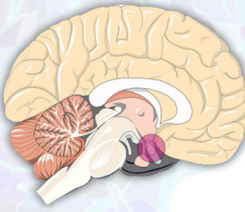


Amygdala

- "Fear brain" or "smoke alarm"
- Can suppress cortical structures
- Involved in fear/threat detection
- Makes final decision about what is dangerous
- Begins stress response through activation of the HPA axis




Limbic System

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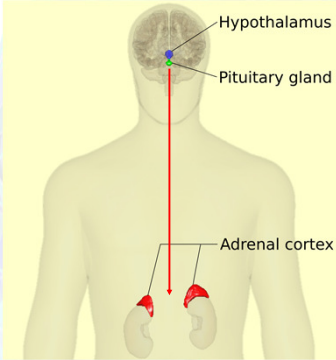
Hypothalamus

- Regulates autonomic functions
- Takes commands from amygdala
- Starting point for the stress pathway in the brain (HPA Axis)



Limbic System


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HPA Axis

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Limbic System

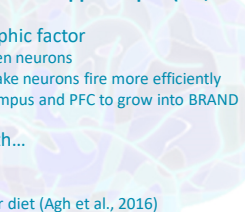


Hippocampus

- Involved in learning and memory
- Cortisol is toxic to this area
- Explicit, autobiographical, declarative memories

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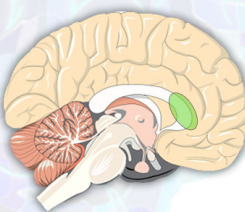
Heal the Hippocampus



- **BDNF promotes neurogenesis in the hippocampus (i.e., Kuipers et al., 2016)**
- **BDNF = brain derived neurotrophic factor**
 - Consolidates connections between neurons
 - Promotes growth of myelin to make neurons fire more efficiently
 - Acts on stem cells in the hippocampus and PFC to grow into BRAND NEW NEURONS!
- **Increase your neurogenesis with...**
 - Exercise (Sleiman et al., 2016)
 - Meditation (Cahn et al., 2018)
 - Incorporating Omega-3s into your diet (Agh et al., 2016)
- **Decrease your neurogenesis by...**
 - Aging (sorry!)
 - Experiencing chronic stress
 - Marijuana use
 - Excessive alcohol use

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Limbic System



Insula

- Site of proprioception and interoception
- Helps you feel into the body, for "felt sense"
- Translates sensations into emotions

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Limbic System


Limbic System

Nucleus Accumbens

"Addiction Center"

Involved in reward, laughter, pleasure, addiction

Important component of the reward pathways of the brain



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Limbic System


Limbic System

Cingulate Cortex

"Self-regulation center" – regulates thoughts, emotions, behavior

Involved in monitoring conflict, emotion regulation, pain expectancy


Is a limbic and cortical structure (two-in-one)



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Cortical Areas

Cortical Areas



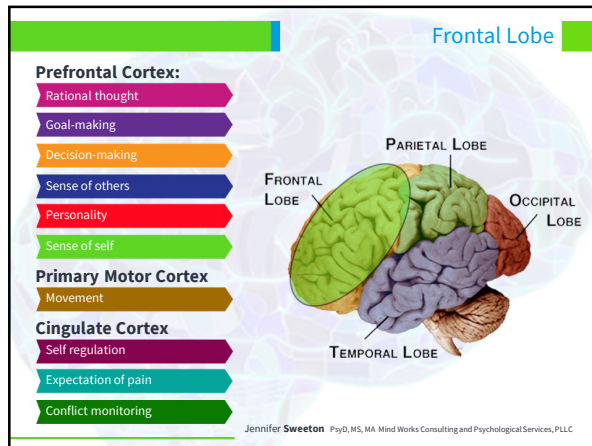
Triune Brain

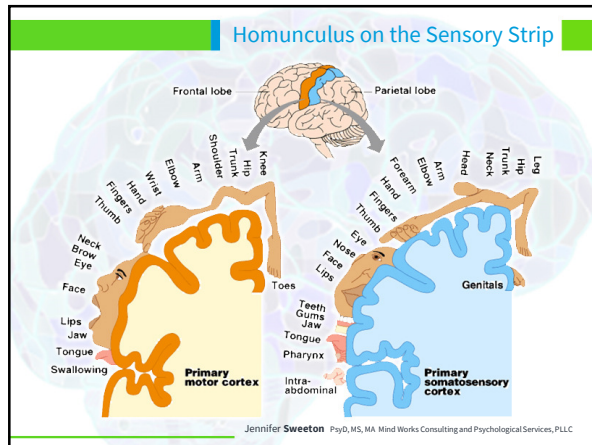
Survival Brain Reptilian (Lower brain)

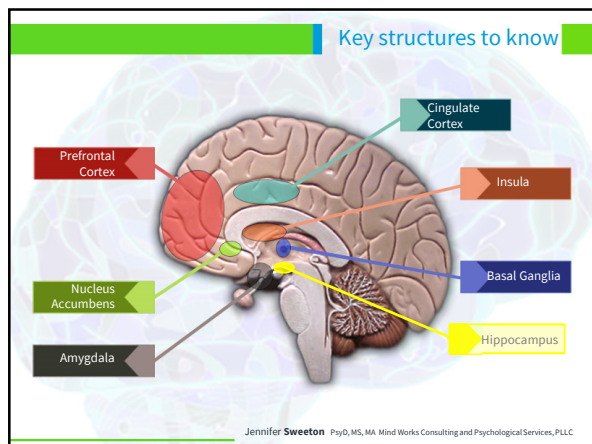
Emotional Brain Limbic (Interior area)

Thinking Brain (Cerebral cortex)

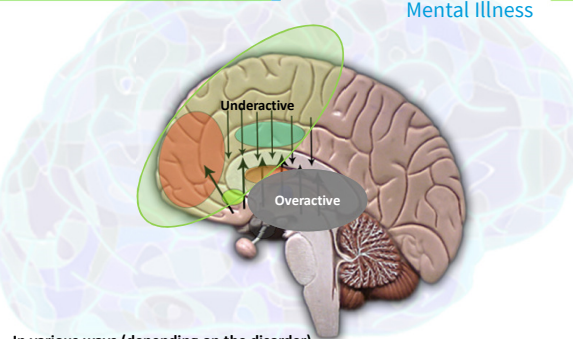
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Neuroscience of Mental Illness




In various ways (depending on the disorder), the brain is "bottom heavy"...

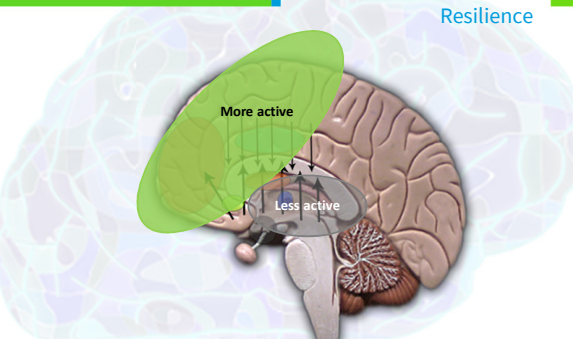
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"I'm Triggered."

<https://www.youtube.com/watch?v=yCu0LSggqvU>

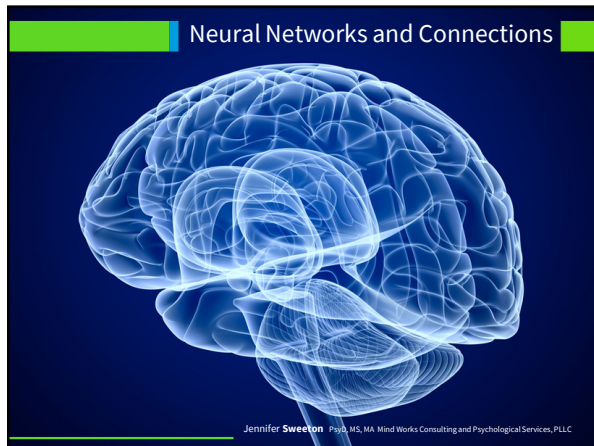


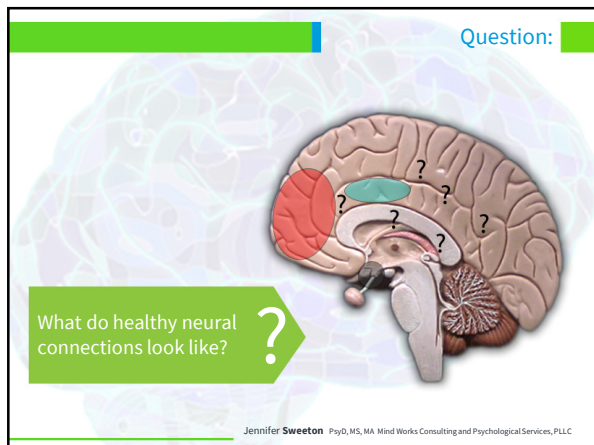
Neuroscience of Resilience

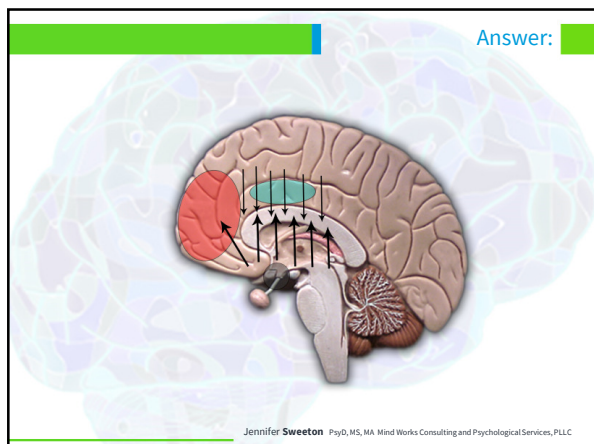


In various ways (depending on the disorder), the brain is "bottom heavy"...

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Answer:

Strong afferent connections make us reactive, impulsive...

Weak efferent connections make it difficult to down-regulate strong emotions...

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Question:

What do resilient neural connections look like?

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Neuroscience of Resilience

Reversing the connections makes it so that we are less reactive, have more presence of mind, and are more resilient (can better cope with psychological injury)...

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Cognitive Control Network

Active during focused attention and cognitive control, such as when we...

- Are engrossed in an activity requiring mental effort
- Are paying attention to the present moment
- Problem-solve
- Set goals
- Make decisions

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Default Mode Network

Active during times when we are not exerting effortful cognitive control. Our "default state" or "neutral state," such as when we...

- Daydream
- Are between being awake and asleep
- Spontaneously remember things from the past (as opposed to effortful recall)
- Think about ourselves
- Drive mindlessly

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Areas of the Networks

When you switch off, a distinct network of brain areas not involved in focused attention bursts into action

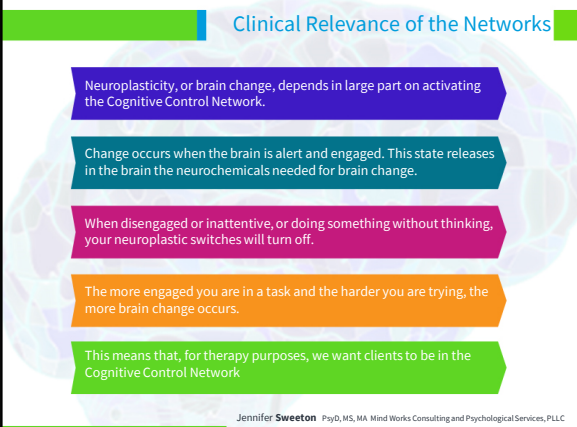
INSIDE LEFT HEMISPHERE

- Default network
- Cognitive Control Network

OUTSIDE LEFT HEMISPHERE

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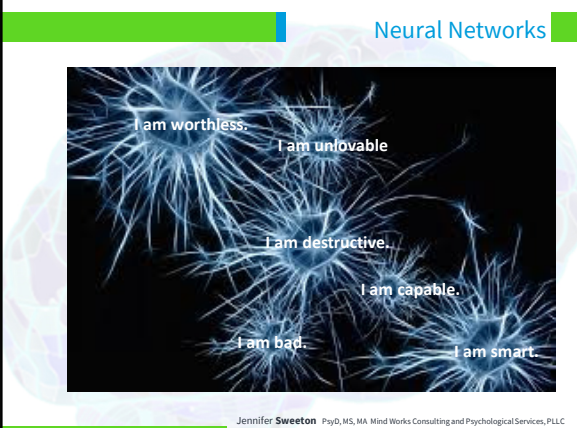
Clinical Relevance of the Networks



- Neuroplasticity, or brain change, depends in large part on activating the Cognitive Control Network.
- Change occurs when the brain is alert and engaged. This state releases in the brain the neurochemicals needed for brain change.
- When disengaged or inattentive, or doing something without thinking, your neuroplastic switches will turn off.
- The more engaged you are in a task and the harder you are trying, the more brain change occurs.
- This means that, for therapy purposes, we want clients to be in the Cognitive Control Network

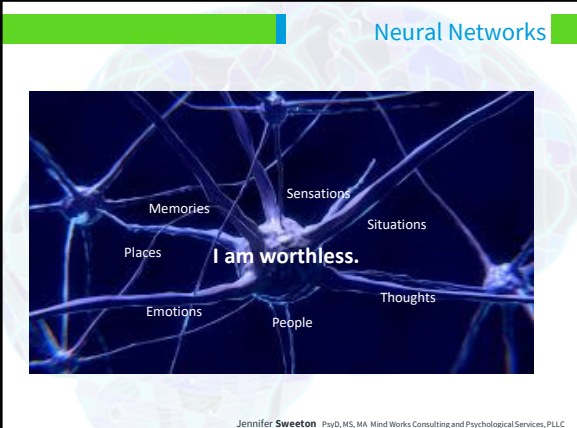
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Neural Networks



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Neural Networks



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Rules of Neuroplasticity

1. Neurons that fire together wire together (Hebb's Rule, 1949)
2. Use it or lose it.
3. You have to activate a network to change it.
4. Your attention is the network you're in.
5. State to Trait: Repetition and effort promotes brain change.
6. Brain change is active, not passive.


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What does therapy aim to change?

- **Activations**
 - Increase some...
 - Decrease others...
- **Connections and pathways**
 - Strengthen some...
 - Weaken others...
- **Networks**
 - Activate/de-activate
 - Shift them...
 - Loosen them...
 - Integrate them...

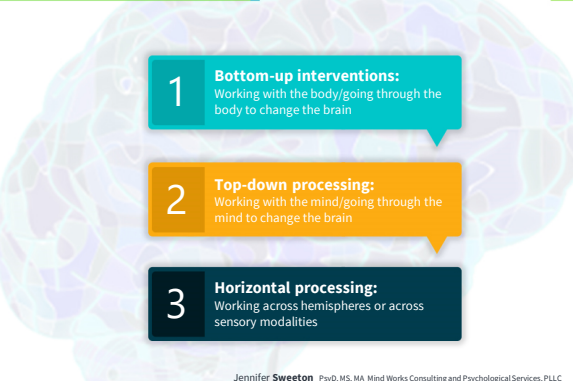
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Brain-Changing Interventions



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Three Types of Interventions

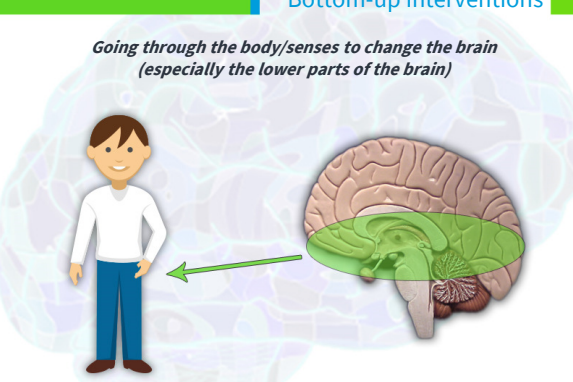


- 1 Bottom-up interventions:**
Working with the body/going through the body to change the brain
- 2 Top-down processing:**
Working with the mind/going through the mind to change the brain
- 3 Horizontal processing:**
Working across hemispheres or across sensory modalities

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Bottom-up Interventions

Going through the body/senses to change the brain (especially the lower parts of the brain)



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Bottom-up Interventions

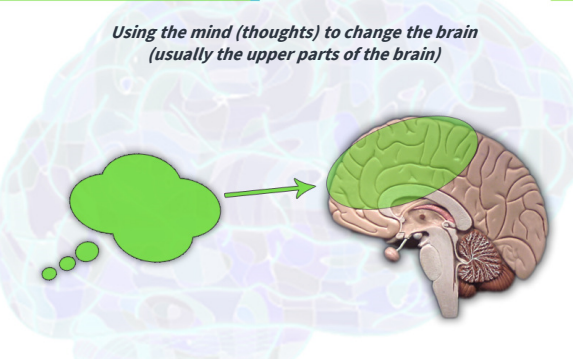


- 01 Sensory awareness or exposure techniques
- 02 Interoceptive awareness or exposure techniques
- 03 Proprioceptive awareness or exposure techniques
- 04 Yoga
- 05 Qigong
- 06 Diaphragmatic breathing
- 07 Body scan
- 08 Progressive muscle relaxation
- 09 Autogenic training (both bottom-up and top-down)
- 10 Exercise

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Top-down Interventions

*Using the mind (thoughts) to change the brain
(usually the upper parts of the brain)*



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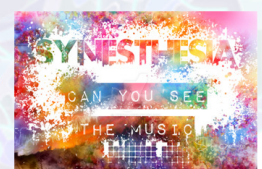
Top-down Interventions

Cognitive restructuring/ reappraisal	Autogenic training (both bottom-up and top-down)
Acceptance and Commitment Therapy cognitive exercises	Talk therapy
Open monitoring meditations	Assertiveness training, communication techniques
Focus/concentration meditations	Many evidence-based interventions

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Horizontal Interventions

- 1 Processing across modalities
or hemispheres
- 2 Art and music therapies
- 3 Sensory Integration
- 4 EMDR



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Question:

When do you think horizontal interventions might be most helpful to a client?

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Question:

Should we start with top-down approaches or bottom-up approaches with our clients? And why?

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Answer:

1 **Bottom-up** for most disorders, since most disorders contain a stress component. When stress is involved the amygdala becomes overactive, and it then suppresses activation of the "thinking area" of the brain.

2 When the PFC is underactive it becomes extremely difficult to engage in top-down interventions (such as cognitive therapy) with success.

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Treatment Roadmap

Five-Phase Neuropsychotherapy Treatment Roadmap

1. Develop therapeutic alliance (bottom-up)
2. Develop “felt sense”(bottom-up)
3. Reduce subcortical activations (bottom-up/top-down)
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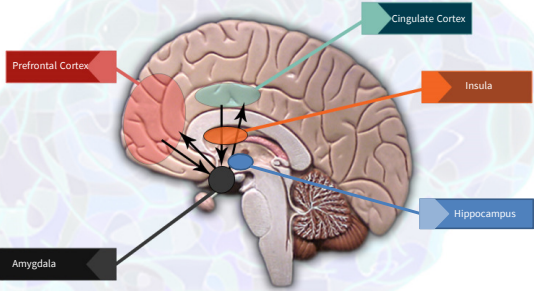
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Brain Profiles of Common Disorders

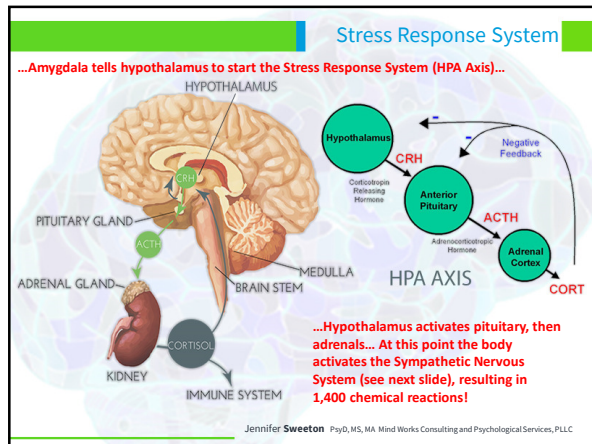


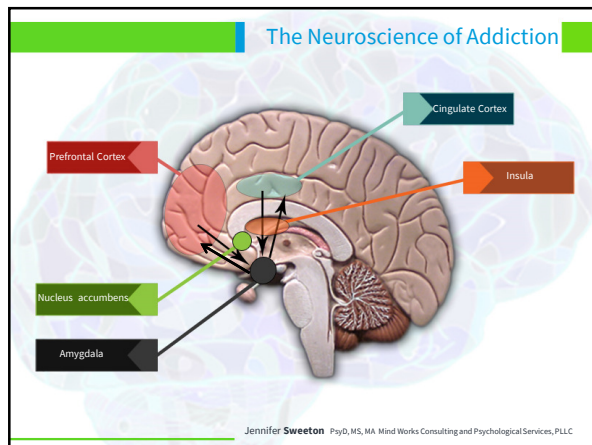
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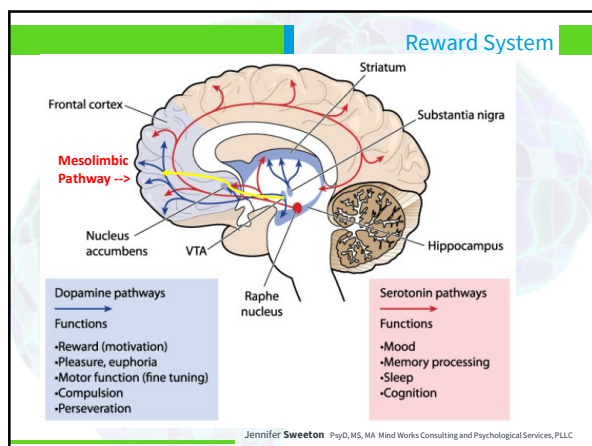
The Neuroscience of Anxiety and Trauma



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Reward Pathway

Mesolimbic Pathway (Dopaminergic Pathway):
Involved in reward, pleasure, addiction. Three areas:

- 1 Ventral Tegmental Area** releases dopamine for the pathway
- 2 Nucleus Accumbens** (aka Ventral Striatum) involved in reward, laughter, pleasure, addiction
- 3 PFC** appraises/interprets pleasurable stimuli

Other reward circuits are also involved in reward and pleasure, but also habit formation and motivation.

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The Neuroscience of Depression

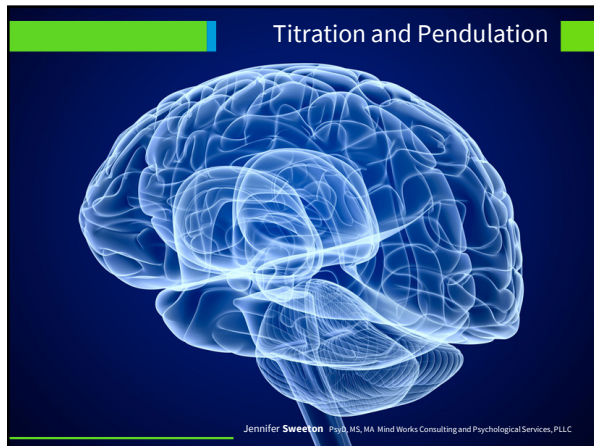
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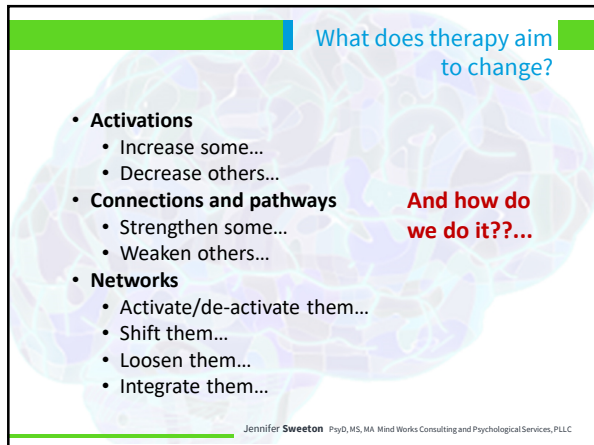
Treatment Roadmap

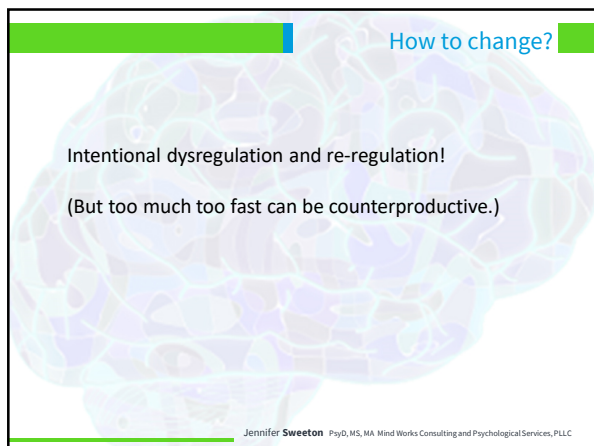
Five-Phase Neuropsychotherapy Treatment Roadmap

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Incorporating Pendulation and Titration

- Emotion induction is a “pendulation” strategy which builds emotion-regulation skills.
- Pendulation is the movement between regulation and dysregulation. The client is helped to move to a state where he or she is dysregulated, and then iteratively helped to return to a state of regulation.
- “Titration” allows the client to experience small amounts of the event's distress at a time in order to release the stored energy and allow their nervous system to return to balance.

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Science of Pendulation

1. Slightly increase amygdalar activation (titration/pendulation)
 2. Help client re-regulate. Ex: Working through the body (utilizing the breath), send signals up to the amygdala to calm down....
- The breathing/body activates the parasympathetic nervous system and disarms the amygdala.
 - When you are able to reduce amygdalar activation after a stressor, you have successfully regulated emotion and reversed the stress response.
 - You feel more in control, and able to manage overwhelming emotions.

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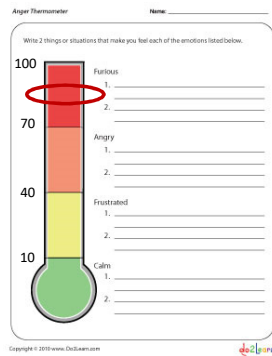
Distress Thermometer

- Staying stabilized, within “degrees of freedom” (DoF) is critical.
- Leaving DoF leads to dissociation or “losing your mind” (amygdalar hijacking)
- Distress thermometer = 1-100, where 1 is no distress and 100 is the worst possible distress
- Want to identify approximate upper and lower limits of distress thermometer (“boiling point” and “freezing point” if applicable)
- Checking in with “temperature” increases “dual awareness,” which is when the client can both experience and observe a phenomenon at the same time.
- **Dual awareness can reduce feelings of guilt, blame, and shame.**

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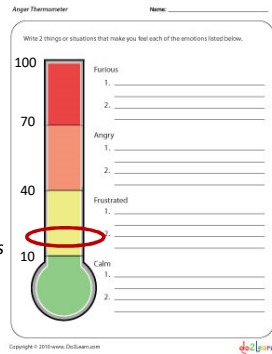
Distress Thermometer

- Ask, “Do you have a sense of where your own ‘boiling point’ is, the point at which you feel overwhelmed or out of control?”
- Define the upward “anchor” as an example of this.



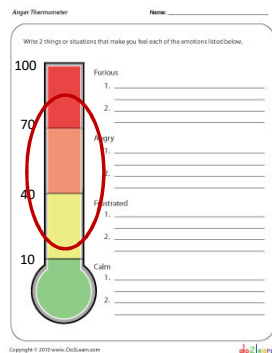
Distress Thermometer

- Ask, “Do you have a sense of where your own ‘freezing point’ is, the point at which you feel disconnected, dissociated, or frozen?”
- Define the downward “anchor” as an example of this.




Distress Thermometer

- Between these points is your “Degrees of Freedom”
- This is where therapy is done!
- **Resourcing is needed when the boiling or freezing points are approached.**



Phase I: Develop Therapeutic Alliance



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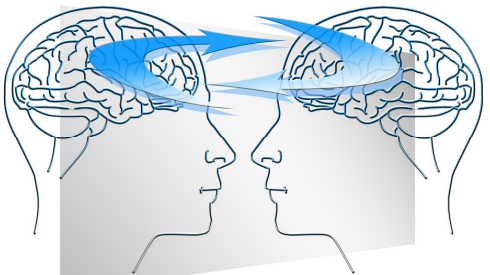
Phase I: Develop Alliance

- Therapeutic alliance = Bottom-up approach to therapy
- The therapeutic alliance accounts for between 15-50% of the outcome variance (depending on which studies you believe).
- Various bodies of research indicate that *brains can interact with and influence other brains...*
 - Brain waves align when people make eye contact and “attune”
 - Mothers can soothe infants and reduce their cortisol by focusing on them using their PFC (through eye contact and touch)

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Neuroscience of the
Therapeutic Alliance

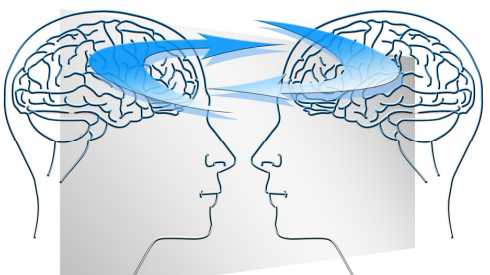
What is the mechanism?



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Neuroscience of the
Therapeutic Alliance

What is the mechanism? **MIRROR NEURONS!**



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Discovery of Mirror Neurons

- Mirror Neuron Hypothesis: There is a link between particular neurons in our own brain and other people's actions.
- Dual action: Brain contains a system of neurons that fire in response to the intentional actions of others, and when we perform those actions (Gallese, Fadiga, Fogassi, & Rizzolatti, 1996).
- Emotional centers also have mirror-like qualities (Singer et al., 2004)

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Implications of Mirror Neurons

- Mirror neurons are the neural mechanism of the therapeutic alliance.
- They allow clients to have a different, (hopefully) reparative *experience* in therapy.
- Clients can, through this alliance, re-learn and heal attachment.
- **The therapeutic alliance remains the MOST important “approach” or “technique” you will use with a client.**

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Mirror Neurons

- Activate mirror neurons
 - Eye contact/listening
 - Mirroring
 - Following
- Monitor Transference/Countertransference
 - Somatic and cognitive/emotional countertransference
- Recalibrate Boundaries
 - Too rigid = not enough merging
 - Too loose = too much merging

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Social Medicine is Real!

- Connection with others – “social medicine”:
 - Reduces cardiovascular reactivity (Lepore, et al, 1993)
 - Reduces blood pressure (Spitzer, et al, 1992)
 - Reduces vulnerability to catching a cold (Cohen, et al, 2003)
 - Reduces anxiety (Cohen, 2004)
 - Slows cognitive decline (Bassuk, et al 1999)
 - Improves sleep (Cohen, 2004)
 - Improves depression (Russell & Cutrona, 1991)
 - **Reduces cortisol levels (Kiecolt-Glaser, et al, 1984)**

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The chemical side...


Oxytocin vs. Cortisol

https://www.ted.com/talks/kelly_mcgonigal_how_to_make_stress_your_friend/transcript?language=en

“Your biological stress response is nudging you to tell someone how you feel, instead of bottling it up.”

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Mirroring Exercise




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Rethinking transference and countertransference

- Transference, countertransference, projective identification – these contain useful clinical information!
- Goal is therapeutic mirror neuron activation/merging, through boundary calibration and recalibration.

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Phase II: Develop “Felt Sense”



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Treatment Roadmap

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Anchoring Into the Present
(Outside-In)

Connect with three surfaces and notice how they feel different from one another. Notice temperature, texture, etc. Can be done with touch, smell, sound, taste, sight.

Grounding exercises
Sensory awareness techniques
Interoceptive exposure

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Research Support

- Improved cognitive control and pain management (Gard et al., 2012).
- Improved attention and concentration (Malinowski, 2013).
- Increased insula and dACC activation (Critchley, Wiens, Rotshtein, Ohman, & Dolan, 2004).

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Distress in the Body
(Inside-In)

Slowly, safely connect with the body; can start with a body scan for this and identify "safe" or "strong areas" (for resourcing)

Inquire about distress in the body, both at "baseline" and when stressed. See handout for example questions!

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Interoceptive Exposure
(Inside-In)

Evidence-informed technique that helps traumatized individuals build interoceptive awareness by connecting external movement and sensations with internal experiences.

This is primarily done by physically connecting with the breath and heartbeat using the hands.

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Research Support

- 1 Improved self-regulation and sense of well-being (Herbert & Pollatos, 2012; Gu & Fitzgerald, 2014).
- 2 Improved emotional balance (Seth, 2013).
- 3 Increased ability to be in the present moment and to focus (Seth et al., 2011).
- 4 Improved ability to sustain attention (Bishop, Lau, Shapiro, Carlson, Anderson, Carmody, et al., 2004).
- 5 Increased dACC and insula activation (Critchley, Wiens, Rotstein, Ohman, and Dolan, 2004).

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Phase III: Reduce Subcortical Activation

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Treatment Roadmap

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Mindful Breathing: Diaphragmatic Breathing

"Mindful breathing is a technique whereby individuals direct their awareness and attention to their breath, and to any sensations that arise (Kabat-Zinn, 1990)."

Breathing techniques are recommended for anxiety management (Davis et al., 2008) due to their ability to reduce autonomic arousal and amygdalar activity.


Techniques can be open or closed, and are largely bottom-up.

BUT, for breathing exercises to work we need to breathe through our diaphragm!

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Mindful Breathing: Vagus Nerve


- 10th cranial nerve
- Activates the PNS
- Depends on acetylcholine to function
- Relaxes you and reduces inflammation
- Stimulated through diaphragmatic breathing!



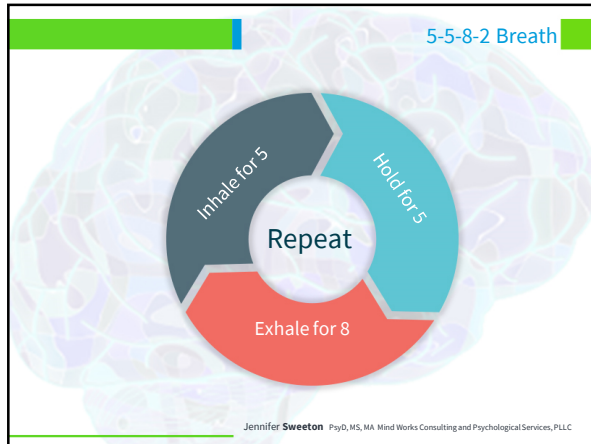
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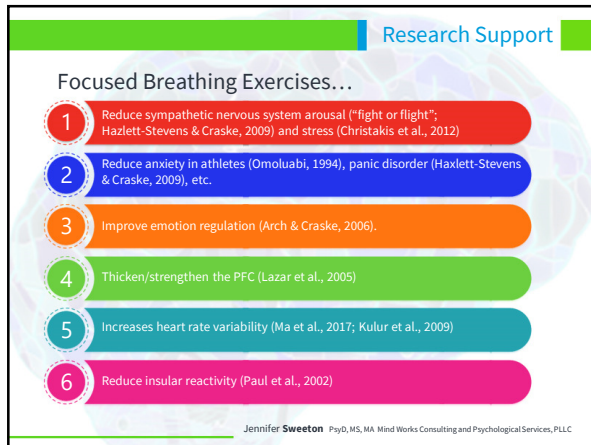
Mindful Breathing: Vagus Nerve

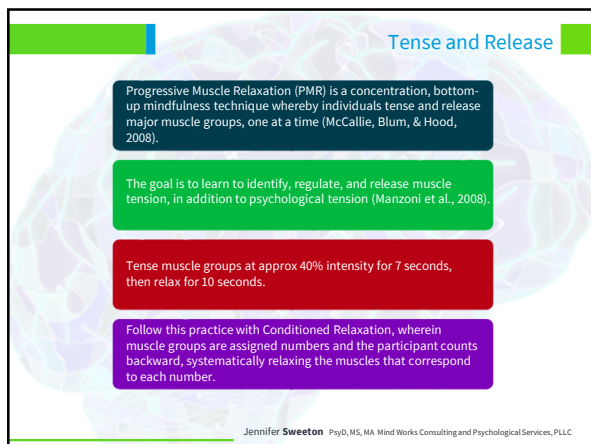
- Wonder woman pose
- La-Z-Boy pose
- Sit on your hands
- Halasana (and other yoga poses)



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Research Support

- 1 Increases HRV, reduces cardiovascular indices of stress (Green, 2011)
- 2 Normalizes cortisol levels (Dolbier & Rush, 2012)
- 3 Reduces depression (Lolack et al., 2008), anxiety (Chen et al., 2009)
- 4 Medium/large effect sizes for generalized anxiety and panic (Manzoni et al., 2008).
- 5 Reduces headaches (Sanjiv & Apurva, 2014)

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Autogenic Training

Mindfulness technique where person focuses on selected sensations (Gonzalez de Rivera, 1997) in order to achieve psychophysiological relaxation (Stetter & Kupper, 2002).

Autogenic training improves self-regulatory capacities and trains individuals to modify the functioning of their autonomic nervous system by repeating a sequence of statements about warm and heavy sensations felt throughout the body.

Redirects blood flow to promote relaxation, instead of tension/anxiety.


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Research Support

- 1 Increases heart rate variability and improves vagal heart control (Lim & Kim, 2014; Miu, Heilman, & Micalea, 2009), thereby reducing individuals' level of stress and anxiety
- 2 Reduces anxiety and insomnia (e.g., Bowden, Lorenc, & Robinson, 2012; Dhiman & Harneet, 2010)
- 3 Improves self-monitoring and self-regulation (e.g., Shinozaki et al., 2010; Yagi & Sakurai, 2009)
- 4 Increases insula activation and self-awareness (Schlammann, Naglatzki, de Greiff, Forsting, and Gizewski, 2010)

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Phase IV: Activate Cortical Structures



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Treatment Roadmap

Five-Phase Neuropsychotherapy Treatment Roadmap

1. Develop therapeutic alliance (bottom-up)
2. Develop "felt sense"(bottom-up)
3. Reduce subcortical activations (bottom-up/top-down)
4. Increase cortical activations (top-down)
5. Alter brain connectivity (bottom-up/top-down)

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Integrated Systems Check

- An open awareness, bottom-up AND top down meditation in which the person "checks in" with their thoughts, emotions, body, and breath
- Can be done in 3 minutes, or 30 minutes

Four steps:

Check in with the body

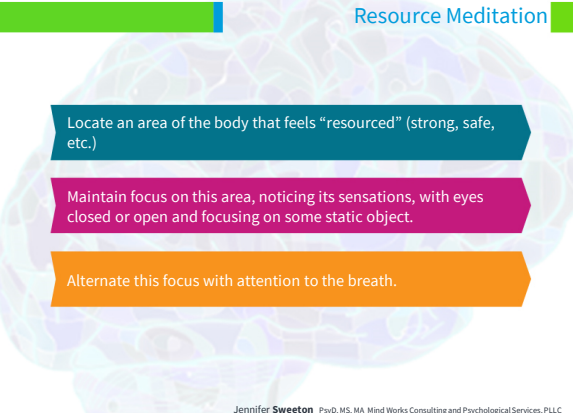
Check in with emotions

Check in with thoughts

Notice the link between thoughts, emotions, and physical sensations

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Resource Meditation



- Locate an area of the body that feels "resourced" (strong, safe, etc.)
- Maintain focus on this area, noticing its sensations, with eyes closed or open and focusing on some static object.
- Alternate this focus with attention to the breath.

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Research Support

Meditations...

- 1 Enhance cognitive abilities (Xion & Doraiswamy, 2009)
- 2 Improve empathy (Fulton, 2005; Zha- piro & Izett, 2008).
- 3 Reduce stress and anxiety (Chiesa & Seretti, 2009; Hofmann et al., 2010)
- 4 Increased activation of PFC and ACC (Fox et al., 2014)
- 5 Reduces amygdalar activation (Taren, Creswell, & Gianaros, 2013)

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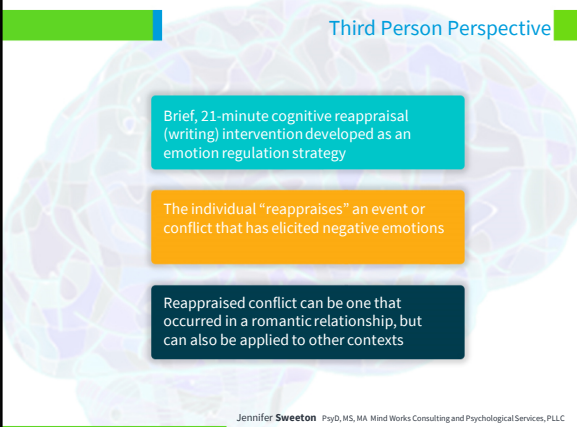
Remembering Your Past Self



- Describe a recent disappointing or distressing event that you feel anxious or upset about.
- Note emotions related to this event, and what the mind tells you about how you will be impacted by it.
- Now, recall your life 5 years ago, and stressors you had at that time. Are they still part of your daily life? Did they resolve?

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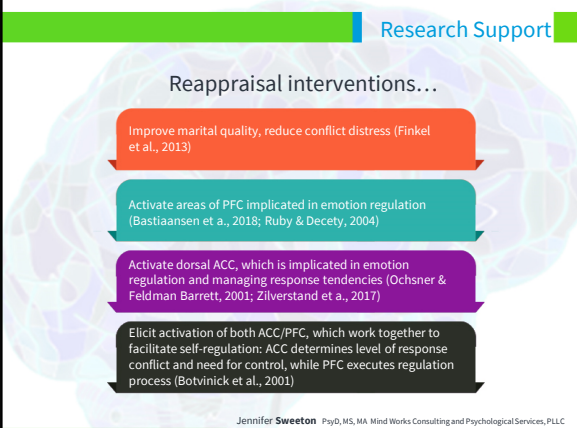
Third Person Perspective



- Brief, 21-minute cognitive reappraisal (writing) intervention developed as an emotion regulation strategy
- The individual "reappraises" an event or conflict that has elicited negative emotions
- Reappraised conflict can be one that occurred in a romantic relationship, but can also be applied to other contexts

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Research Support



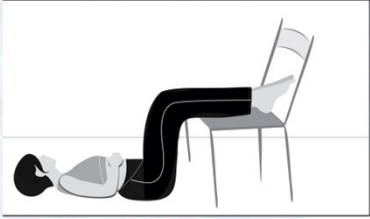
Reappraisal interventions...

- Improve marital quality, reduce conflict distress (Finkel et al., 2013)
- Activate areas of PFC implicated in emotion regulation (Bastiaansen et al., 2018; Ruby & Decety, 2004)
- Activate dorsal ACC, which is implicated in emotion regulation and managing response tendencies (Ochsner & Feldman Barrett, 2001; Zilverstand et al., 2017)
- Elicit activation of both ACC/PFC, which work together to facilitate self-regulation: ACC determines level of response conflict and need for control, while PFC executes regulation process (Botvinick et al., 2001)

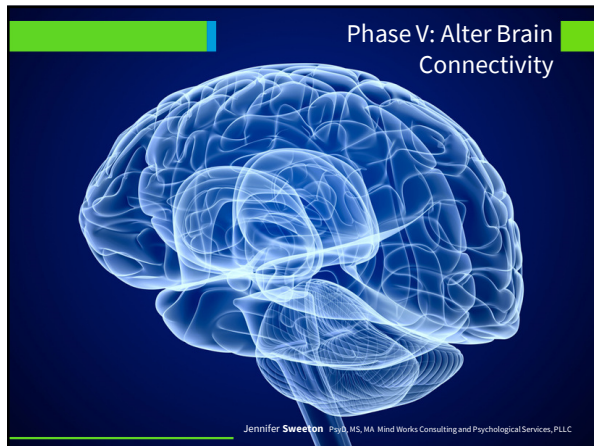
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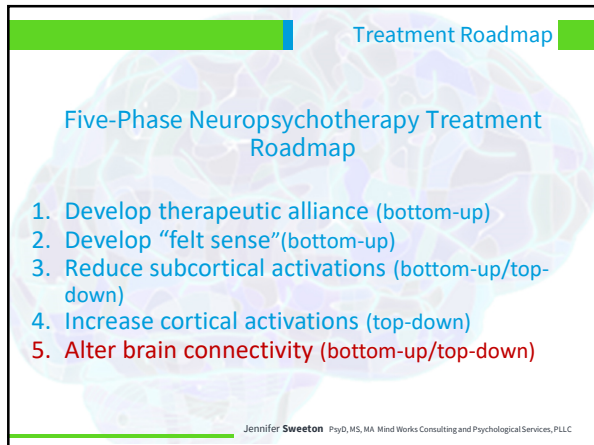
Getting Creative – Combining Bottom-Up and Top-Down

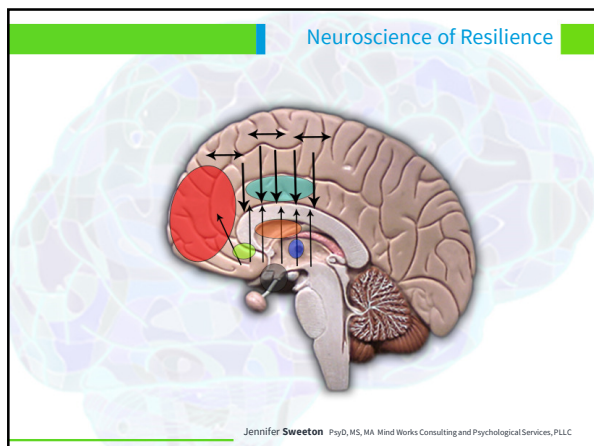
Psoas Relaxation:



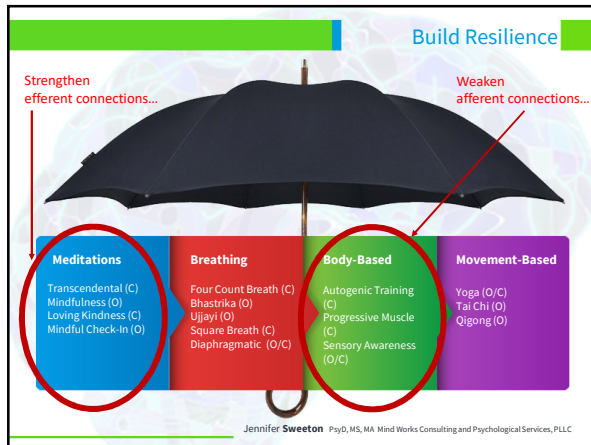
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Thank you!

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