazepines
 - Buspar
 - SRI/SNRI
 - Anticonvulsant Meds
 - GABA
 - Kava
 - Valerian Root

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Treatment of trauma: Medications

- Temporal Lobe and Deep Limbic System
 - Aggression
 - Dark/violent thoughts
 - Mild paranoia
 - Reading/word finding difficulties
 - Emotional instability
 - Headaches
 - Déjà vu
 - Confusion
- For Temporal Involvement: Anticonvulsants (often with a stimulant)

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Treatment of Trauma Injury

- Education on stress management
 - Sleep Integrity and Hygiene
 - Nutrition
 - Pace of activities.

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24-hour rhythm

- 8 hours = 1/3 of day in recovering energy and consolidating memory (emotional and content)
- 16 hours = 2/3 of day in rhythmic pace of expending energy

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Normal Sleep Architecture

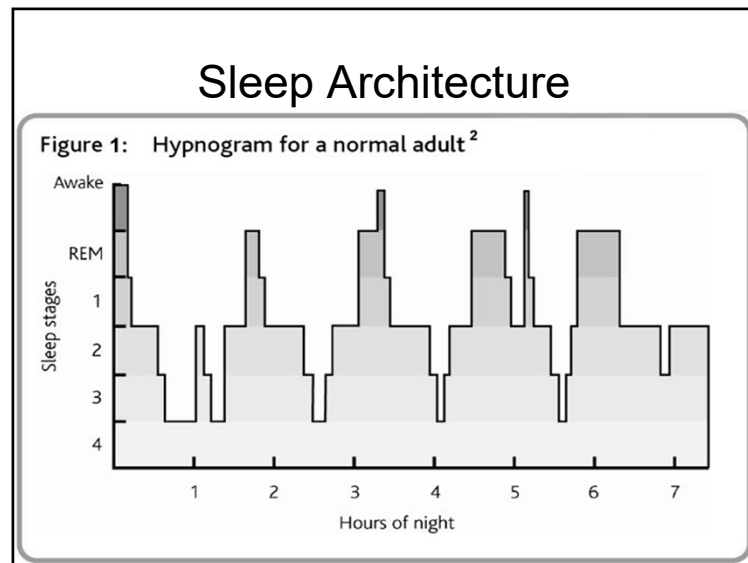
- Rapid stepwise progression from awake through REM-1-2-3-4 stages of sleep
- There are 4-6 sleep cycles during the night
- Deficits of each stage lead to sleep disorders
- Stage 4, deep sleep, is longer early in the sleep period
- Stage 5, REM, increases in frequency and length later during the sleep period
- REM can be 20% - 35% of sleep period for adults

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Stages of sleep

- Stage 1: Theta: can be easily awakened
- Stage 2: Kindling: can be easily awakened
- Stage 3 and 4: Delta, deep sleep
- Stage 5: REM aroused just below awake to be aware and encode that I dreamt.
 - Rhythm is just below awake rhythm: Beta

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Neurological importance of sleep

- Sleep is important for two neurological functions
 - Restoring spent energy: recharging batteries
 - Rebuilding Neurochemistry
 - Thought to be more of deep sleep
 - Consolidating and Integrating events into self concept/perception:
 - Dreaming/REM sleep

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Natural Circadian Rhythm

Natural rhythm follows the Sun

Our brain will naturally de-arouse as the sun sets.

Our brain naturally begins to arouse as the sun comes up

Dream later in night and early AM

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Establishing Sleep Hygiene

- To sleep same time every night
- To Wake Same time every morning regardless of schedule
- 8 hours apart
- Choose consistent time to get up every day, go back 8 hours that when sleep rhythm should begin.

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Sleep Hygiene

- No screens, only lite meal (blueberries), no heavy exercise for one hour before you are to enter recovery arousal (Sleep)
- Meditate to transition into recovery arousal
- If awakened for any reason: meditate until you are back to sleep or its time to get up.
- Meditation is the best intervention to train the brain to manage recovery arousal.

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Pace of Activities

- Take same ratio:
 - 1/3 recovery
 - 2/3 process and activity
- Place back into the 16 hours of arousal

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Pace of Activity

- Pace of activity should be:
 - Time plus ½ time for activity
 - ADA generic guideline for accommodations
- Make sure to calculate entire activity
 - Activity calculate 30 minutes;
 - do in 45 minute Pace
- Pace should not exacerbate symptoms

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Pace of activities

- Labor law studies show:
 - Two people work 8 hours
 - One takes a 10-15 minute break every two hours
 - One works 8 hours
- The one taking breaks is more productive over 8 clock hours

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Sample Schedule

- 6 AM up with meditation/breakfast
- 7-9 Exercise and activities
- 9-10 Meditation and Nutrition
- 10-12: Paced activities
- 12-1: Meditation and Nutrition
- 1-3 Paced Activities
- 3-4 Meditation and Nutrition
- 4-6 Exercise and paced activities
- 6-7 Meditation and Nutrition

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Neuro Cognitive-Behavioral

- Mindfulness Intervention
 - Meditation
 - To transition into better arousal rhythm (Beta/Alpha/Delta)
 - To “recharge” the neurochemistry (every 3rd hour, and when triggered)
 - Applied Mindfulness: Somatic, EMDR
 - Executive Functioning Skills

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Treatment of Trauma Injury

- Psycho-spiritual intervention
 - Meditation: Get into the “right” hemisphere
 - Mindfulness Intervention
 - No Judgment: just experience
 - (emotion plus synthesis)
 - “That was Then, this is now”

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Do not dwell in the past, do
not dream of the future,
concentrate the mind on
the present moment.

Buddha

 BrainyQuote®

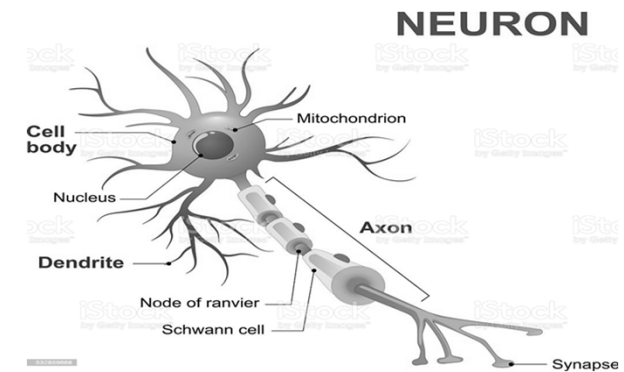
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Exercise and Meditation

- Empirical Evidence identifies that:
 - Mindfulness meditation done for ten minutes twice daily begins to re-myelinate axons in the sub-cortical juncture of the frontal lobes
 - Exercise enriches dendrite growth on neurons

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Structure of a typical neuron stock illustration



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Consider...

Do not be anxious about tomorrow, for tomorrow will be anxious for itself. Let the day's own trouble be sufficient for the day.

Jesus Christ

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Schedule of Meditation for trauma recovery

- When transitioning arousal:
 - For transition from wake to sleep (Beta>alpha/theta)
 - Whenever awakened during the night
 - During the 1/3 "recovery arousal" during the day (every 3rd hour + high energy snack)
 - When triggered into anxiety (PRN)
 - Tapering off of medication

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What to "do"

- Realize the chemistry is over
- Meditation
 - Find your "God" (safe) spot
 - Practice
 - Apply
- Stop the self-judgment
 - Stop the chatter
- Stop the projection

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Treatment of Trauma Injury

- Breathing Training
- Mindfulness Training
 - Moment-to-Moment (present centered) awareness of internal and external stimuli
 - Nonjudgmental self-observation
 - Acceptance of Good, bad or neutral thoughts, feelings and memories
 - Compassion/"friendliness" toward self and others

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Treatment of Trauma Injury

- Empirically –based Mindfulness-related therapies:
 - Dialectical behavior therapy (Linehan)
 - Mindfulness-based stress reduction (Kabat-Zinn). Somatic Mindfulness (Levine)
 - Mindfulness-based cognitive therapy (Siegal)
 - Acceptance and commitment therapy (Hayes)
 - Forgiveness (Fred Luskin)
 - EMDR (Francine Shapiro)

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Healing the Trauma from the inside out

- Attachment Disorder and Bonding
- The rings of intimacy and safety
- Intrapersonal Bonding or Spiritual Bonding
- Interpersonal Bonding
 - With environment (work, neighborhood, city)
 - With others (family, friends, acquaintances)

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Consider...

You can search throughout the entire universe for someone who is more deserving of your love and affection than you are yourself, and that person is not to be found anywhere. You yourself, as much as anybody in the entire universe deserve your love and affection.

- Buddha
- : <http://www.brainyquote.com>

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Consider...

If you bring forth what is within you, what you bring forth will save you. If you do not bring forth what is within you, what you do not bring forth will destroy you.

- Jesus Christ
- <http://www.brainyquote.com>

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Intrapersonal Spiritual Interventions

- How I treat myself
 - Do I see my self as “whole”
 - Am I acceptable
 - Difference between Acceptable and Accepted
 - Acceptable: “me to me” relationship: INTRApersonal
 - Accepted: “others to me” relationship: INTERpersonal
 - Accepted without Acceptable= 0

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Spiritual Interventions

- How I interpret Others
 - Based on Acceptance, not Accepted
 - “Oh that happens to me all the time”
 - Condensing: “They don’t understand me”
 - Supportive: “You’re OK for me just the way you are”
 - Which interpretation feels better?
 - Which Interpretation enhances you and your relationship?
 - Why not choose that one.

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Executive Functioning Skills

- **PLANNING:** The ability to create a roadmap to reach a goal or to complete a task. Being able to make decisions about what's important to focus on.
- **ORGANIZATION:** The ability to arrange or place things according to a system
- **TIME MANAGEMENT:** The capacity to estimate how much time I have, how to allocate it, and how to stay within time limits

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Executive Functioning

- Reasoning, synthesizing, decision making
- Impulse control,
- Regulation of process
- Problem solving
- Planning solution.

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Executive Functioning Skills

- **TASK INITIATION:** The ability to begin a task without undue procrastination, to do a task in a timely fashion.
- **WORKING MEMORY:** The ability to hold information in mind while performing complex tasks, including drawing on past experience to apply to the situation at hand or to project problem-solving strategies into the future

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Executive Functioning Skills

- **GOAL-DIRECTED PERSISTENCE:** The capacity or drive to follow through to the completion of a goal and not be put off by other demands or competing interests
- **FLEXIBILITY:** The ability to revise plans in the face of obstacles, setbacks, mistakes, and/or new information

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Executive Functioning Skills

- **RESPONSE INHIBITION:** The capacity to think before you act. The ability to resist the urge to say or do something allows us the time to evaluate a situation and how our behavior might impact it.
- **SELF-REGULATION OF AFFECT:** The ability to manage emotions in order to achieve goals, complete tasks, or control and direct behavior

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Consider...

- If passion drives you, let reason hold the reins.

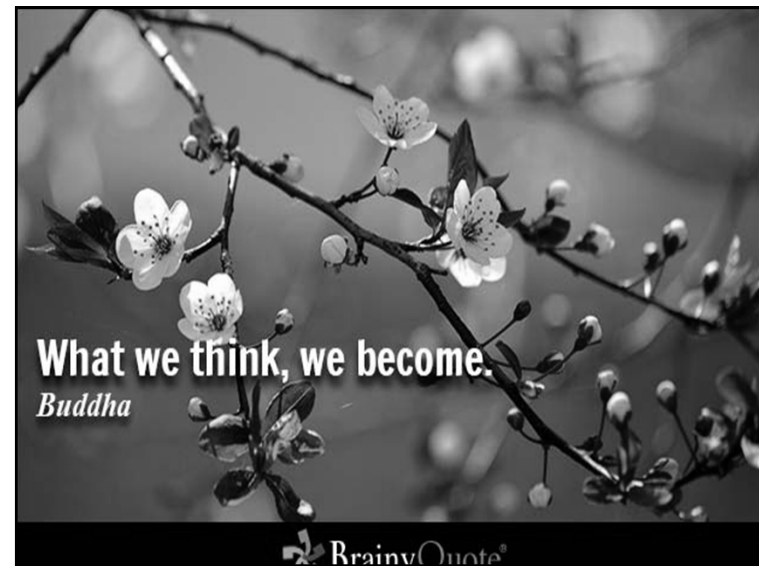
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<http://www.brainyquote.com/>

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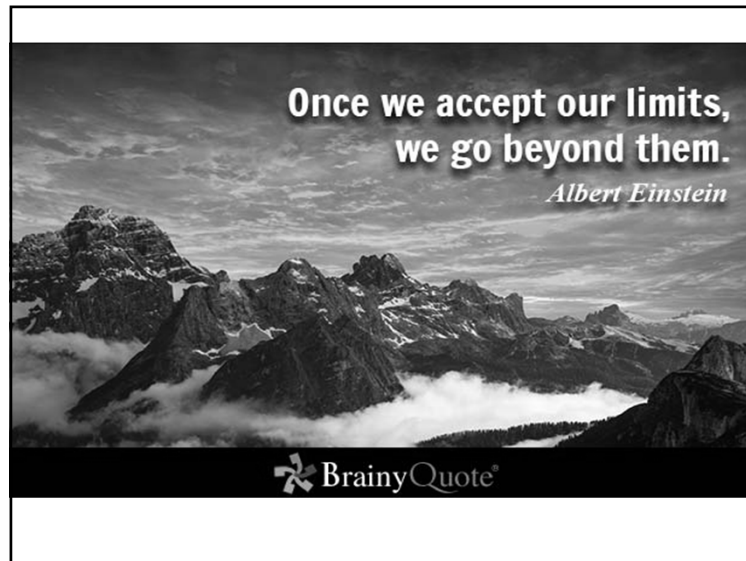
Executive Functioning Skills

- The Whole is greater than the sum of the parts:
- What we hear our minds say (even internally) our brains will believe to be true even if it is not true.
- Reframe the words
- Update your story

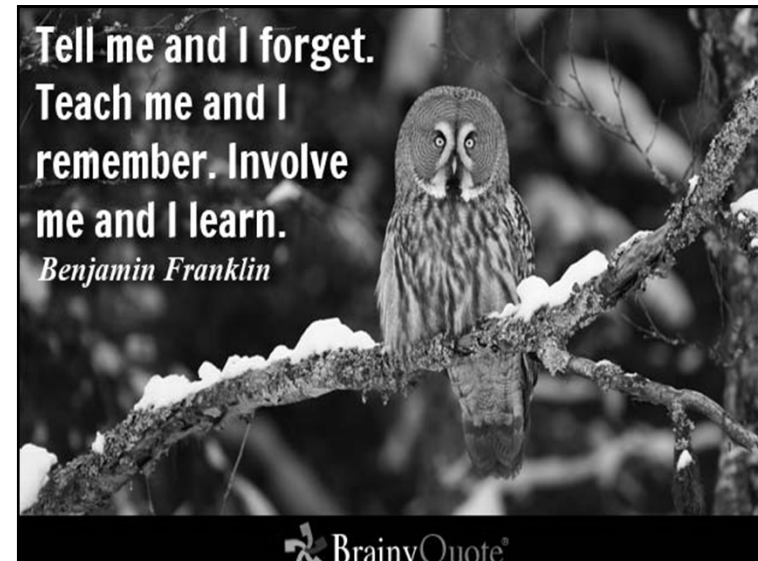
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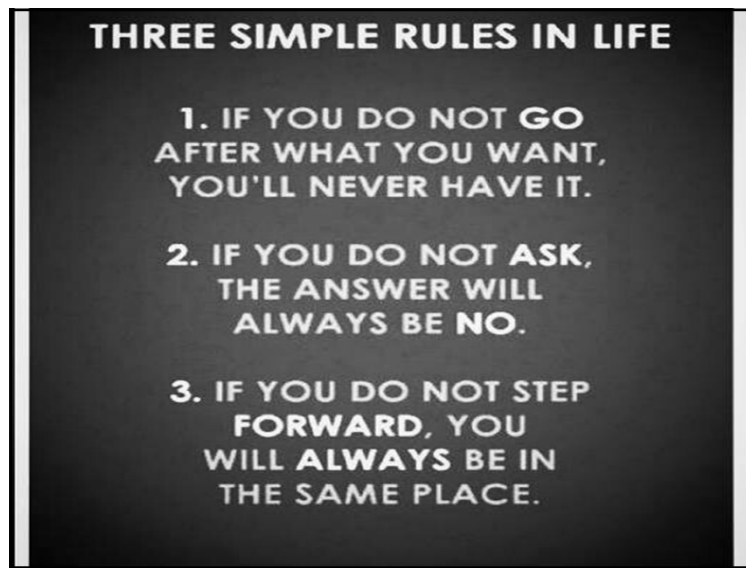
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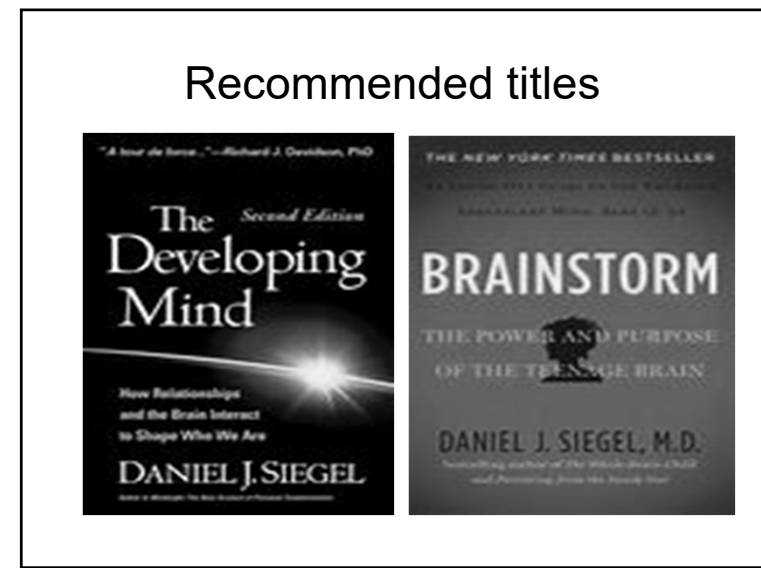
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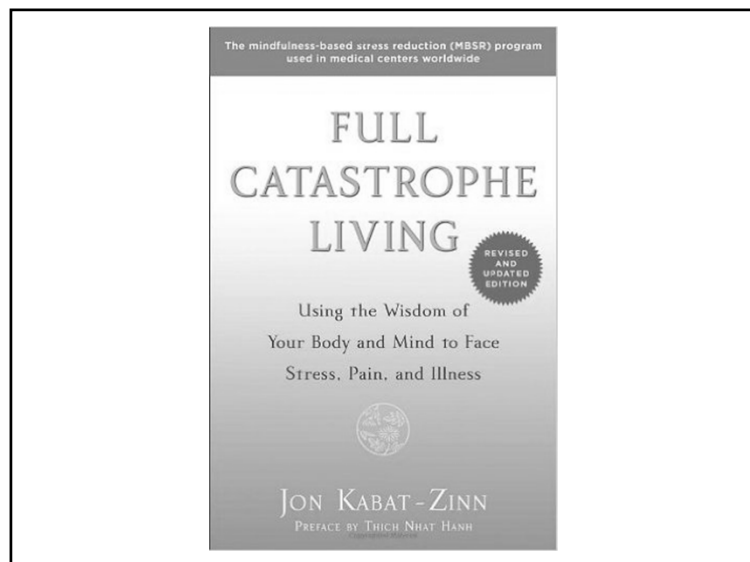
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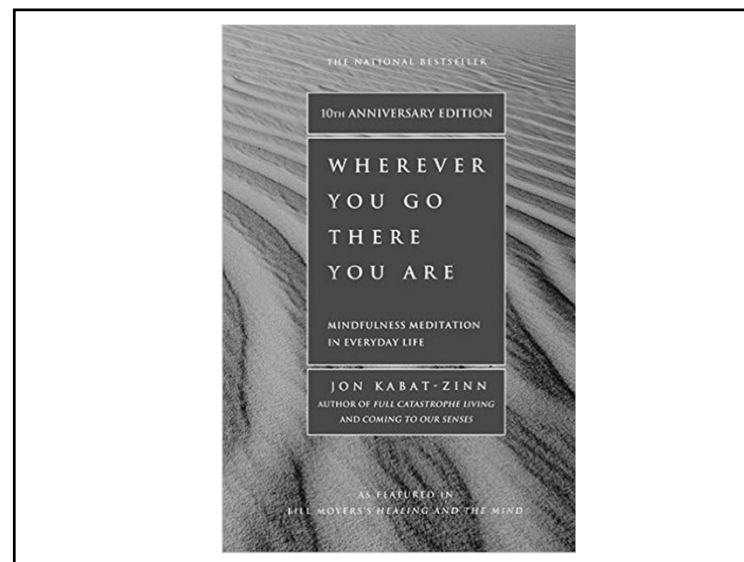
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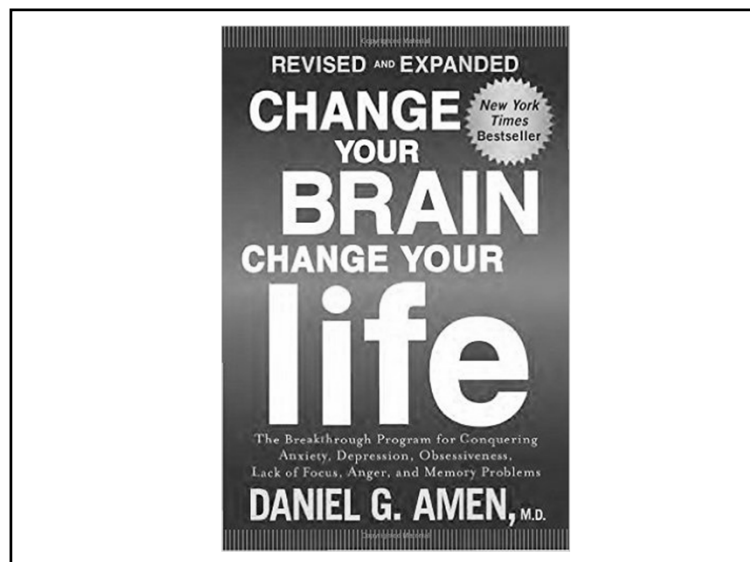
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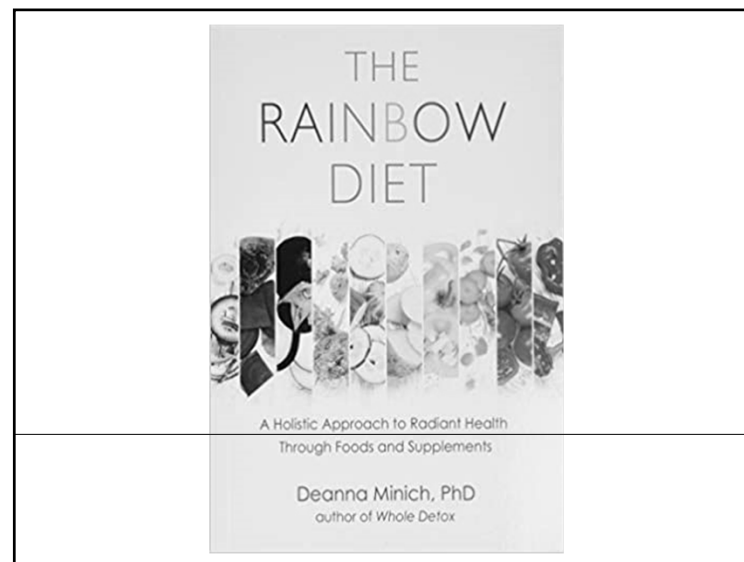
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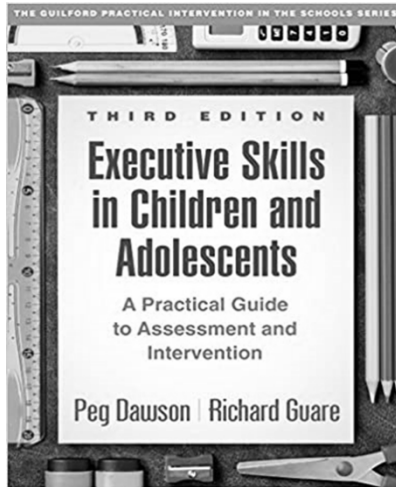
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