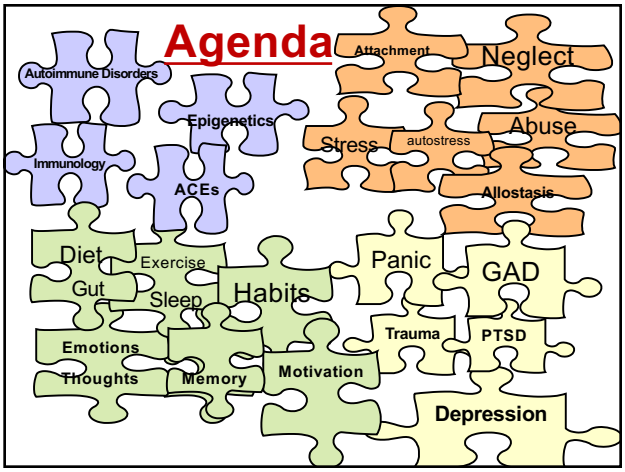
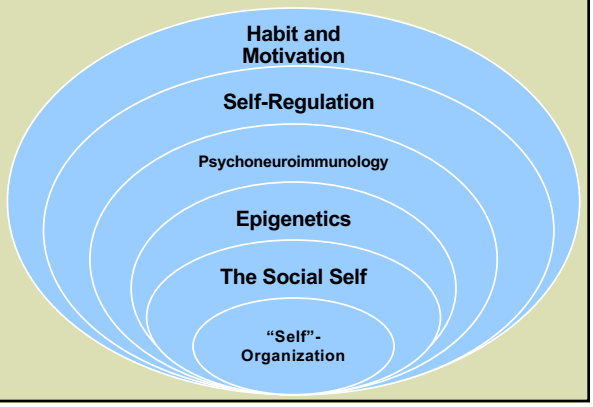
Attachment and Emotion Regulation: Brain-Based Strategies and Interventions

John B. Arden, PhD, ABPP

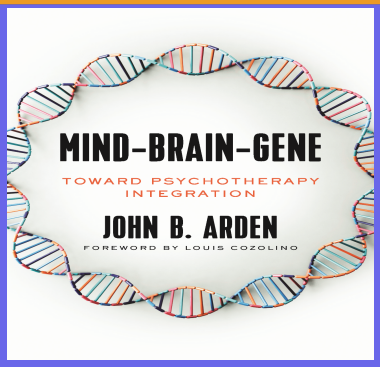
Agenda



Mind-Brain-Gene Feedback Loops



References



Mind-Brain-Gene Feedback Loops

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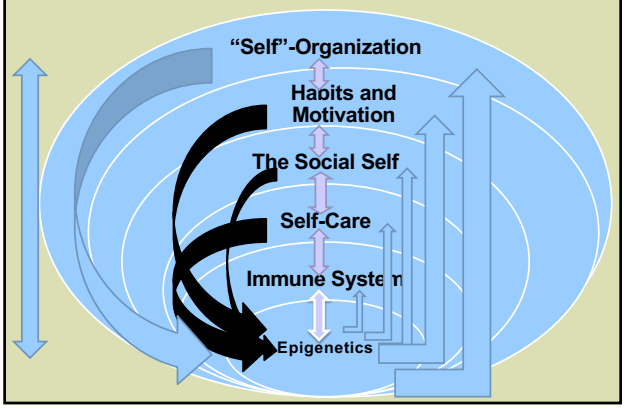


Feedback Loops

Theme Colors

Purple color family and teal—Main presentation

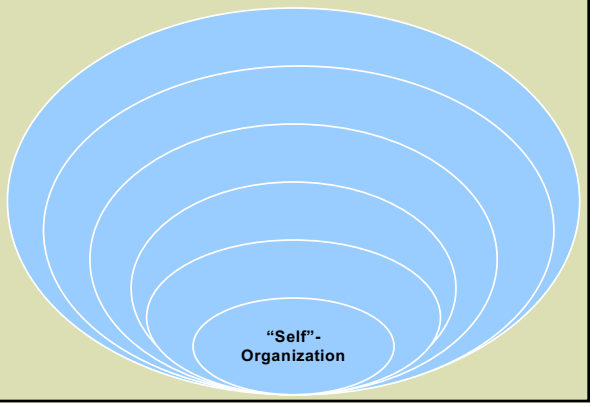
Green—Client information

Yellow—Neuroscience

Red—Anxiety and stress

Blue—Depression

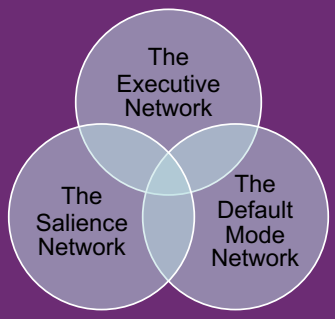
Mind-Brain-Gene Feedback Loops



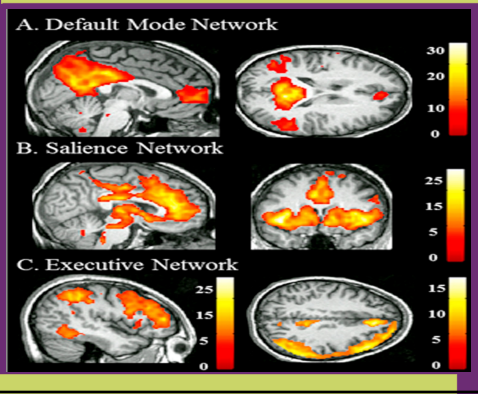
The Mind's Operating Networks:

- **Salience Network:**
- the material "me"
- emotional and reward saliency;
- **Default Mode Network:**
- mind-wandering; fantasying, ruminating
- mentalizing, projecting to the future or past;
- **Central Executive Network:**
- moment to moment monitoring of experience
- selection, planning, toward goals;

Balancing the Mental Networks



The Mental Networks



Affect Asymmetry

Set points

Left Hemisphere

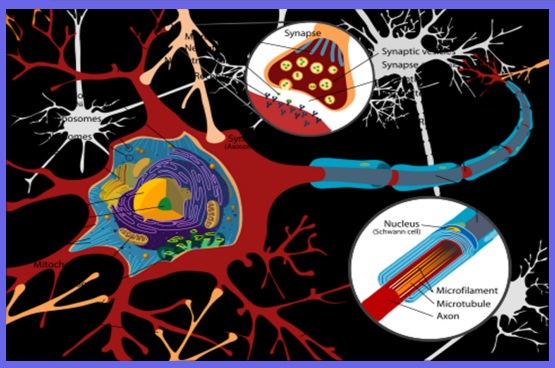
Positive emotions
Approach behaviors
Feeling engaged

Right Hemisphere

Negative emotions
Withdrawal and Avoidance
Feeling overwhelmed

100 Billion Neurons

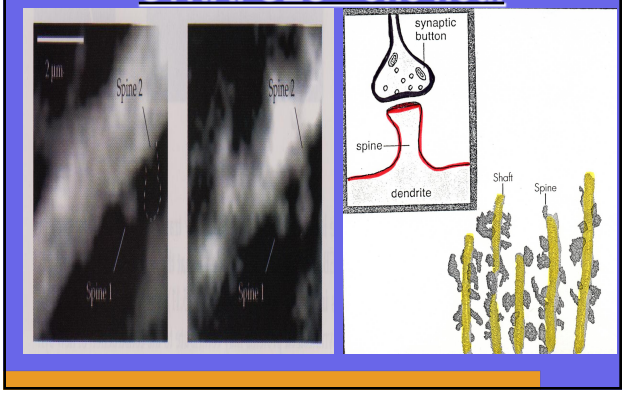
Each with 10,000 synaptic connections



Neurons that fire together, wire together

- *Neuroplasticity* is a general term that describes changes in the brain as you experience and learn (Buonomano & Merzenich, 1998)
- Neuroplasticity involves many changes to the brain including:
  - New synaptic connections
  - Strengthening of connections through LTP
  - The growth of new dendrites (dendritogenesis)
  - Neurogenesis (the growth of new neurons)

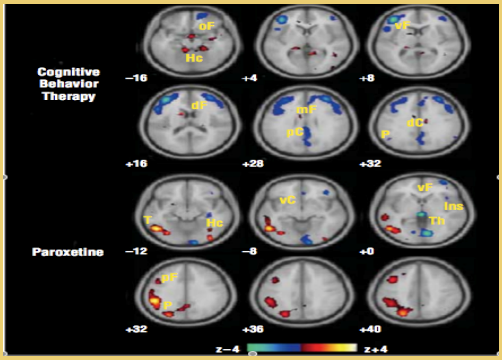
DENDRITE SPINES & SYNAPSES—one hour



Client Education

- Your brain is not hardwired but soft-wired.
- Our job together is to rewire your brain so that you no longer suffer from anxiety and depression.

Brain Change: Two Perspectives



Psychotherapy and the Brain

Direct, observable links between successful CBT/IPT and brain changes

- Reduced amygdalar activity in:
  - phobics (Straube, et al., 2006),
  - panickers (Prasko et al., 2004),
  - social phobics (Furmark et al, 2002)
- Increased ACC activation in PTSD clients (Felmingham et al., 2007)
- Increased hippocampal activity in depressives (Goldapple et al., 2004)
- Decreased caudate activity in OCD (Baxter, et al., 1992)

Mind-Brain-Gene Feedback Loops

The ACE Study

- Examined the health effects of ACE's throughout the lifespan among 17, 421 members of Kaiser Permanente in San Diego county
- What are Adverse Childhood Experience?
  - Childhood abuse and neglect
  - Growing up with domestic violence, substance abuse, parental discord, crime, or mental illness in the home

Categories of Adverse Childhood Experiences

Abuse, by Category	Category Prevalence (%)
• Psychological (by parents)	11%
• Physical (by parents)	11%
• Sexual (anyone)	22%
Household Dysfunction, by Category	
• Substance Abuse in family	26%
• Mental Illness in family	19%
• Domestic Violence	13%
• Imprisoned Household Member	3%
• Loss of parent	23%

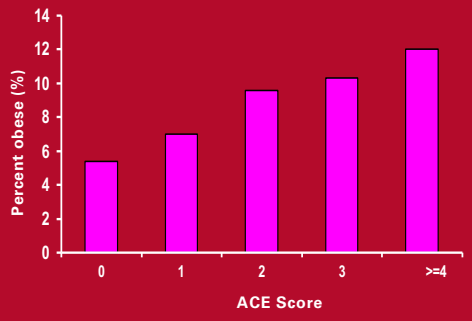
ACEs score percentages

Number of categories of childhood experiences are summed

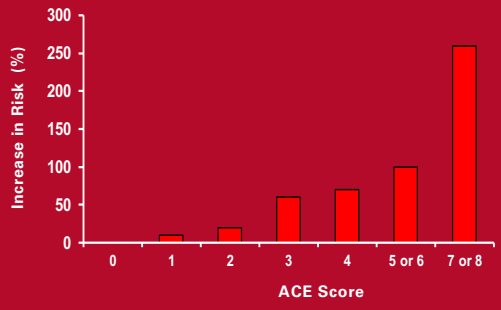
ACE Score	*Prevalence*
0	48%
1	25%
2	13%
3	7%
4	7%

- More than *half have at least one ACE*
- Slightly more than one quarter have experienced 2 – 4 ACE categories

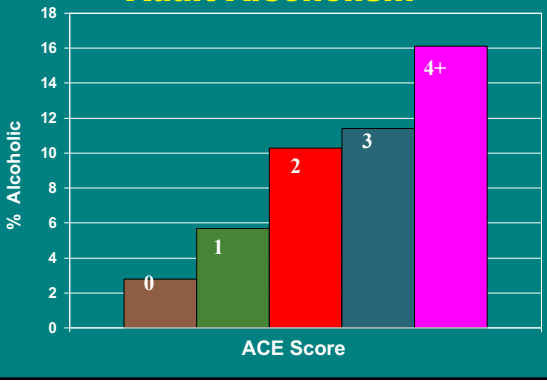
The ACE Score and the Prevalence of Severe Obesity (BMI>35)



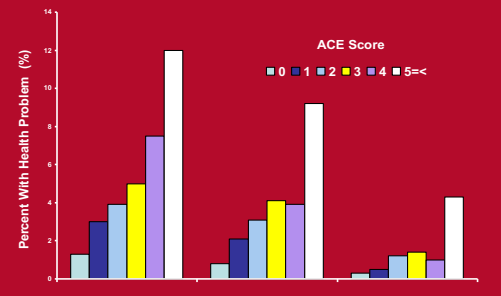
The ACE Score and the Risk of Coronary Heart Disease



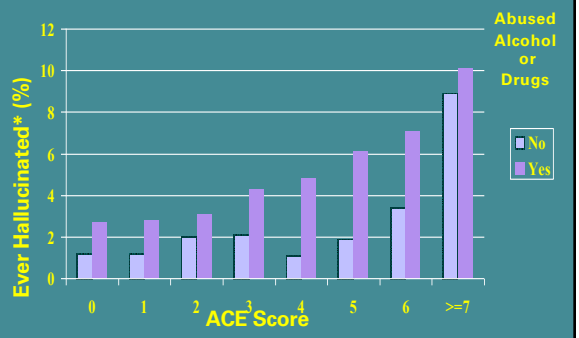
ACE Score and Adult Alcoholism



The ACE Score and Drug Addiction

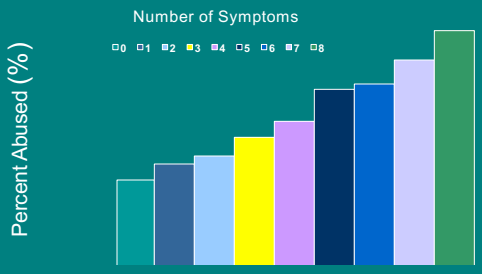


ACE Score and Hallucinations



*Adjusted for age, sex, race, and education.

Childhood Sexual Abuse and the Number of Unexplained Symptoms



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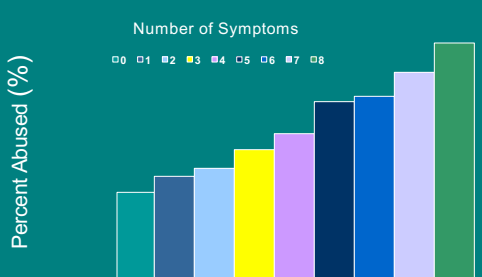
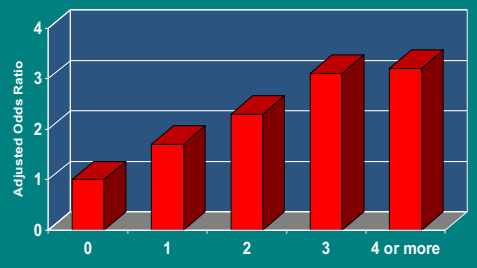
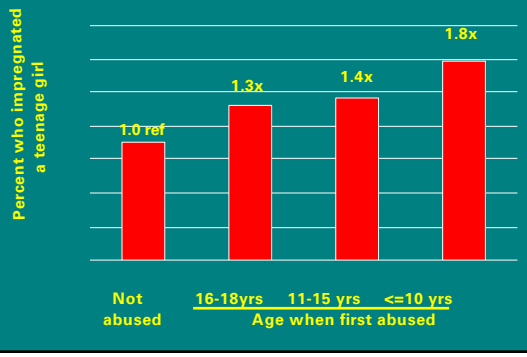


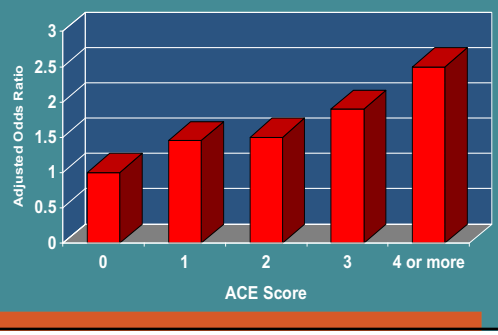
ACE Scores and Likelihood of > 50 Sexual Partners

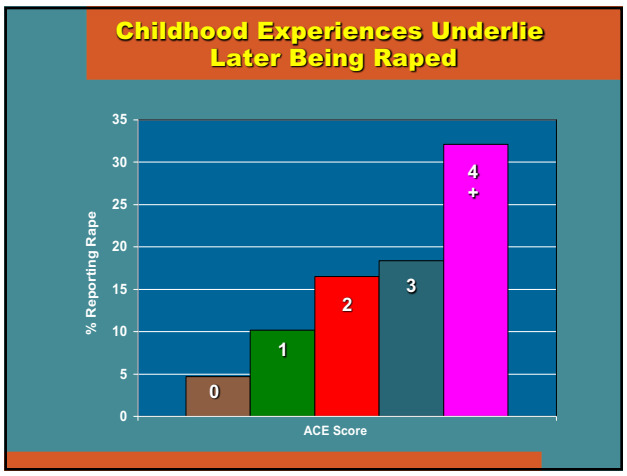


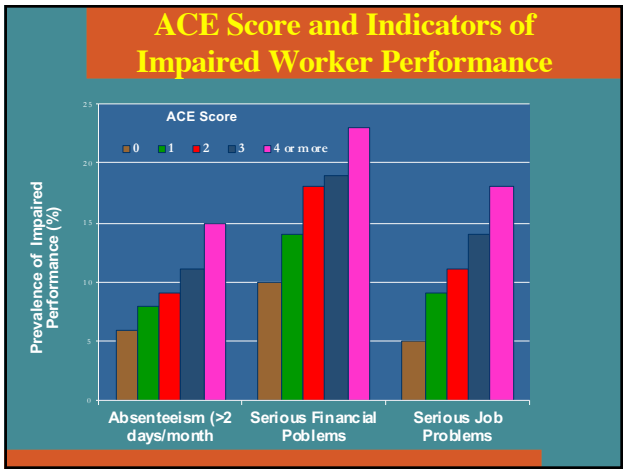
Sexual Abuse of Male Children and Their Likelihood of Impregnating a Teenage Girl

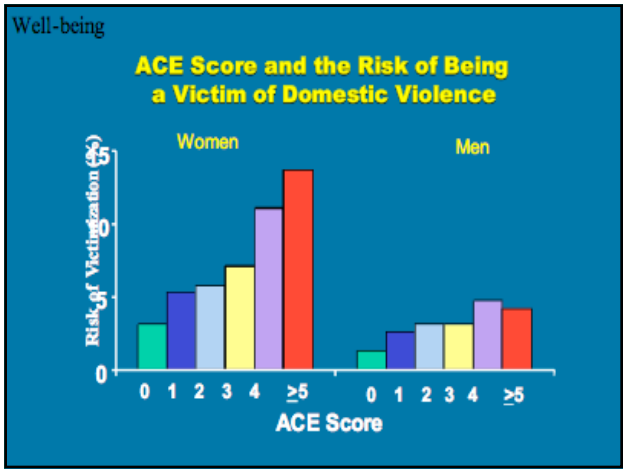


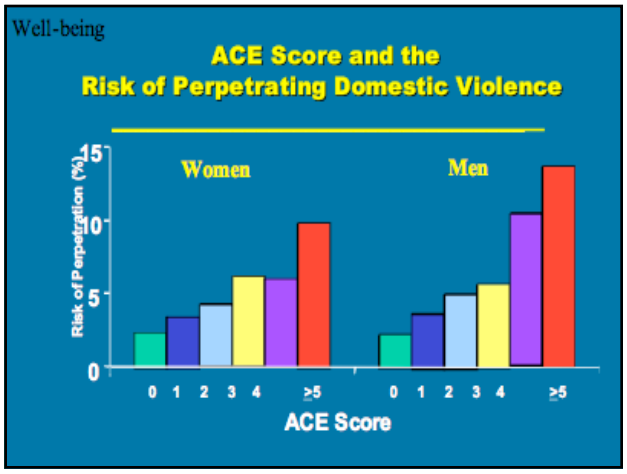
ACE Scores and History of STDs

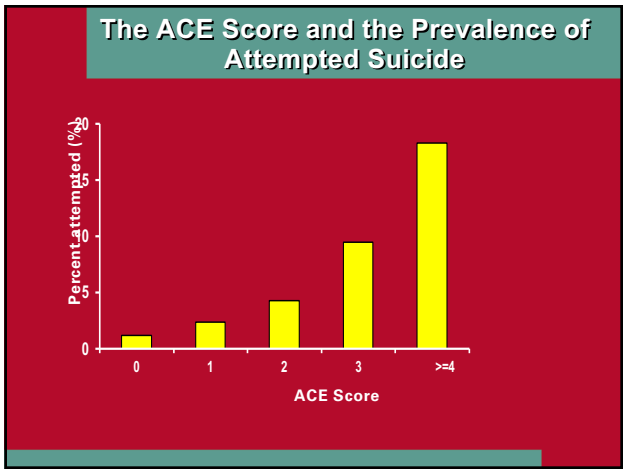


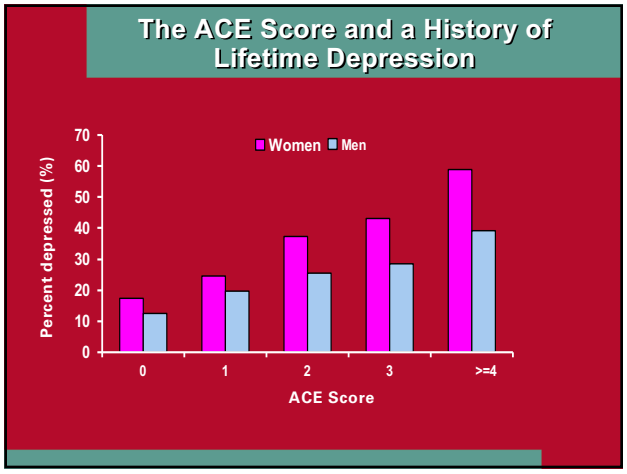

Childhood Experiences Underlie Later Being Raped
% Reporting Rape
35
30
25
20
15
10
5
0
0
1
2
3
4 +
ACE Score


ACE Score and Indicators of Impaired Worker Performance
Prevalence of Impaired Performance (%)
ACE Score
0
1
2
3
4 or more
Absenteeism (>2 days/month
Serious Financial Poblems
Serious Job Problems

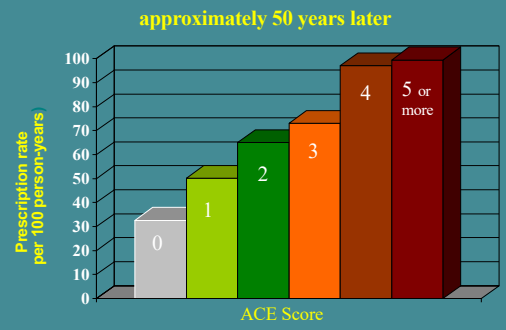

Well-being
ACE Score and the Risk of Being a Victim of Domestic Violence
Women
Men
Risk of Victimization (%)
0
0 1 2 3 4 ≥5
0 1 2 3 4 ≥5
ACE Score


Well-being
ACE Score and the
Risk of Perpetrating Domestic Violence
Women
Men
Risk of Perpetration (%)
15
10
5
0
0 1 2 3 4 ≥5
0 1 2 3 4 ≥5
ACE Score

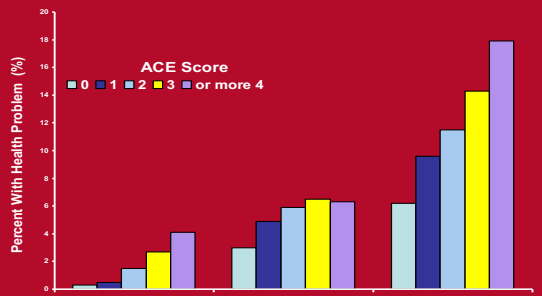

The ACE Score and the Prevalence of Attempted Suicide
Percent attempted (%)
20
15
10
5
0
0
1
2
3
>=4
ACE Score


The ACE Score and a History of Lifetime Depression
Women
Men
Percent depressed (%)
70
60
50
40
30
20
10
0
0
1
2
3
>=4
ACE Score

ACE Score and Rates of Antidepressant Prescriptions



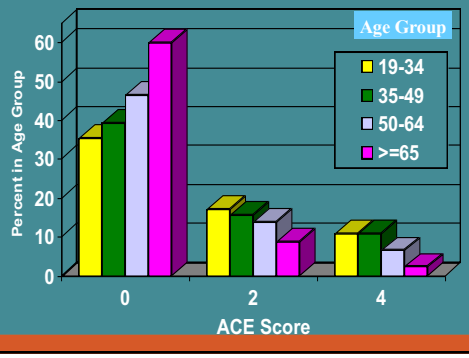
ACE Score and HIV Risks

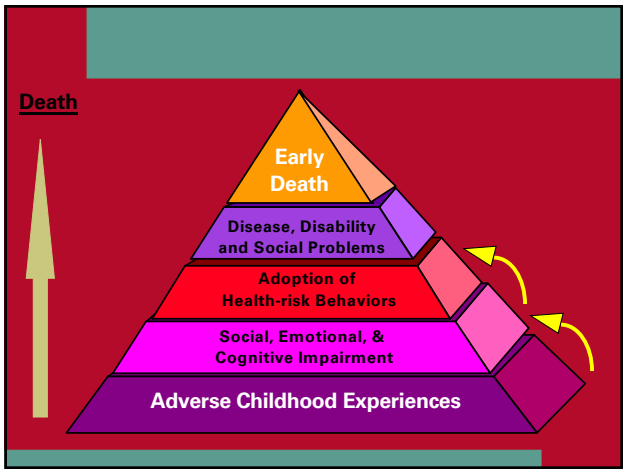


A Connection with Homelessness

- Mental illness and substance abuse problems are more common among homeless people
- ACEs connection to substance abuse and mental illness
- Even non-homeless people with either substance abuse problems or mental illness are less likely to hold a job
- More than half of sample with ACE Score of 4 or higher

Effect of ACEs on Death Rate





Hungry Social Networks

- Brain development involves many forms:
  - the establishment of synaptic connections
  - the pruning of others
  - changes to the behavior of a single ion channel
  - dendritic outgrowth
  - changes to the shape and number of sprouting new axons
  - modifying their dendritic surfaces

(Kolb & Gibb, 2001)

The Effects of Social Medicine

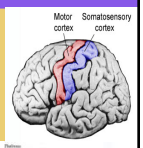
- ↓ Cardiovascular reactivity (Lepore, et al, 1993)
- ↓ Blood pressure (Spitzer, et al, 1992)
- ↓ Cortisol levels (Kiecolt-Glaser, et al, 1984)
- ↓ Serum cholesterol (Thomes, et al, 1985)
- ↓ Vulnerability to catching a cold (Cohen, et al, 2003)
- ↓ Depression (Russell & Cutrona, 1991)
- ↓ Anxiety (Cohen, 2004)
- ↓ Natural killer cells (Kiecolt-Glaser, et al, 1984)
- ↑ Slows cognitive decline (Bassuk, et al 1999)
- Improves sleep (Cohen, 2004)

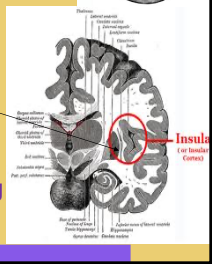
Insula and Touch

Soft touch: C—Tactile fibers (CT)

– Unmyelinated—thus slower, tracks to the:

- insula (part of the Salience Network
- Emotional touch
- Oxytocin
- Impaired in people struggling with forming relationships





Anterior Cingulate Cortex

- ACC integrates cognitive and emotional information (Bush, et al, 2000)
- Active when detecting emotional signals from self and others (Critchley, et al., 2004)
  - The ACC is involved in both physical pain and social rejection (Eisenberger & Lieberman, 2005)
  - The dorsal ACC activates when fear of rejection occurs (Lieberman, 2005)
  - Activated when someone we love experiences pain or social ridicule (Botvinick, et al, 2005)
- Part of neural basis for cooperation (Pilling, et al, 2002)
- Damage results in reduced empathy and/or maternal behavior (Brothers, et al., 1996)

Spindle Cells

- Found in abundance in the OFC, AIC, and ACC---transmitting salience info
- Four times larger than other neurons, with a long extension
- At birth humans have approximately 28,000 spindle cells,
  - growing to 184,000 by age four,
  - 193,000 by adulthood.
- By comparison an adult ape has 7,000.

Mirror Neurons

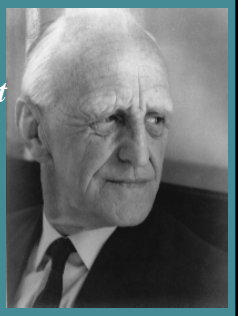
- Originally found in monkeys (Rizzolati & Arbib, 1998)
- Critical for evolutionary development of social skills
  - Associated with anticipating goal-directed behavior
- Associated with empathy (Iacobini; Miller, 2005)
- Found in PFC, posterior parietal lobe, superior temporal sulcus, insula, and cingulate cortex

The Neuroscience of Attachment

- Balance Between the two branches of the Autonomic Nervous System
- Endorphin & Benzodiazepine receptors
- Cortisol Regulation
- Positive Immunological Functioning
- Neural Growth and Plasticity

D.W. Winnicott

- Analysand of Melanie Klein
- *Good-enough parenting*
- The *holding environment*
- *Impingements mirroring*
- *transitional object*



Good-enough parenting and frustration tolerance

- If the baby is matched by instantaneous soothing s/he will not develop the PNS and the brakes to the SNS and HPA axis
- Good enough parenting factors in time before the baby is soothed
  - To anticipate being soothed and activate the parasympathetic nervous system
  - builds in frustration tolerance

The Cost of Loneliness

- In the long-run as detrimental as smoking to longevity (Cacippo & Hawley, 2009)
- The temporal-parietal junction (TPJ)—associated with cognitive empathy is much less activated and can atrophy
  - Creates a downward spiral → less successful → less successful
- Less activity of the ventral tegmental area (VTA) and the nucleus accumbuns
  - Less of a sense of pleasure

Deprived Social Brain Networks

- 150,000 children found languishing in Romanian orphanages. They were emotionally neglected.
- They missed human contact during critical periods (Kuhn & Schanberg, 1998).

Sustained impairment if over one year

- Increased Cortisol
- Impaired OFC
- Cognitive impairments (i.e. ADD)
- Shorter Telemeres

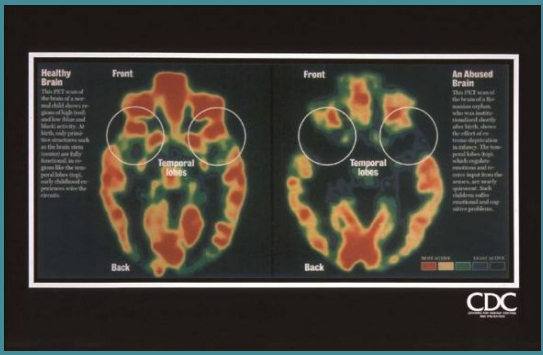
"Normal" vs Romanian Brains

Brain activity of a normal five-year-old child (left) and a five-year-old institutionalized orphan neglected in infancy (right).

Child Abuse and Neuropathology

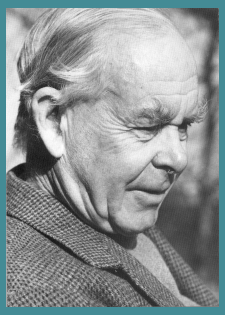
- Diminished left hemisphere and left hippocampal volume (Bremner et al., 1997).
- Accelerated loss of neurons (Simantov, et. al., 1996)
- Delays myelination (Dunlap, et. al., 1997)
- Abnormalities in developmentally appropriate pruning (Todd, 1992)
- Inhibition of neurogenesis (Gould, et. al., 1997)
- Adults who were physically or sexually abused as children – high IL-6 & CRP
  - diminished left hippocampal development (Howe, Roth, & Cicchetti, 2006).

"Normal" vs Abused Brains



John Bowlby (1907 – 1990)

- *Supervised by M. Klein*
- *Safe haven*
- *Attachment figures*
- *Proximity seeking*
  - **infants seek proximity to the attachment figure for safety.**
  - **"Like a thermostat"**



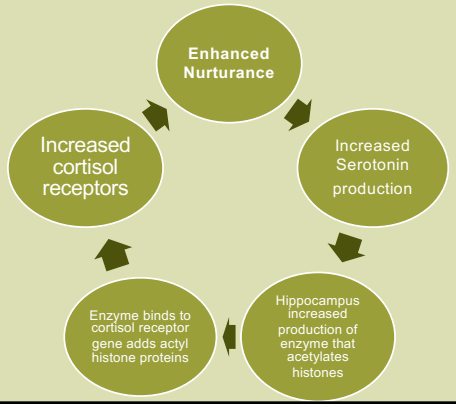
The Neuroscience of Attachment

- Balance Between the two branches of the Autonomic Nervous System
- Endorphin & Benzodiazepine receptors
- Cortisol Regulation
- Positive Immunological Functioning
- Neural Growth and Plasticity

Epigenetics and Decreased Stress

- Decreased methylation levels of cortisol receptor gene:
  - In offspring who had good nurturing produces more cortisol receptors on the hippocampus
    - Lower levels of CRH, ACTH, and cortisol
    - More 5-HT
    - Stress tolerance (Good thermostat)

Epigenetics of Stress Tolerance



Thermostat of Attachment

- **Secure attachment limits elevations of cortisol in stressful situations because the parent perceives and responds to the inner state of the child** (Fonagy & Target, 1997).
- **Early positive maternal care protects the hippocampus from high levels of cortisol** (Meaney et al., 1989).
- **Insecurely attached toddlers in the face of stranger and separation situations show elevated cortisol levels** (Nachmia, et al, 1996).

Insecure Attachment Longitudinally

- Anxious/ambivalent and avoidant attachment styles associated with the development of depression.
  - Avoidant style leads to depression based on a sense of alienation
  - Anxious /ambivalent style leads to depression based on an internalized sense of helplessness and self-doubt.

Client Education

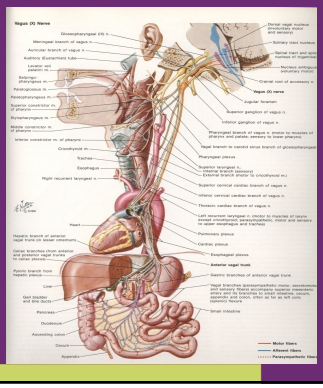
- Though the stress thermostat function in your brain is not working, we will work together to rebuild it so that you will no longer react to normal situations as if they are dangerous.

Social Brain and the PSN

- Neurochemistry includes:
  - Oxytocin
    - Turns down cortisol
- Central Parasympathetic Nerves
  - "Smart" Vagus Nerve

The Vagus Nerve System

- Tenth Cranial Nerve --a complex of sensory and motor nerve fibers.
- *Vagal tone*- the ability to modulate target organs without sympathetic arousal
- allows attachment and sustained relationships.

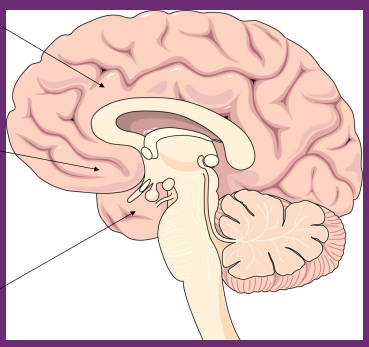


On the market

Cingulate Cortex

Orbital Frontal Cortex

Fusiform Gyrus



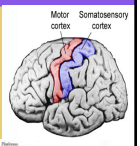
Anterior Cingulate Cortex

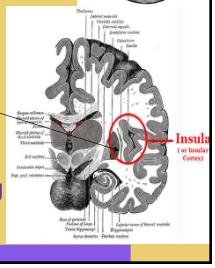
- ACC integrates cognitive and emotional information (Bush, et al, 2000)
- Active when detecting emotional signals from self and others (Critchley, et al., 2004)
  - The ACC is involved in both physical pain and social rejection (Eisenberger & Lieberman, 2005)
  - The dorsal ACC activates when fear of rejection occurs (Lieberman, 2005)
  - Activated when someone we love experiences pain or social ridicule (Botvinick, et al, 2005)
- Part of neural basis for cooperation (Pilling, et al, 2002)
- Damage results in reduced empathy and/or maternal behavior (Brothers, et al., 1996)

Insula and Touch

Soft touch: C—Tactile fibers (CT)

- Unmyelinated—thus slower, tracks to the:
  - insula (part of the Salience Network
  - Emotional touch
  - Oxytocin
  - Impaired in people struggling with forming relationships





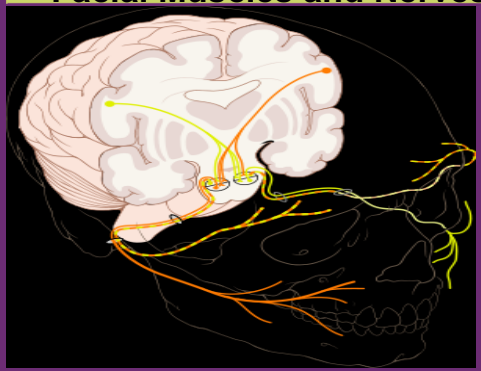
Spindle Cells

- Found in abundance in the OFC, AIC, and ACC---transmitting salience info
- Four times larger than other neurons, with a long extension
- At birth humans have approximately 28,000 spindle cells,
  - growing to 184,000 by age four,
  - 193,000 by adulthood.
- By comparison an adult ape has 7,000.

Mirror Neurons

- Originally found in monkeys (Rizzolati & Arbib, 1998)
- Critical for evolutionary development of social skills
  - Associated with anticipating goal-directed behavior
- Associated with empathy (Iacobini; Miller, 2005)
- Found in PFC, posterior parietal lobe, superior temporal sulcus, insula, and cingulate cortex

Contralateral Facial Muscles and Nerves



Facial Expressions

Left Hemisphere	Right Hemisphere
Controls expression on the lower right side of face	Controls expression on the lower left side of face
• Is NOT adept at reading facial emotion expression (e.g. alexithymics)	• Is adept at reading facial emotion expression

Facial Expressions

- We view objects and faces with different systems
- Facial-reading systems --amygdala, fusiform gyrus, and supertemporal gyrus (Gauthier, et al, 2000)
- Reading of faces when faces are right-side up, but not when faces are upside-down (Kilts, et al, 2003)
- When we view faces upside-down, we view them as objects, unable to read their emotional content
- ASD patients read faces as if they were viewing objects

D Smiles

- Guillaume Duchenne (1806-1875) identified the orbicularis oculi muscles around the eyes
- Non-D smiles, possibly masking negative states and are more likely to be asymmetrical
- D smiles -- L-PFC activation
- Non-D smiles -- R-PFC activation (Ekman, et al, 1996)

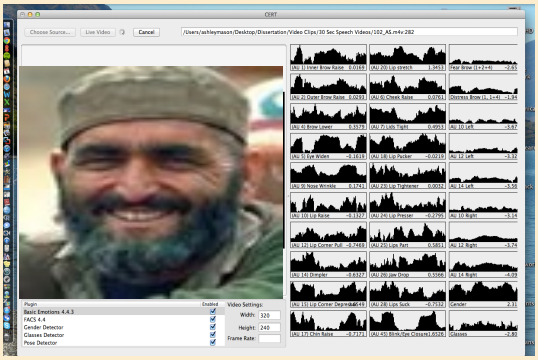
Feedforward Expressions

- Therapists can model and influence the client's facial expressions and mood via feedforward and feedback:
  - Contracting muscles on the right side activates LH and positive emotions
  - Contracting muscles on the left side activates RH and negative bias--e.g., a "smirk" (Schiff, et al, 1992)

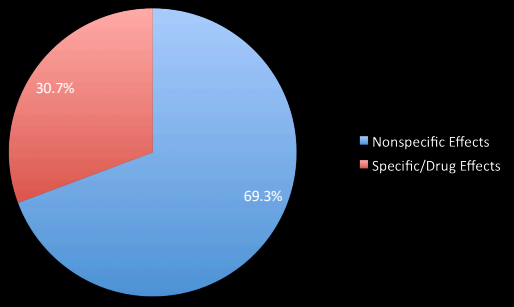
Duchenne 1862 Stimulating Facial Muscles

Micro-Expressions

Facial Action Coding System--FACS



Placebo

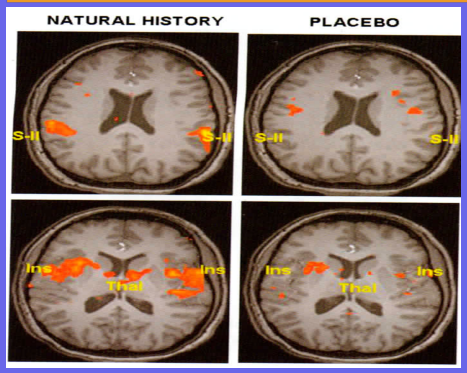


*Derived from pooled response rates for drug and placebo of 53.8% and 37.3%
Papakostas, *Eur Psychopharmacol*, 2009

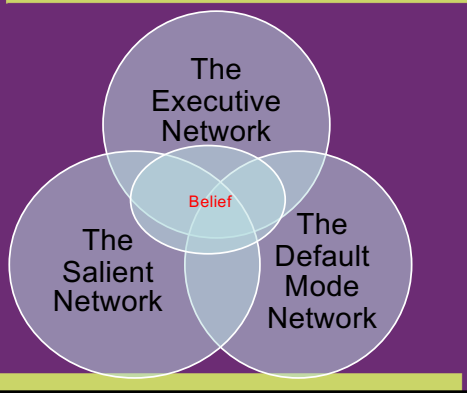
Incidence of Placebo Response

- 10% to 70%
- Average 35% across studies and diseases as well as psych disorders
- Works best for subjective outcomes like pain and psychological disorders
- Half as effective as morphine
- Quite effective with depression and anxiety

IBS and Pain vs. Placebo



The Mental Neworks & the Long-Term Memory Systems



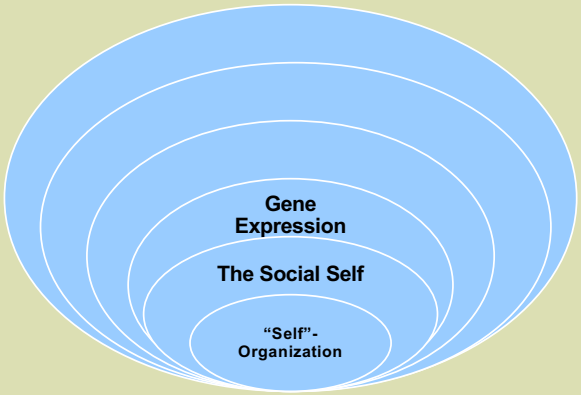
Therapeutic Frames of Reference

- The expectancy set
- Degrees on the wall
- Confidentiality explained
- Empathy—Compassion
- 50 minute hour
- Problem/symptom focus
- Solution focus

Social Summary

- Social brain networks need activation
- Health related costs without activation
- Neurochemistry of social connection
- Non conscious facial expressions
- The emotional and cognitive costs of loneliness
- Social medicine for stress reduction

Mind-Brain-Gene Feedback Loops



Epigentics and parenting

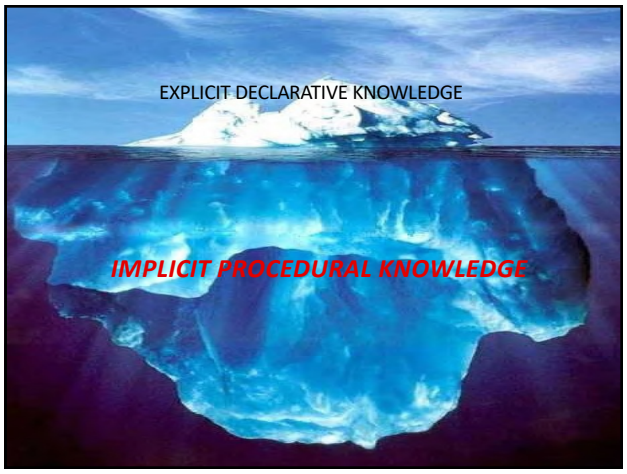
Good parenting produces kids with less methylation of the cortisol receptor gene

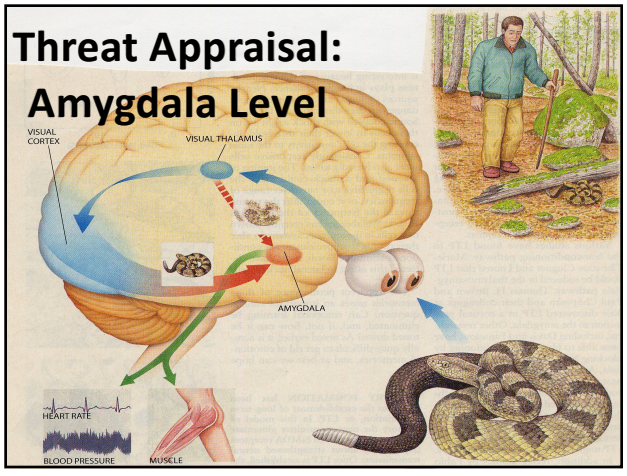
The kids have a better thermostat for cortisol and can turn of the stress response system more easily

Cortisol level

Two LT Memory Systems

Implicit	Explicit
Non-declarative	Declarative
• Procedural • Emotional • Generalized • Classical conditioning	• Episodic • Autobiographical • Semantic • Context Specific
Amygdala and BG-driven	Hippocampus-driven

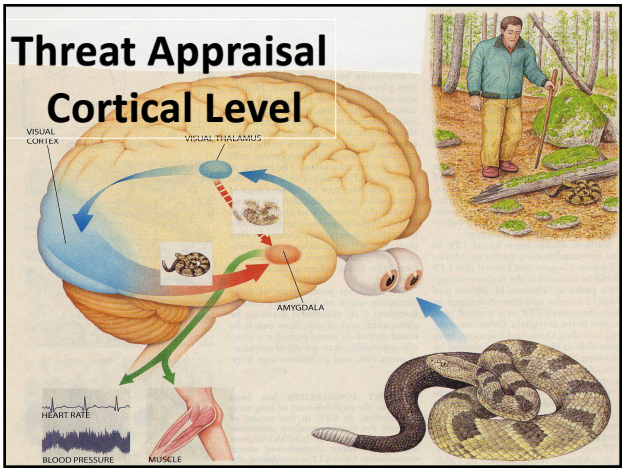




The Fast Circuit to the Amygdala

- Sensory info goes to the Thalamus then directly to the Amygdala:
- Fight or Flight: SNS and HPA activation
- Emotional Learning
- Fear Conditioning
- PTSD, panic, etc.
- Flashbacks
- "Bottom up"

Threat Appraisal Cortical Level



The Slow Circuit to the Amygdala

Sensory info goes to the Thalamus through the Cortex and Hippocampus to the Amygdala

Complications:

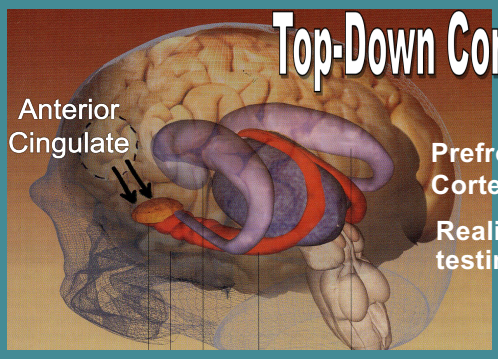
- Worries and GAD
- Fears and Phobias

Benefits:

- Tames the Amygdala
- With exposure, New Thinking (cortex)

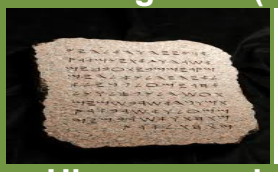
"Top down"

Cortical-level Appraisal



The Dynamics of Fear

- Amygdala memories are hard to forget ("Stone tablet")



- Hippocampal circuits tell us what to fear and in what context ("Etch-a-Sketch")

Client Education

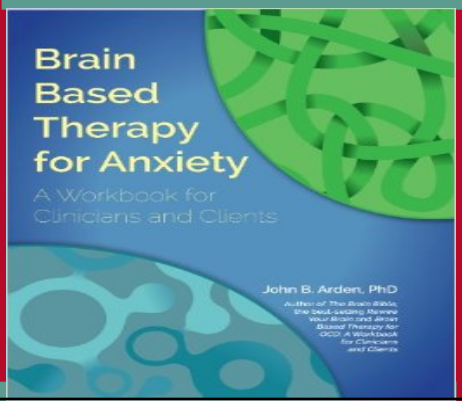
- Your brain is not like a computer, coding every program used or website visited.
- Your memories change in response to new experiences. That's what therapy does.

Memory (summary)

- Attention is critical to the coding of new memory
- The power of mnemonics
- The "Inverted U": too little stimulation (e.g., boredom) or too much stimulation (e.g., trauma) conflict with the coding of new memory
- A moderate degree of anxiety works best to facilitate neuroplasticity and new memory

Allostasis
&
Allostatic Load

Anxiety



Medical and Drug Related Factors that Mimic Anxiety

- Neurological: complex partial seizures, head injuries
- Pulmonary: Asthma, hyperventilation, COPD, lung cancer
- Various meds, drugs, and alcohol in withdrawal
- Endocrinological: Hyperthyroidism etc.
- Cardio: MVP, high blood pressure,
- Toxins such s hydrocarbons, mercury, and carbon dioxide
- Deficiencies in magnesium, Vitamin B-12, potassium, and calcium

Stress—Bottom Up or Top Down?

- William James—bottom up--"I am running from the lion –I must be scared"
- Walter Cannon—top down—emotions are determined by what you decide. Arms up!
- Schacter and Singer (1962) 2 Factor Model
  - Injection of epinephrine—arousal
- Paul Ekman—support for James
  - Moving facial muscles changes emotions

Those that think stress is harmful are more stressed

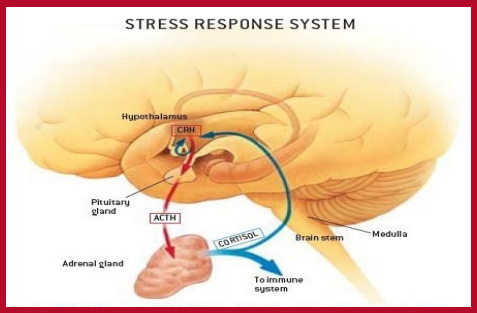
Allostasis

- Allostatic adjustments are adaptive over the short term with moderate and fluctuating levels of cortisol to help orchestrate adjustments by:
  - enhancing or inhibiting gene transcription
  - regulation of BDNF
  - up regulates amygdala activity
  - targets prefrontal systems involved in stress and the emotion (Sullivan & Gratton, 2002).
  - maintaining stability through a change (McEwen, 1998).
- *Allostatic load* --When demands exceed the balance of energy and regulatory gains from rest and recuperation. (McEwen and Wingfield, 2003).

Client Education

- Just as your car needs shock absorbers for bumpy roads, so too can you develop the durability to adapt to daily challenges.

Sympathetic ANS and Neuroendocrine Systems

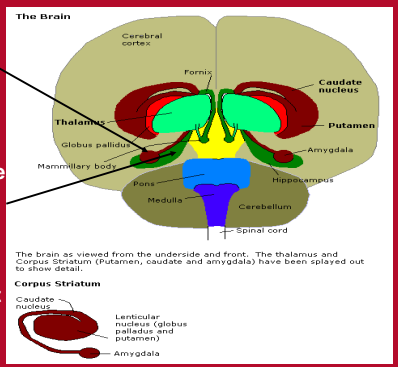


Locus Coeruleus (LC) source of NE which has extensive projections throughout the brain and can trigger the HPA axis (Aston-Jones, et al., 1994).

The Seahorse and the Almond

Amygdala *turns up* the HPA axis and sympathetic NS

Hippocampus *turns down* the HPA but may get saturated with too much cortisol and the thermostat can break



Cytokines

- Proteins released by immune cells that act on target cells to regulate immunity
  - Proinflammatory (IL-1, IL-6, TNFά) *coordinates* inflammatory responses
  - Anti-inflammatory (IL-10) *controls* proinflammatory responses.

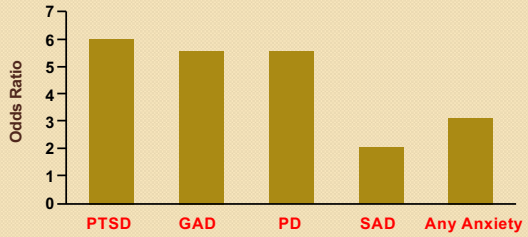
Hypocortisol vs. Hypercortisol Activity

- Chronic stress (especially uncontrollable) alters the cortisol system
- Early on there can be *higher* cortisol
  - Can lead to agitated depression
  - Kills white blood cells
  - Metabolic syndrome
- More distant traumas may result in an inadequate cortisol response
  - Autoimmune disease
  - Inflammation
  - depression

Dysregulation of the HPA axis

- Adrenaline and NE increases PICs
- PICs increase HPA axis
- Excessive CRH and low ATCH results in:
  - Low cortisol= high PICs
  - High PICs increase depression
    - Suicide victims—higher IL-6, TNFά and lower IL-2

Risk of Suicide Attempts Among Patients with Anxiety Disorders

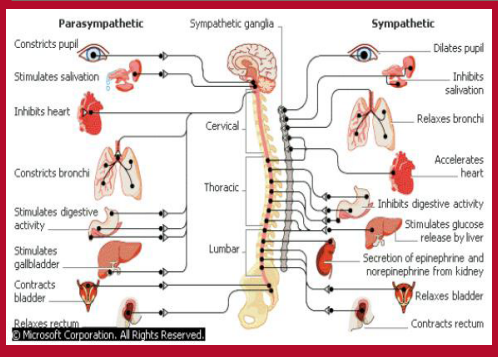


Kessler et al. Arch Gen Psychiatry. 1999;56:617

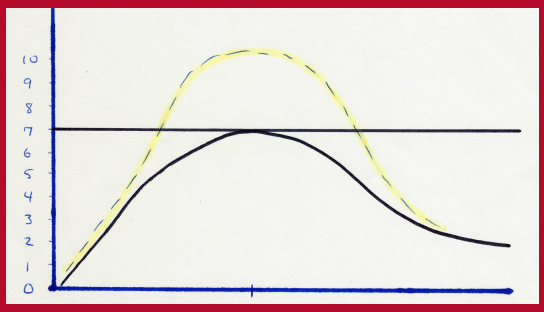
Physiology of GAD

- Less parasympathetic more sympathetic-- reduced vagal tone
- Bed nucleus of the stria terminalis (BNST)
  - –Free-floating anxiety
- Amygdala—an intolerance for ambiguity
  - – Anxious individuals select more threatening interpretations of ambiguous stimuli (e.g., Mathews & Mackintosh, 2000)

Balancing the ANS



Abnormal Respiration



Symptoms: Shortness of breath, smothering

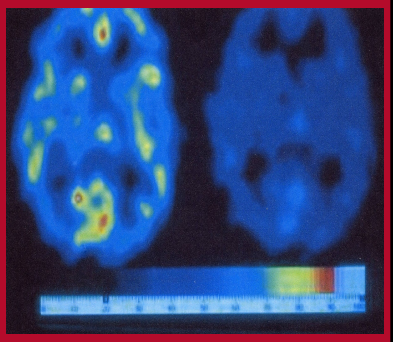
Hyperventilation 1 ½ minutes
Vaso-constriction: too little CO2

↑ Oxygen

↓↓ CO2

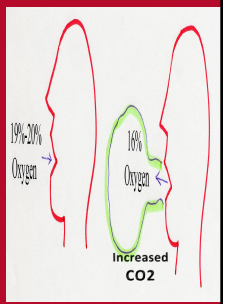
respiratory alkalosis

causes vasoconstriction in the brain



Breathing and Over-Breathing

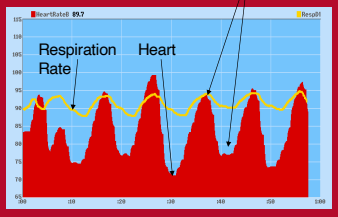
- Most people breathe 9 to 16 breaths per minute. Panic attacks - 27 breaths
- Over-breathing pulls in too much oxygen forces down the carbon dioxide level in the blood stream.
- Carbon dioxide helps maintain the critical acid base (pH) level in blood. Lower pH level causes nerve cells become more excitable and people associate the feelings with a panic attack.



Variability is healthy

Notice how heart rate increases with inhale. Heart rate decreases with exhale. This pattern shows high vagal tone (high PSNS activity) and a high amount of heart rate variability.

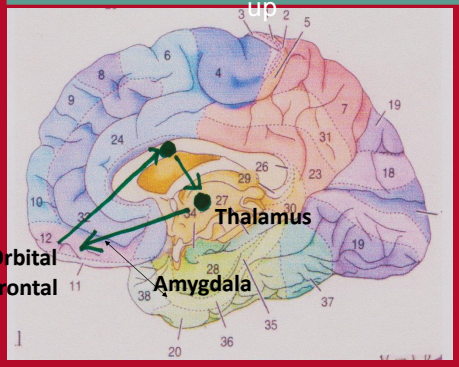
Peak/valley differences = vagal tone *when respiration is in normal range*



Activating the PNS

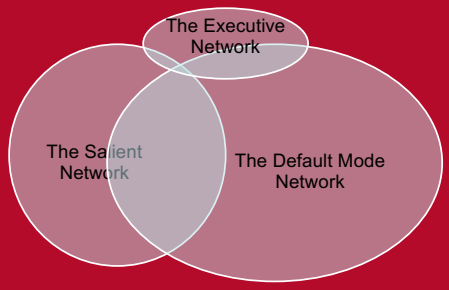
- Diaphragmatic Breathing
- Stretching
- Yoga
- Meditation
- Cuddling
- Orgasm
- Pulling the Kegel

Worry Loop attempts dampen autonomic arousal only to crank it back up

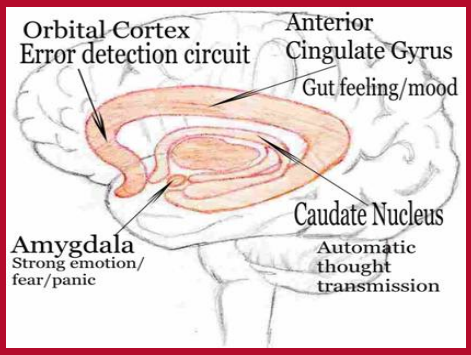


Worry as Cognitive Avoidance

- Excessive DMN ruminations with little Executive Network



Interrupting the Worry Loop



Challenging Feared Outcomes and Gaining Perspective

- Worse possibility?—exaggerate it
  - Re-Attribution (it's just my body)
- Worse realistic possibility?
  - So what if….
- Physiological Symptoms (e.g. this is not dangerous)
- Temporal perspective
  - When was the last time I died from this?

CBT vs. Metacognitive Models

(ACT, DBT, MBCBT, etc.)

CBT	MC Models
Rationale=control	Rationale=relinquish control
Cognitive restructuring	Thought Diffusion
Breathing retraining	Observe & accept
Interoceptive exposure to lessen fear & avoidance	Interoceptive exposure with acceptance of internal cues
Situational exposure to lessen fear fear and avoidance	Situational exposure to achieve life values and goals

Client Education

- The next time a well-meaning person tries to reassure you that there is certainty in life, say:
- "Thanks, but I'm learning how to appreciate uncertainty and the shades of grey."

REAL not GAD

"R" is for relaxation, including deep breathing, stretching, self hypnosis, mediation, and prayer to activate your parasympathetic nervous system and increase vagal tone.

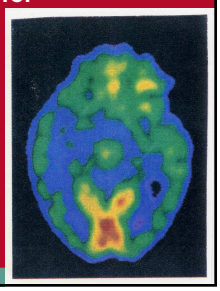
"E" is for exposure such as in scheduling an hour of worry time, allowing focused exposure to all your worries, and giving your higher brain a chance to work on developing the capability of dealing with the ambiguities inherent to life.

"A" is for acceptance. Since there is no ultimate certainty with much of life, acceptance of uncertainties allows worries to fade into the texture of normal living.

"L" is for labeling. When you have an anxious thought you can label it as just "an anxious thought," thereby detaching from the feeling of anxiety.

Neurodynamics of Anxiety

- Two routes to the amygdala, the fast and slow
- Right frontal bias in general for anxiety disorders
- Under-activation of the left frontal lobes and in Broca's area explains why some people feel "speechless" when they're scared (Rauch et al., 1997).



Slow Track—Allostasis

- ***Automatic thoughts***—fast track impulse—interrupt with curiosity and time
- ***Assumptions***—from pessimism to incremental optimism
  - "I'm working on it and can tolerate distress"
- ***Core beliefs***—existential self descriptor
  - "I'm a survivor."
- Global/Passive (R-PFC) vs. Detail/Action (L-PFC)

Shifting Perspective to Speed Up the Slow Track

- Labeling thoughts—"That is an anxiety provoking thought" vs. "This makes me anxious!"—R-vlPFC
- Externalizing—"What would another person in this situation say and how is s/he right?"
- Temporal Distance—"How will I sensibly view this situation in six months?"
- Humor—"What is funny about this?"
- Wisdom—"How can I grow from this?"

Avoidance: the Polarizer

- Over-Sensitizing the Amygdala
  - –Forms of Avoidance
    - »Escape behaviors
    - »Avoidant behaviors
    - »Procrastinating
    - »Safety behaviors

Avoidance

- Interpersonal trauma vs. natural disasters, etc…
  - "mistrust schemas"
- Do not reach out to others
  - for comfort (withdrawal)

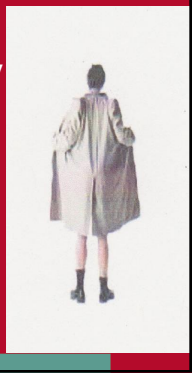
Why avoidance is hard to resist

- –It works to reduce fear over the short term
- –The more you avoid the harder it is to resist repeating --they become habits
- –There is a superficial logic to avoidance, --- "Why wouldn't I avoid something that makes me anxious?"
- –You get some secondary gain from it like extra care because people around you feel sympathy

Deceptively Simple but so Complex Exposure Techniques

Beta- endorphin is co-released along with ACTH but is momentarily blocked by ACTH at the common receptor sites.

The therapeutic effects from exposure in part result from beta-endorphin anxiolytic effects 20 minutes after the exposure



Critical Aspects of Exposure

1. To maximize violation of expectancies
2. To multiple feared conditioned stimuli individually and in concert
3. Occasionally reinforcing a CS with an UCS
4. Removal of safety signals or safety behaviors
5. Stimulus variability
6. Retrieval skills in other contexts that are transferable for real life situations
7. Multiple contexts

Exercise and Anxiety

- **Since fight/flight is meant for action exercise provides the method to feelings – take action.**
- **Exercise:**
  - **Reduces muscle tension**
  - **Builds brain resources (neuroplasticity and neurogenesis)**
  - **Increases GABA and serotonin**
  - **Interoceptive exposure**
  - **Improves resilience – self-mastery**

REAL not GAD

"R" is for relaxation, including deep breathing, stretching, self hypnosis, mediation, and prayer to activate your parasympathetic nervous system and increase vagal tone.

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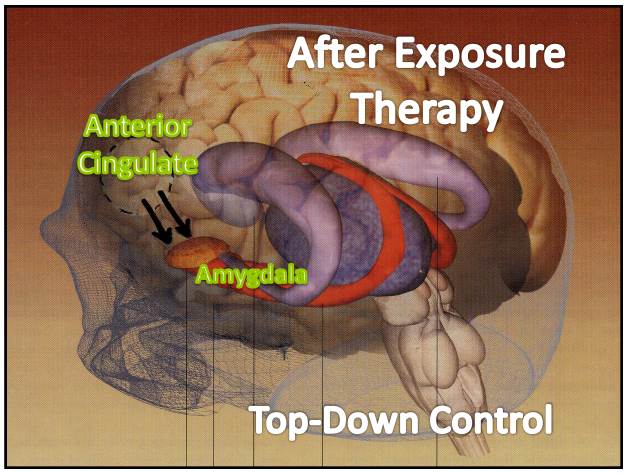
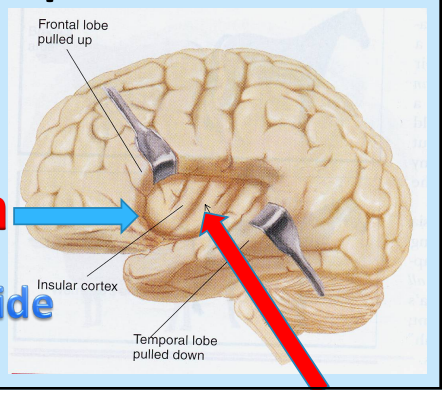


Client Education

- Sensations from your own body should not be the cause for alarm.
- Don't let your body be the boy who cried wolf.

Interoceptive Feedback



Client Education

- Do you have shortness of breath, rapid heartbeat, sweating, headaches, or nausea?
- Each one of these are normal body sensations. It's when you overreact to them you may tumble into a panic attack.
- Befriend your own body sensations.

Interoceptive Exposure +

- **Swallowing quickly--- to cause a lump in the throat**
- **Tensing the body--- leading to chest constriction**
- **Standing up quickly from lying on the floor---to cause dizziness.**
- **Staring at one spot---to increase the feeling of being trapped**

Interoceptive Exposure +

- There are a variety of interoceptive exercises including:
  - –Running in place--- to increase heart rate and hyperventilation
  - –Holding your breath--- to simulate sensations of suffocation
  - –Spinning--- leading to dizziness
  - –Hyperventilation or breathing through a straw---leading to light-headedness

BBT and Panic Disorder

- Desensitizing the Amygdala—Avoiding avoidance
- Interceptive exposure exercises—Embracing body sensations
- Speeding up the slow track—Getting the L-PFC and L-Anterior Insula cortex involved

BEAT Panic

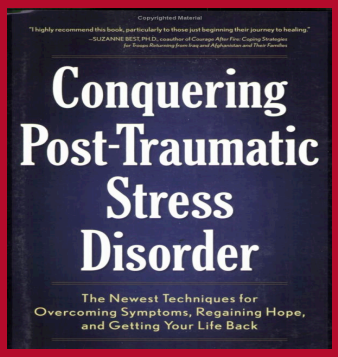
"B" is for body. When you feel your heart race or breathe too fast just ride it out. Say, "I can befriend my own body!

"E" is for exposure. Through interceptive exposure exercises you can regain tolerance to body sensations. Say, "this is not a heart attack but just my own body sensations that I've felt many times before."

"A" is for the amygdala. With its fast and slow tracks. "I can learn to slow down my fast track and speed up my slow track."

"T" is for thinking. To speed up your slow track, remind yourself that what you think is happening has a dramatic effect on what you feel is happening.

Post Traumatic Stress Disorder



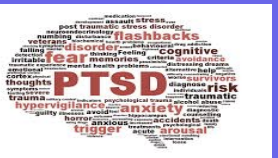
Chronic, severe, inescapable

- War Zones
- Rape
- Child abuse
- Elder abuse
- Domestic violence
- POWs and refugees

Refugee Crisis

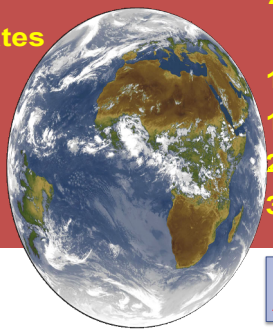
Re-traumatization caused by:

- relentless war in the region
- growing level of violence
- traumatic experiences
- extreme deprivation in daily life



PTSD as a Worldwide Problem

Germany	2.2%*
United States	7.8%
Ethiopia	15.8%
Gaza	17.8%
Cambodia	28.4%
Algeria	37.4%

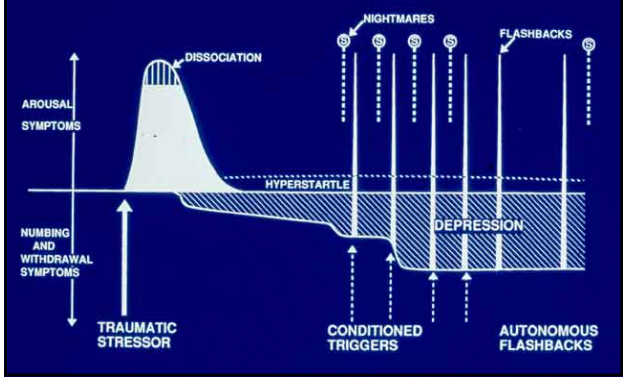


Iraq, Syria, Afghanistan?

Risk Factors for PTSD

- Greater distress before/after the trauma
- Poverty and low socioeconomic status
- Previous or current psychological disorder and poor affect regulation
- Family discord and/or insecure attachment
- Cognitive disengagement at the time of the trauma and dissociation involving depersonalization and de-realization
  - Especially with early and repeated trauma

Time Sequence



Phylogenetic Responses to Stress

- 1) Trigger the social engagement system—the myelinated vagus
- 2) Fight or flight—SNS and HPA axis arousal
- 3) Immobilization—freeze, collapse, and feigned death:
  - 2 stages
    - Freezing in terror
    - Paralyzed—shut down—total submission, trancelike, dissociation

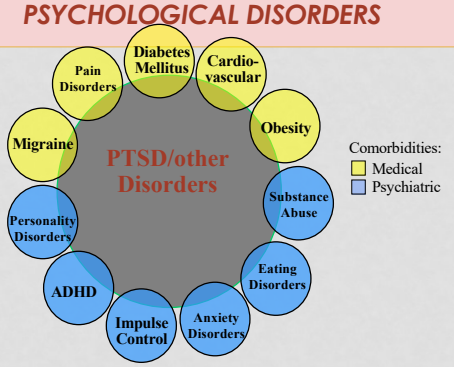
PTSD Neurodynamic Aspects

- ↑ amygdala—general false positives for threat
- ↓ mPFC especially the ACC (reduced neurointegration and cortical volumes) (De Bellis, et. al., 2000) (inadequate top down inhibition of the amygdala)
- ↓ hippocampus (cortisol, excitotoxity, blocking of neurogenesis)

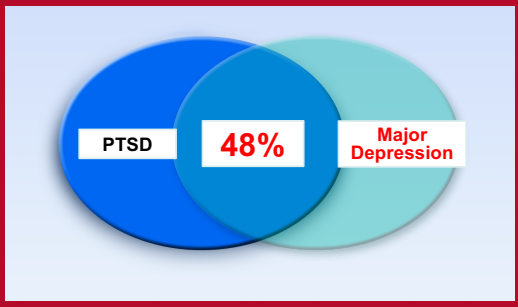
Most Common Acute Post-Traumatic Stress Response

- **Depression**
- **Anxiety Disorders**
- **Substance use / abuse**
- **Acute Stress (ASD) only later PTSD**
- **Adjustment disorders**
- **Persistent complex bereavement**

THE RULE NOT THE EXCEPTION
THE MULTIDIMENSIONALITY OF NEURO-PSYCHOLOGICAL DISORDERS



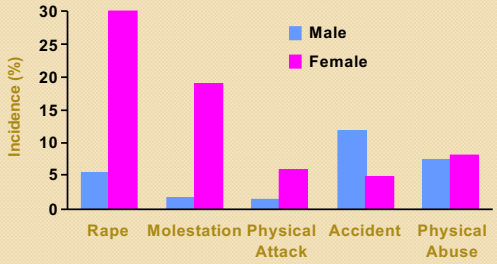
Common Occurrence of PTSD and Depression



A Big Problem: Reluctance to tell or seek out help

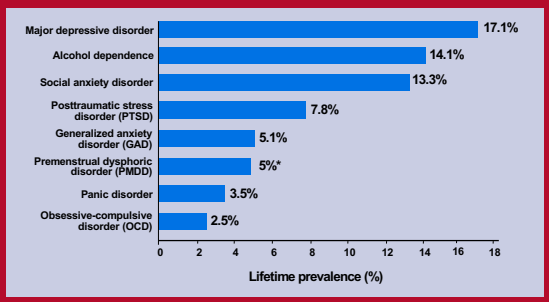
- **Sexual assaults**
- **Bullying** (kids and adults)
- **Work-place violence**
- **Domestic violence**

Non-Combat-Related Trauma Associated with PTSD



Kessler et al. Arch Gen Psychiatry. 1995;52:1048
Courtesy of: David V. Sheehan, M.D., M.B.A.

Lifetime Prevalence of Common Psychological Disorders

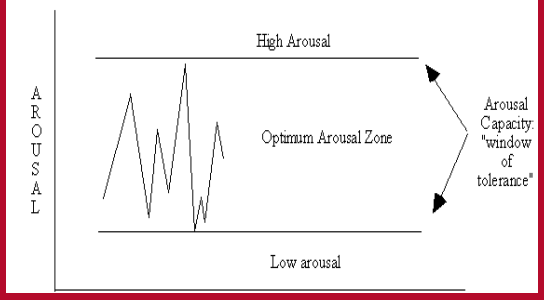


Predicting PTSD

Dissociation or amnesia at the time of traumatic event
Panic attack: first 24 hours
70% greater risk

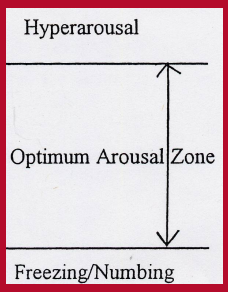
The Severity of the Traumatic Event is <u>not</u> predictive of outcome

Window of Tolerance



Working the "Therapeutic Window"

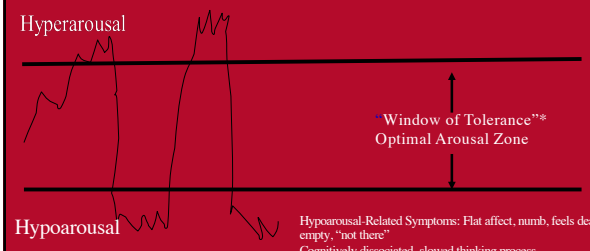
Over-Shoot



Under-Shoot

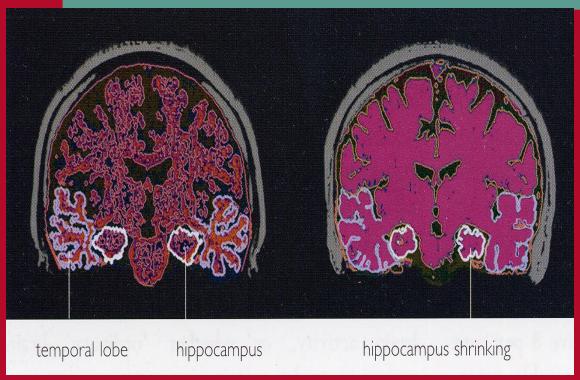
Trauma Responses are Autonomically Driven

Hyperarousal-Related Symptoms:
High activation resulting in impulsivity, risk-taking, poor judgment
Chronic hypervigilance, post-traumatic paranoia, chronic dread
Intrusive emotions and images, flashbacks, nightmares, racing thoughts
Obsessive thoughts and behavior, cognitive schemas focused on worthlessness and dread



Hypoarousal-Related Symptoms: Flat affect, numb, feels dead or empty, "not there"
Cognitively dissociated, slowed thinking process
Cognitive schemas focused on hopelessness

Hippocampal atrophy



Client Education

- Though your memory may be temporarily impaired, you can revitalize these areas of your brain by aerobic exercise followed by learning and goal oriented behaviors.

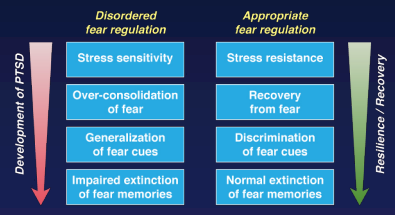
Possible Neurochemical Vulnerability of PTSD

- ↑ NE post trauma may predict PTSD (Yehuda, et. al., 1998)
- ↑ cortisol in the evening not in the morning
- ↑ proinflammatory cytokines post trauma
  - The secretion of IL-6 inflammatory cytokines can be triggered by B-adrenergic receptors with ↑ NE
  - Inflammation can occur post trauma via CRH/substance P-histamine axis with ↑ cortisol and IL-6 (Elenkov, et. al., 2005)

Client Education

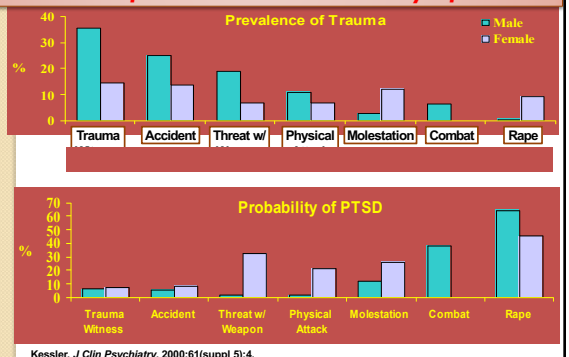
- It's common to feel like being alone after a traumatic event. But, isolating now will make you worse and feel even more alone.
- Parts of your brain activate when you are with people which helps you buffer anxiety and lift depression.

Disordered Fear Regulation in PTSD



From: Mahan AL, Ressler KJ. Trends Neurosci. 2012, 35:24-35.

Prevalence of Trauma and Probability of PTSD



Kessler. *J Clin Psychiatry.* 2000;61(suppl 5):4.
Kessler et al. *Arch Gen Psychiatry.* 1995;52:1048.

Avoidance

The major factor in perpetuating PTSD and contributing to a more chronic course

Avoiding specific trauma triggers; Reminders:
- People
- Situations
- Conversations
- Media
- Medical Treatment

Suicidality and PTSD

- *PTSD patients are 6 times more likely to attempt suicide than the general population*
- *PTSD has higher risk of increased number of suicide attempts than all other anxiety disorders*

Amygdala-Level Processing

Rapid, Crude, Generalized
Many false alarms
Non-Responsive to new "Data"
Outside awareness & Automatic
Beneath the radar of consciousness

Watch for Implicit Memory of Trauma

- Notice that….
- Wow! What just happened
- Did you feel the change in….
- Noting somatic communication
  - "The body knows the score"
- Gentle exposure to changing somatic
  - sensory motor experience

Research on PTSD Treatments

- **Institute of Medicine (IOM) 2007 Review**
  - **Thorough review of psychotherapy research for PTSD (requested by the VA)**
- **Treatments not found to have clear empirical support:**
  - **EMDR, group therapy, hypnotherapy, eclectic, CBT alone….**
- **Exceptions: review found strong efficacy of exposure:**
  - **Prolonged Exposure (PE)**
  - **Cognitive Processing Therapy (CPT)**

Exposure

- **Imaginal exposure (trauma memory)**
  - **Exposes client to memory of the trauma in structured, controlled way**
  - **Trauma exposure helps client in two ways:**
    - **Helps reduce anxiety associated with trauma memory (via extinction of conditioned fear)**
    - **Helps client organize memory into coherent narrative (calms overactive amygdala)**
  - **Generally need minimum of 12 sessions (CBT, PE, CPT)**
    - **CBT approach starts with psychoeducation, anxiety management, and coping skills**
    - **Minimum 4-6 imaginal exposure sessions (temp. increase of anxiety and re-experiencing symptoms)**
    - **Cognitive processing of trauma memory & associated meaning (beliefs)**
- **Situational exposure (CBT & PE)**
  - **targets avoidance of trauma-related situations (and agoraphobic avoidance)**
- **Interoceptive exposure**
  - **Targets "fear of fear" or somatic phobia (treatment for panic disorder)**

Impaired Information Processing in Post-Traumatic Stress Disorder

Dissociation at time of trauma (encoding)
Fragmented, "jigsaw" memories
- **images, emotions, bodily sensations, cognitions……**
- **dis-integrated**

Watch for Implicit Memory of Trauma

- Muscle tension
- Motor impulses
- Heart rate
- Facial expression
- Trembling
- Breathing rate
- Mood changes

Dual Processing Theory

- **Limitations of the "fear network" theory – doesn't account for implicit memory:**
  - **Verbally accessible memories (VAMs) on the conscious memory level. VAMs can be accessed in therapy through deliberate recall.**
  - **Situationally accessible memories (SAMs) non-conscious. SAMs are only accessible through exposure cues that activate the non-conscious network** (Brewin, Dalgleish, and Joseph, 1996).

The Explicit system

- Verbally accessible memory (VAM) system—the narrative—autobiographic
  - Can be deliberately retrieved (Brewin, 2005)
  - Cortex and hippocampus
  - Past, present, and future
  - Available to verbally communicate
  - Restricted by attention and arousal
- Traumatized people use the VAM system to evaluate the trauma
  - They ask themselves "could it have been prevented?"
  - "What are the consequences….the meaning?"

The Explicit system

- VAM system memories are accompanied by "secondary emotions" (not experienced at the time of the trauma)
  - Directed at the past—i.e. regret or anger about the risks taken
  - Often involves guilt or shame over perceived failure or not preventing the event
  - Thoughts about the future—i.e. sadness at the loss of cherished plans or hopeless at the thought of not finding fulfillment

The Implicit System

- Lower level perceptual processing—too briefly apprehended to be bounded together in consciousness memory required for VAMs
  - Sights
  - Sounds
  - Physiological sensations including changes in heart rates, temp, or pain

The Implicit System

- Primary emotions—fear, horror, helplessness
- Accounts for flashbacks that can be triggered involuntary by cues related to the trauma (sight/sounds etc.)
- Not structured by verbally coded memories—therefore more extensive
- The more drawn out the trauma, the greater the tendency to experience a range of sensations and emotion
- Difficult to access in therapy

Client Education

- Every time you go through this exposure exercise it will get easier.
- The higher parts of your brain, will rewire to put the brakes on the alarm button in the lower part of your brain.

Converting traumatic memories into meaning

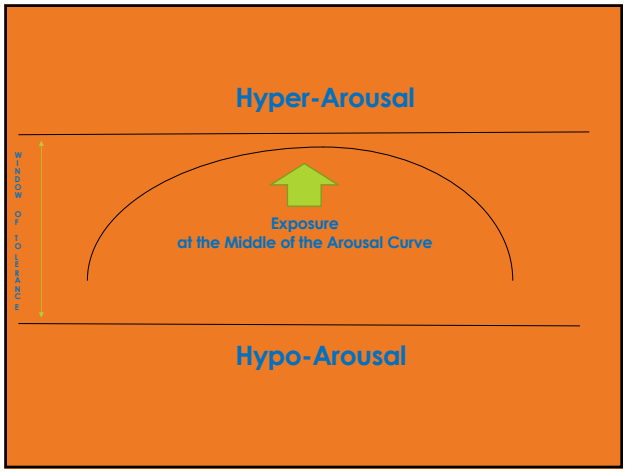
- Traumatic memories are fragmented and disorganized into “hotspots” which can spur flashbacks
- Hotspots occur where there is maximal functioning separation between SAMs and VAMs (i.e. less integration) (Brewin, 2005)
- They need to be integrated and converted into a coherent and an organized form to reduce the risk intrusions into flashbacks (Ehlers & Clark, 2000; Conway & Playdell-Pearch, 2000)

Client Education

- Step-by-step. I am going to help you expose yourself to the cues that trigger the flashbacks so that you can bring them under control.

Explicit and Implicit Integration

- The process needs to be repeated for:
  - Neuroplasticity—the inverted "U"
  - To neutralize the traumatizing quality of the SAM system
  - So that VAMs can compete with SAMs and integrate them
    - The new VAM system puts the SAM system in perspective



Client Education

- By getting your memory systems in sync, what had triggered flashbacks will fade away.
- Those flashbacks will lose their ever presence and be placed where they belong, in the past as you develop a meaningful future.

Continuum of Detachment

- **Traumatized people can experience:**
  - **Mild detachment or absorption: involving a breakdown in the ability to notice outside events and extending to an altered sense of self.**
  - **Moderate detachment: involving feelings of depersonalization and derealization. The person sees himself as if from afar as an observer.**
  - **Extreme detachment: involving a state of unresponsiveness. The person can act catatonic and have no sense of self or time.** (Allen, 2001)

Affective Regulation of Condition Emotional Response (CERS)

- The skill of perceiving, labeling, and accepting emotion
- Identifying and modifying thoughts that exacerbate emotions
- Practical action—act in concert with values
- Insight into why/how the emotions are coming up
- Titrate the exposure within the window of tolerance in the middle of the inverse "U"
  - Highest affect in the middle of the session then calm at the intensity curve at the end

Exposure

- An activity that provokes or triggers memories of the traumatic event:
  - Repeated or extended (prolonged) to objectively harmless but feared stimulus
  - For at least 20 minutes allows enough time to habituate and enough time to recoup with sufficient support
  - Also allows for the release of BE release
  - Start low—go slow

Exposure

Goal—for traumatic memories to lose their power

- a disparity between what a client is feeling (i.e. fear) and the objective reality that there is nothing to fear in the current environment
- Counterconditioning—the presence of positive phenomena that are antithetical to physical or psychological danger. "Cells that fire out of link lose their link." LTD

Client Education

- Delay tension reduction behaviors
  - "Urge surfing"-ride it out, they are only temporary
  - Hold off long enough to defuse the power
  - The upsetting feeling will eventually become tolerable
  - Don't try to change the feeling but change your relationship to it.

Activation

- Conditioned Emotional Responses (CERs e.g. fear, sadness, or horror)
- CERs are critical to trauma processing to extinguish emotional-cognitive associations to a given trauma memory must be:
  - Activated
  - Not reinforced
  - Counter-conditioned

Dissociative Disorders

- Depersonalization/Derealization disorders + persistent or reoccurring experiences of unreality from mind, self, body, and/or surroundings
- Dissociative amnesia – psychogenic inability to recall autobiographical info. Specifier—dissociative
- Dissociative identity disorder (DID)—2 or more personalities with reoccurring memory "gaps" (episodes of amnesia can include possession)

Dissociative Dynamics

- Because the development of a coherent and durable sense of self thrives on safety and positive attachment:
  - When interpersonal environment is dangerous hypervigilance and attention is drawn outward away from the development of a coherent self-system
  - Attention inward could be punished
  - Internal representations could be fragmented

"Identity Training" from Dissociation

- Therapy entails helping the client build a coherent and positive model of the self by facilitating self-exploration and self-reference
  - Helping the client identify, label, accept feelings, and needs
  - Development of a coherent internal life (DMN) and self-determination (EN)

"Identity training" from Dissociation

- Because relational schemas (internal working model—attachment styles) are framed before explicit memory, their implicit nature are "triggered" by situations & feelings states that need reconditioning—activation—reconsolidation
  - Emergent "relational feedback" do not contain the contextual representation of the past (i.e. abuse)
  - "corrective emotional experience" (psychodynamic)

PTSD Treatment

- Increased size and activity of DLPFC
- Increased size and activity of the hippocampus
- Decreased activity of the amygdala
- SNS activity within the window of tolerence
- Decreased PICs
- Recalibrated HPA

Orienting Response, REM, and Memory

- Somatic stimulation of the orienting response (i.e. via EMDR, EFT, acupressure etc.) involve:
  - *Shto takoe?* (Что такое? or *What is it?)*
  - Reorienting of attention -- triggered automatically when a sudden movement grabs attention or intentionally when you chose to look at an object
  - The reorienting of attention requires you to release your focus on one location so that it can shift to a new location
- The shift in attention involves:
  - The orienting response (Sokolov, 1990)
  - Induces REM like state
- Both facilitate cortical integration of memories (Stickgold, 2002)

Orienting and Recoding

- **A stimulus that prompts a person to notice what happens next primes PFC activity.**
- **Coding in novelty, an unexpected somatic sensation, integrates PFC, anterior cingular cortex, hippocampus, and basal ganglia circuits by moderate bursts of dopamine,**
  - **orienting serves as a sort of a kickstart to the connectivity between the executive and the salience networks**

Shifts in attention and asymmetry

- **Why activate the RH when it is already overactive? How about tapping the right hand and/or foot?**
- **The right limb tapping method still includes:**
  - **reorientation response**
  - **attentional shift**
  - **grounding**
- **This method is portable—the client can practice on his own (neuroplasticity)**

Client Education

- I'm going to ask you to direct your attention to the specific movement while at the same time you describe the traumatic event.
- This will help you reset your brain so that it will no longer be stuck in the past and you can move ahead to a positive future.

BBT and PTSD

- Phase 1: Psychological first aid—stabilizing ASD and preventing PTSD
- Phase 2: Integration of implicit and explicit memory systems:
  - Explicit memories (VAMs) –The conscious memory level, which can be accessed in therapy through deliberate recall.
  - Implicit memories (SAMs) –The nonconscious, which are only accessible through cues that activate the network.
  - Aided by somatic reorienting method
- Phase 3: Posttraumatic growth—developing meaning and direction (Constructivism)

SAFE from PTSD

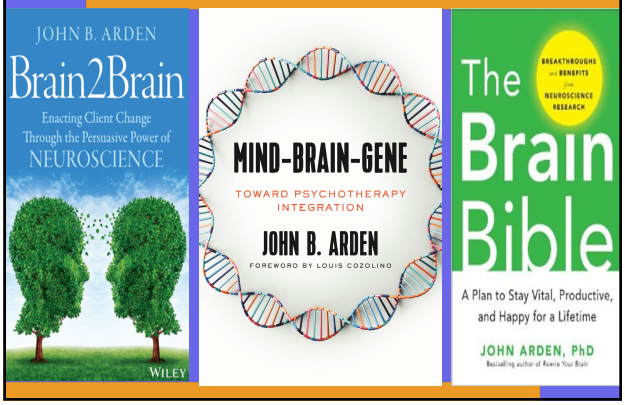
"S" is for stabilizing. To establish a healthy foundation for recovery.

"A" is for acceptance of what happened.

"F" is for future. To visualize a hopeful future--posttraumatic growth.

"E" is for exposure. To confront the feelings and sensations that trigger flashbacks.

References



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Abbreviation Glossary

- AAI—Adult Attachment Inventory
- ACTH—Adrenocorticotropin Hormone
- ACC—Anterior Cingulate Cortex
- BDNF—Brain Derived Neurotrophic Factor
- CRH—Corticotropin Releasing Hormone
- DA—dopamine
- DLPFC—Dorsolateral Prefrontal Cortex
- DMN—Default Mode Network
- ISS—Infant Strange Situation
- OFC—Orbital Frontal Cortex
- NE—Norepinphrine
- NMDA—n-methyl-D-asparate receptors
- 5-HT—Serotonin