Compassion-Based Resilience Training:

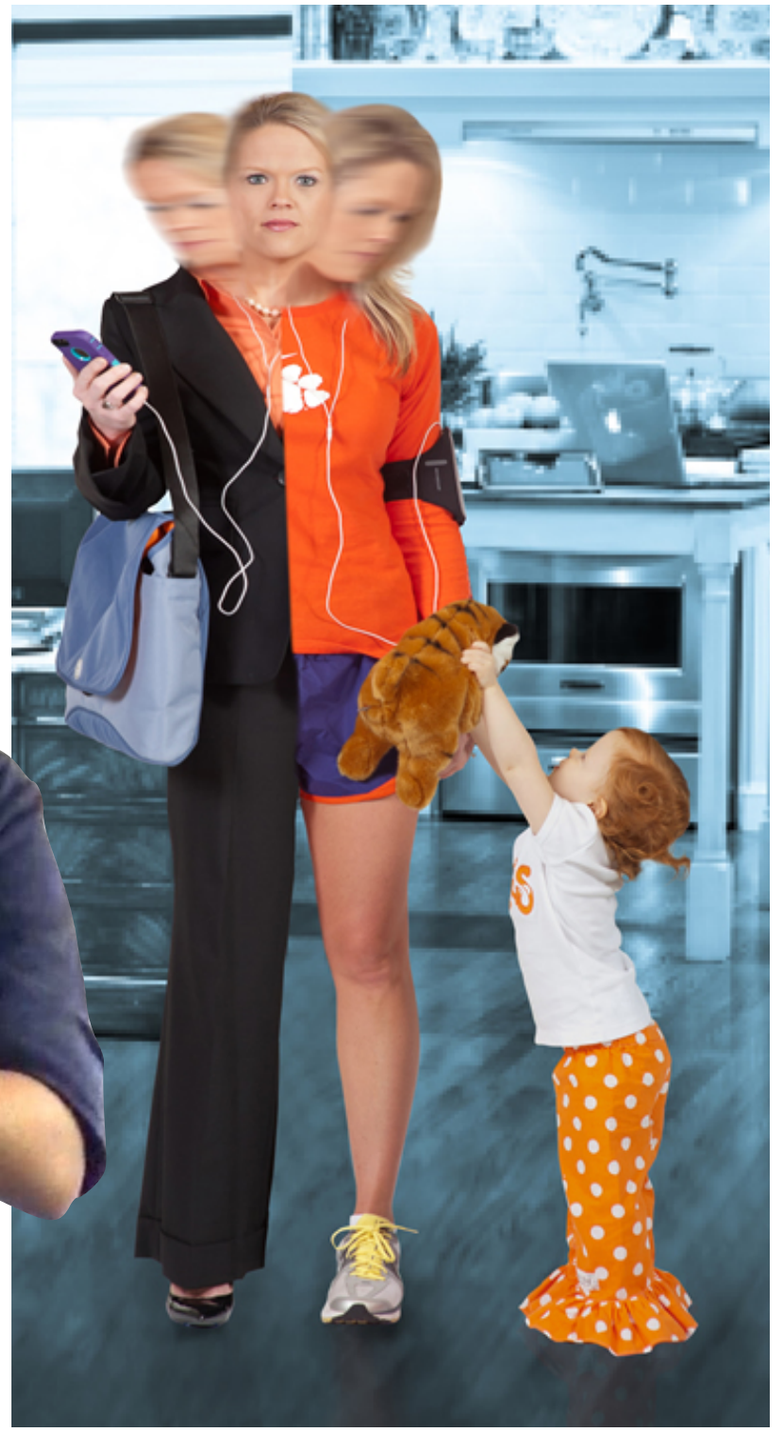
Stress, Meditation, Resilience and Well-Being

by Joseph Loizzo, M.D., Ph.D.

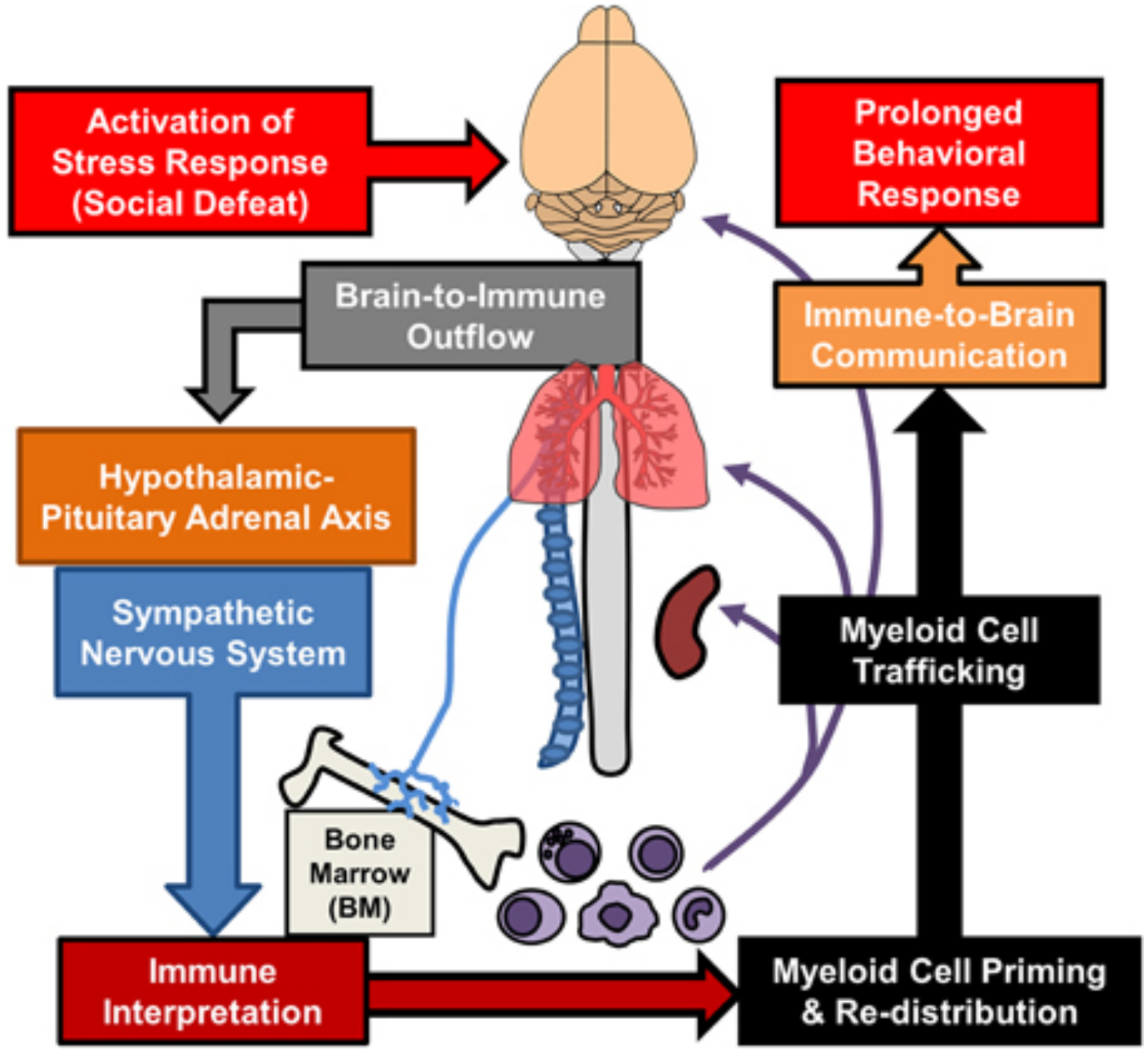
Weill Cornell Integrative Medicine

Nalanda Institute for Contemplative Science

The mounting challenges of everyday life in our digital age are putting ever-greater stress on the minds, brains, and bodies of people of all ages and backgrounds—this is even more true now in the era of COVID 19



Decades of research have mapped every step of the many path-ways by which stress inflicts wear and tear on our bodies and minds



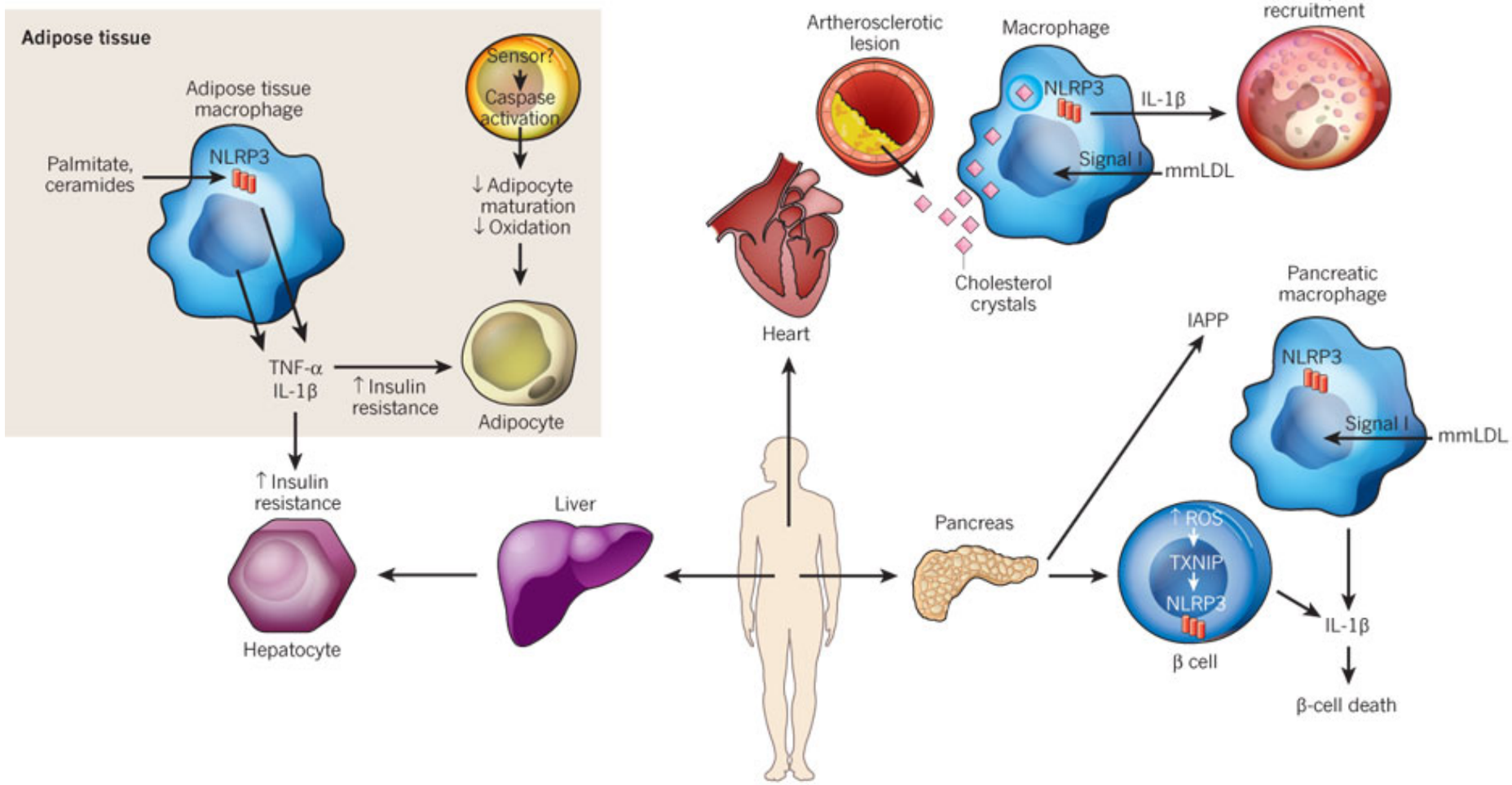
Compassion-Based Resilience Training (CBRT):

In This Training We'll Explore How Anyone and Everyone Can Stop Surviving and Start Thriving...

- The Latest on Stress, Trauma, and Negativity Bias
- The Science of Neuroplasticity and Resilience
- The Power of Mindfulness, Compassion and Embodiment
- How CBRT Fosters Resilience, Connection and Thriving

The Brain Under Stress: How Self-Protective Circuits Drive Self-Enclosure and Erode Health

We know chronic stress causes brain atrophy, lowers immunity, undermines performance, and fuels mind/body health problems like anxiety, depression, addictions, trauma, heart disease, diabetes, obesity and even cancer



Definitions: What are Stress and Trauma?

- Stress vs. stressor—its our response not the challenge
- Stress is our lived experience of outer or inner threat
- Trauma is extreme stress—an immediate, existential threat
- Stress and trauma share the same psychobiology
- The stress response involves the whole brain and body
- CBRT views stress and trauma as a four phase cycle

Cohen et al, 1995, McEwan et al, 1998

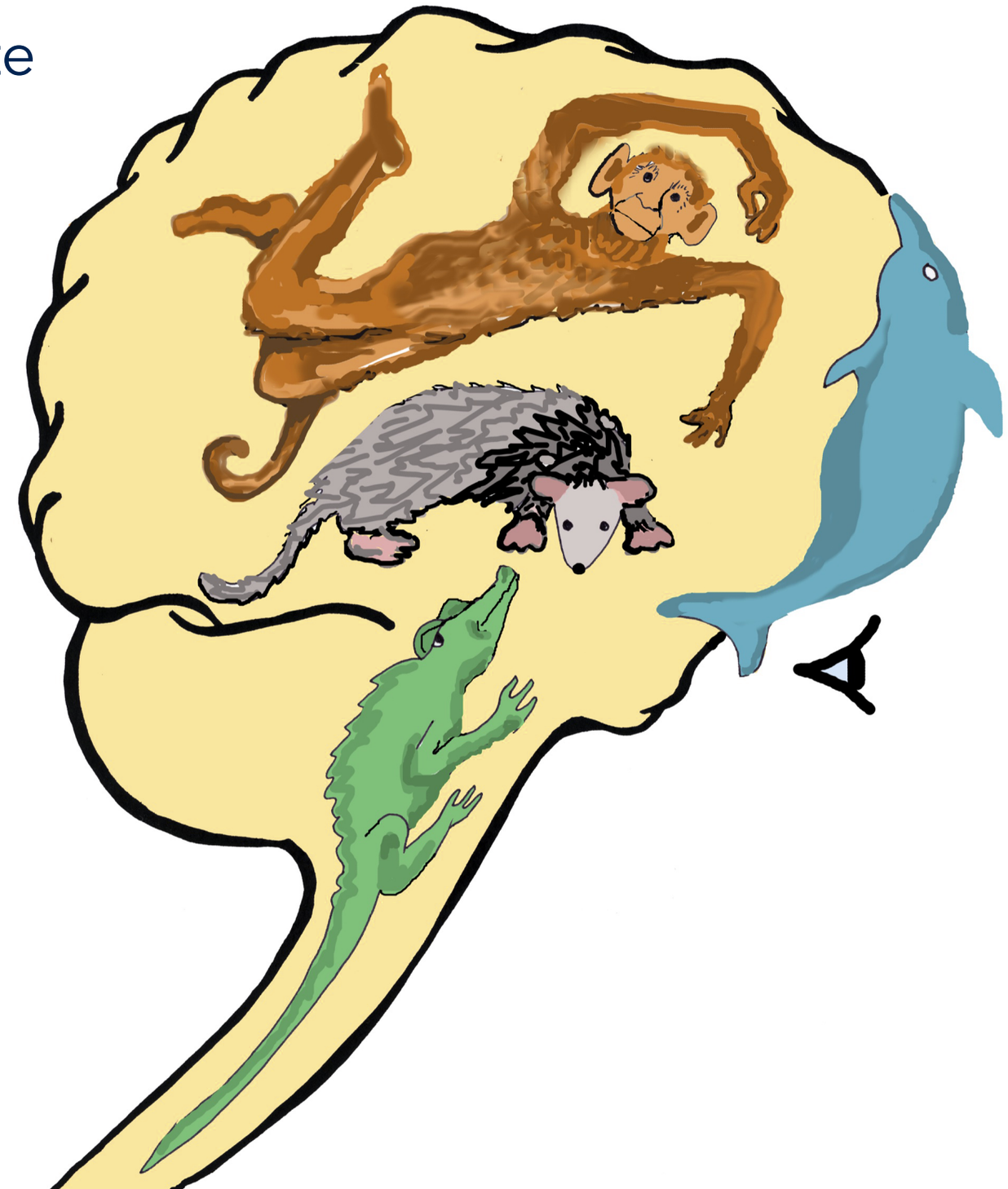
Sheldon Cohen: The Four Phase “Stress Cycle”

- Stress is not an outer challenge but an internal response
- Four phases: perceptual, emotional, visceral, cumulative
- Perceived stress is an appraisal of immanent risk or threat
- Two vector appraisal: outer threat vs. inner self-efficacy
- Emotional stress stirs reactive affects: fear, anger, shame
- Visceral stress: combines neural and chemical activation
- Sympathetic fight-flight, vagal faint-freeze, HPAA activation

Cohen et al, 1995, McEwan et al, 1998

The Human Brain in Evolution

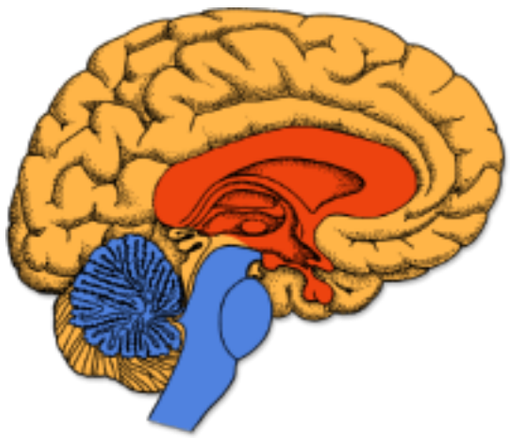
Neurobiology maps the human brain as an aggregate of three neural systems—neocortex, limbic system, brainstem—of primate, mammalian and reptilian origin



The Human Brain's Adaptive Modes

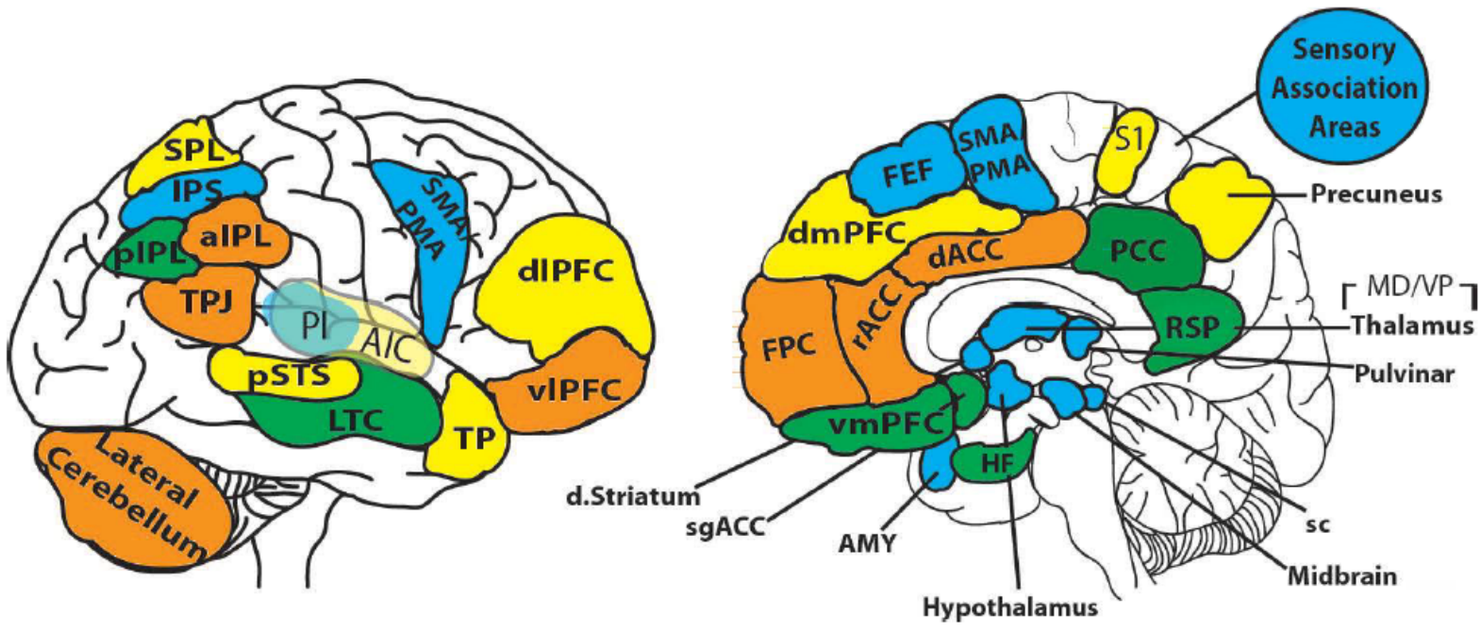
Each system runs the brainstem's basic life support network in response to distinct adaptive challenges:

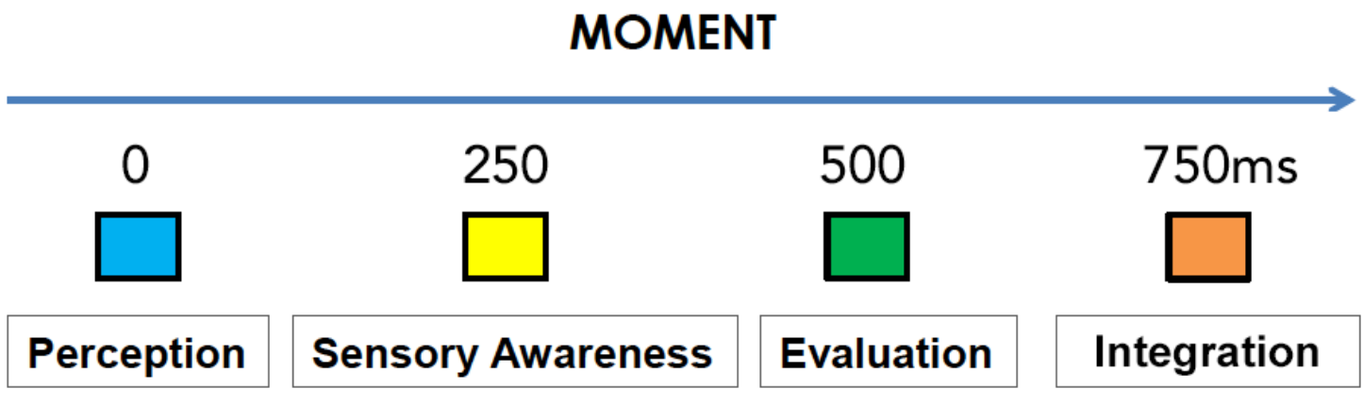
neocortex	role performance
limbic system	social interaction
brainstem	embodied balance



The Science of Neural Networks

Neural functions are not run globally by brain systems or locally by one region but by specialized networks that link key regions within and between systems

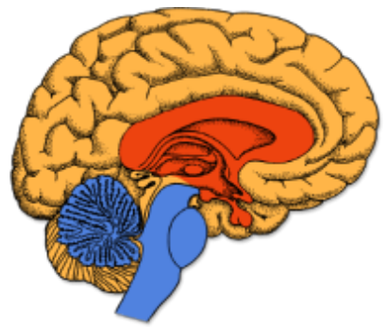




The Perceived Safety Hierarchy

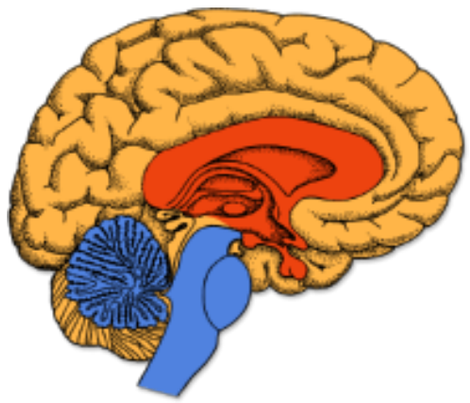
Newer, higher systems and networks support full engagement under safety, but under threat, processing shifts to older, self-protective systems and networks

- In role stress, the neocortex shifts from role engagement to self-enclosed default mode
- In social stress, the limbic system shifts from social engagement to reactive trauma mode
- In physical stress, the brainstem shifts from embodied engagement to reflex survival mode

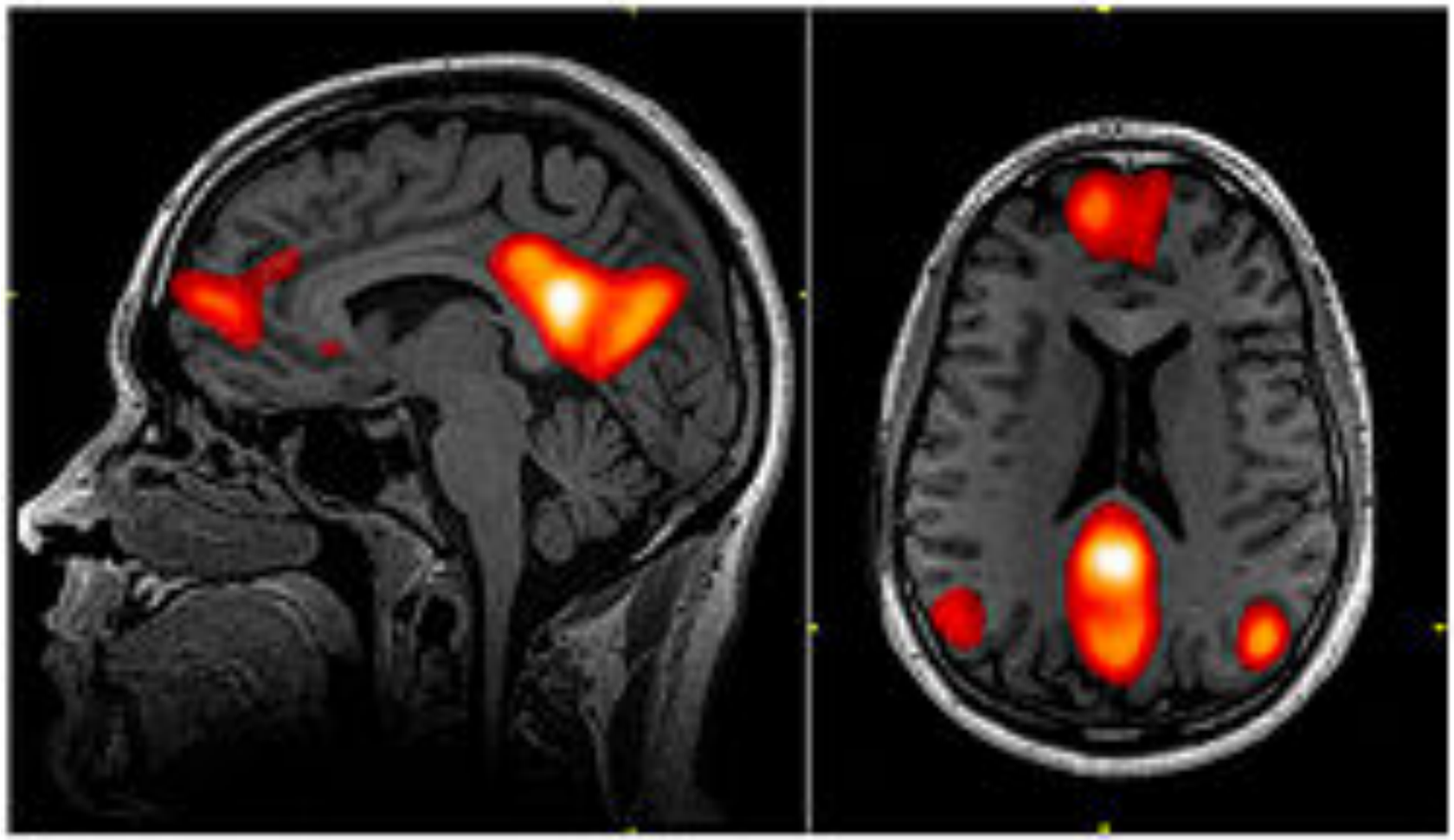


The Neurobiology of Stress and Trauma: Social Engagement Networks versus Self-Enclosing Networks in the Brain

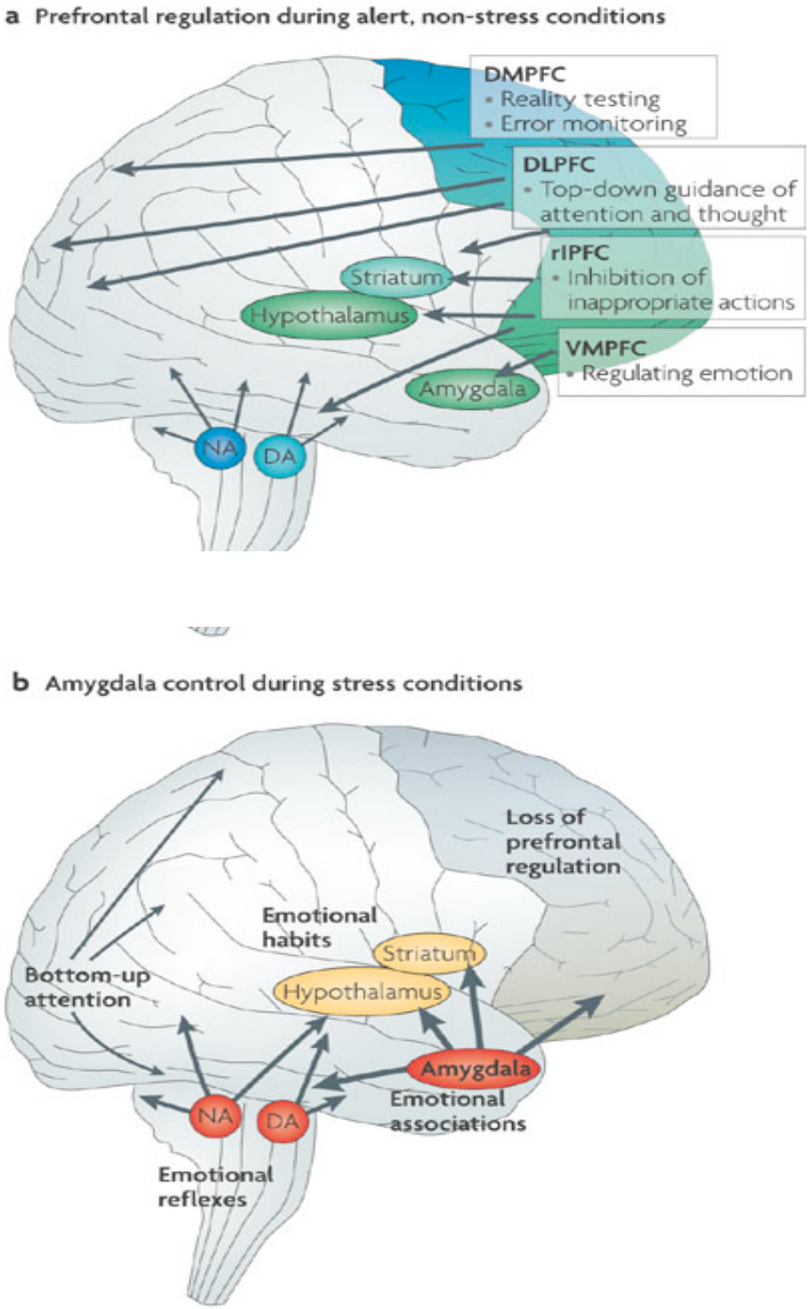
structure	engaged mode	enclosed mode
neocortex	**executive network**	**default network**
limbic brain	**empathy network**	**reactive network**
brainstem	**social autonomic**	**reflex autonomic**



The Default Mode Network:
Stress Appraisal and Neocortical Self-Enclosure



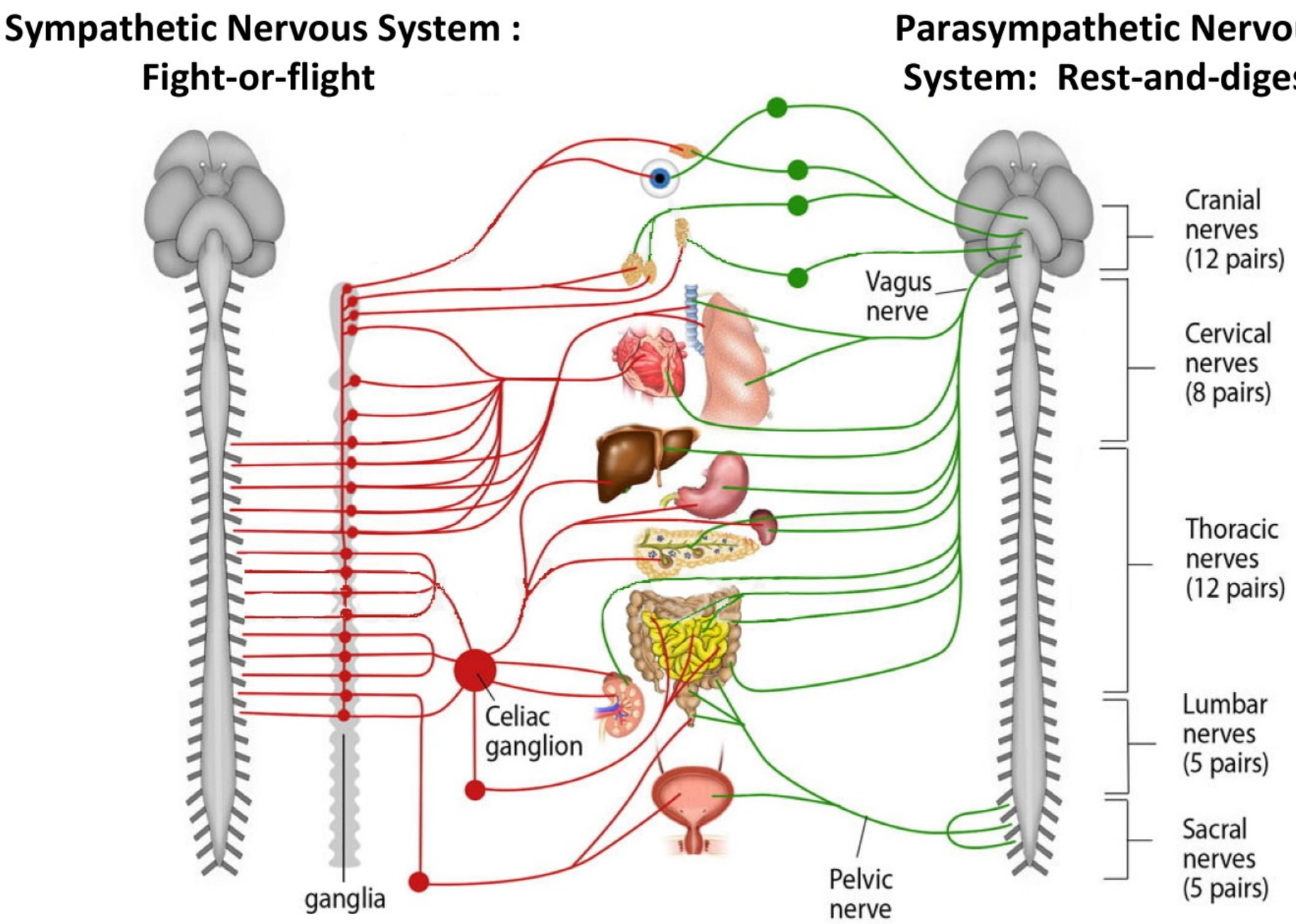
The Social Stress Reactive Network:
Traumatic Emotions and Limbic Self-Enclosure



The brain in safety in full social engagement mode, under the direction of the prefrontal cortex

The brain under stress, hijacked by the amygdala's limbic alarm and the hypothalamic driven stress-response

The Autonomic Stress Network:
Visceral Fight-Flight-Faint-Freeze Self-Enclosure



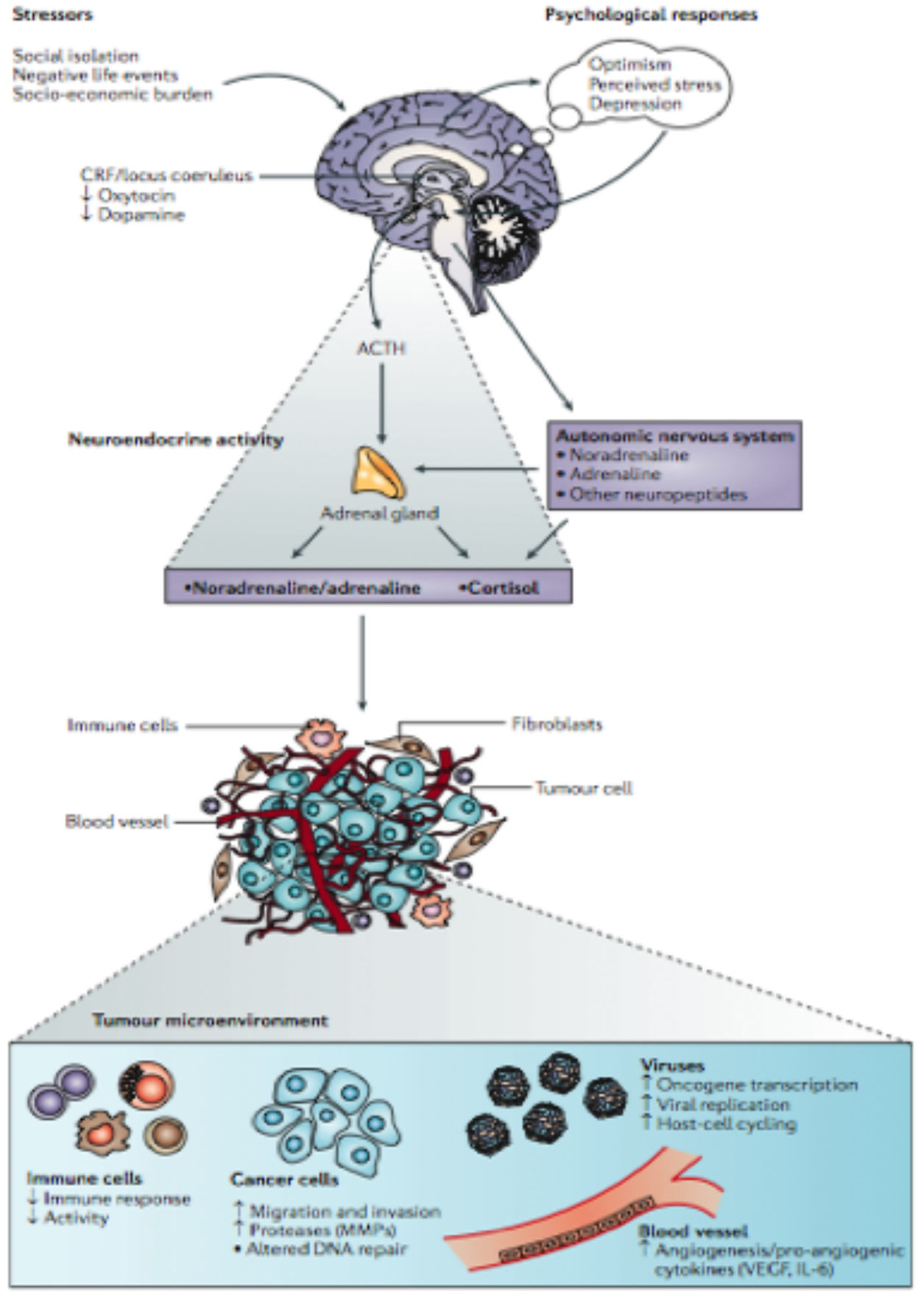
Cumulative Stress and Trauma Tigger the Chronic Reactivity that Drives Many Mind/Body Syndromes

- Dysregulated gut motility, IBS, colitis, etc.
- Increased risk of autoimmune conditions
- Atherosclerotic disease, heart attack, stroke
- Mind/body syndromes like fibromyalgia
- Metabolic disorders like diabetes and obesity
- Progression and spread of cancer

Chronic Stress, Inflammation, and Tumorogenesis

Stress Effects:

- Low Immune Response
- ^ Cancer Cell Migration
- Poor DNA Repair
- ^ Oncogene Transcription
- ^ Viral Replication
- ^ Angiogenesis

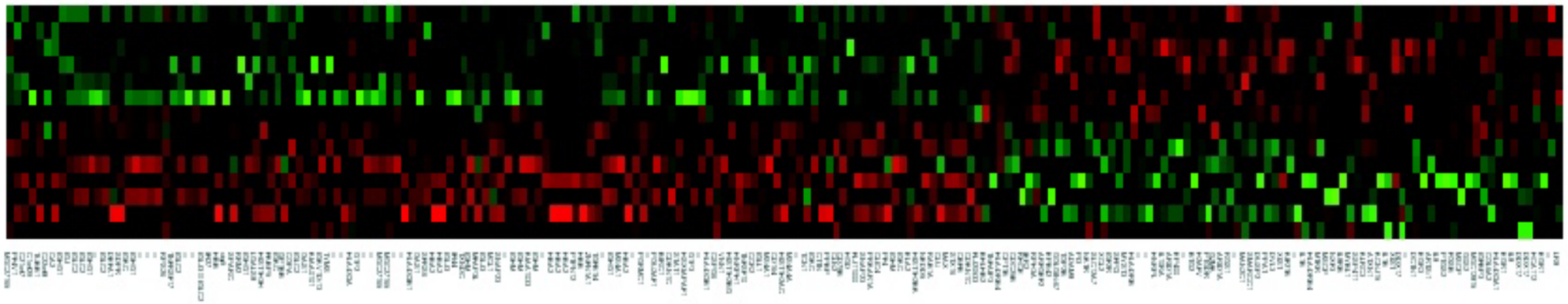


Chronic Stress Leads to a Proinflammatory Shift in Immunity that Promotes ASHD, Diabetes, and Cancer

- Decreased cellular immunity
- Increased pro-inflammatory cytokines (CRP, TNFα, TGFβ, IL 6)
- Decreased anti-viral cytokines (IL10, IL4)
- Metabolic syndrome, atherosclerotic heart disease
- Decreased cell surveillance, cancer proliferation
- Insulin resistance, obesity and diabetes

Chronic Perceived Social Isolation Triggers Proinflammatory Shift in Immune Gene Regulation, Reducing Cellular Immunity and Killer T-Cells

Lonely
N=6
Integrated
N=8



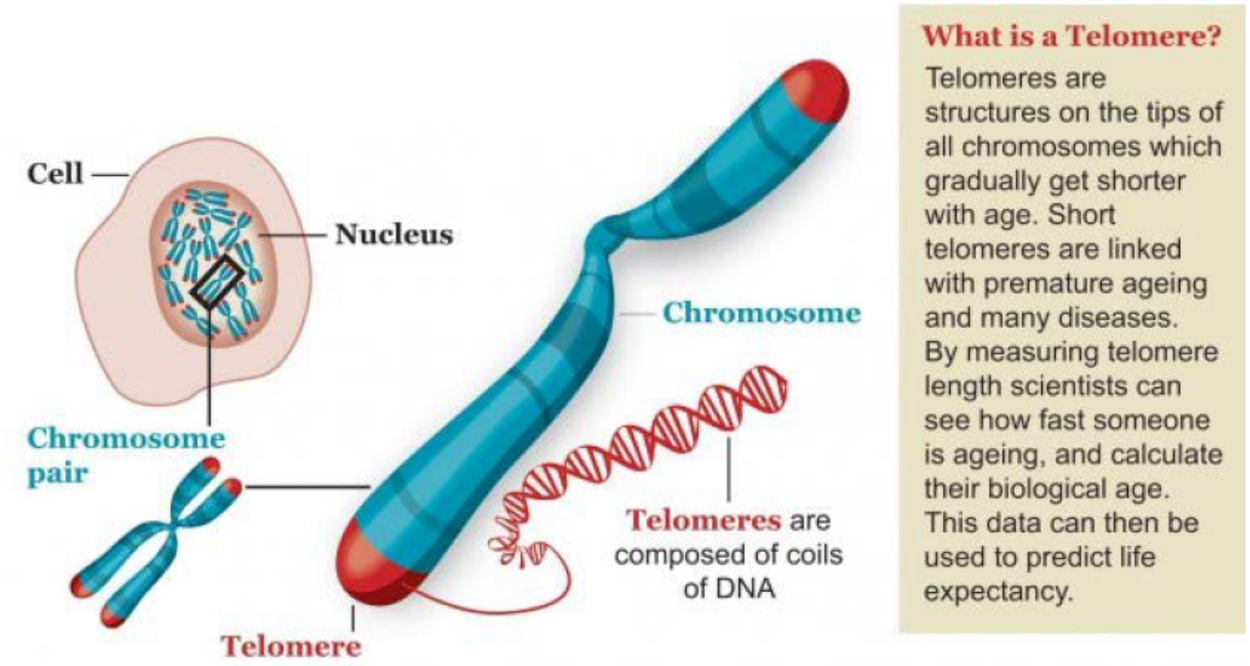
Highly Expressed Genes

Moderately Expressed

Minimally Expressed Genes

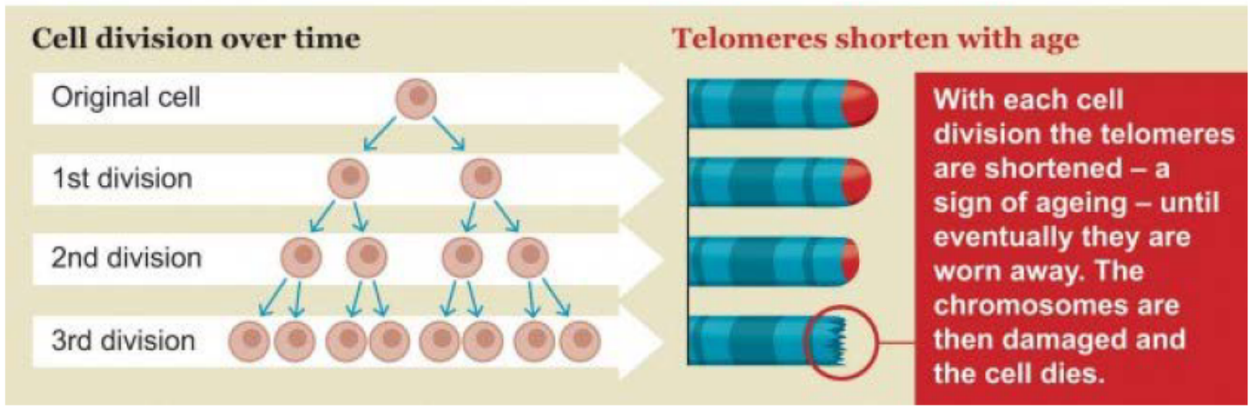
Cole et al, 2013

The Epigenetics of Chronic Stress: Shorter Telomeres Promote Aging and Tumorogensis



What is a Telomere?

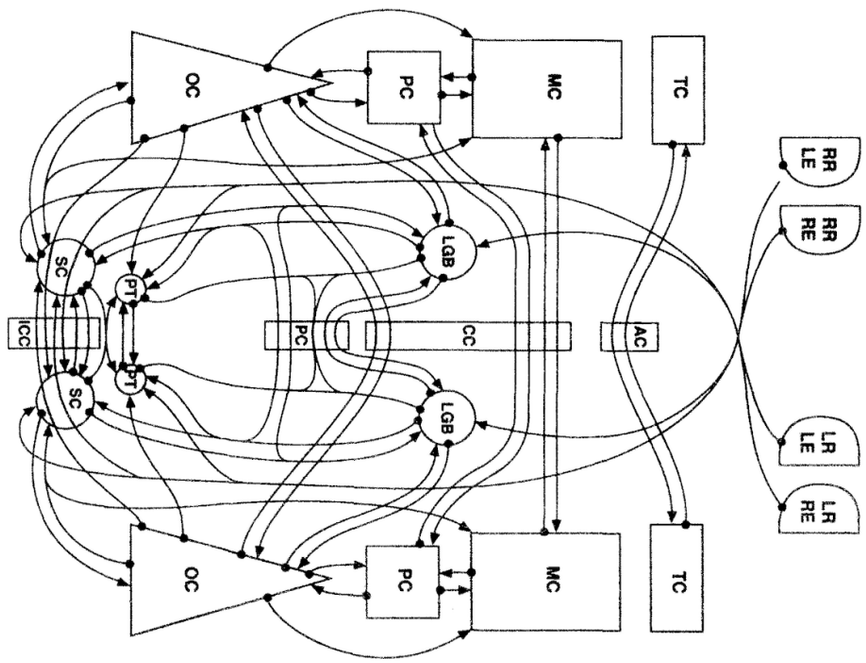
Telomeres are structures on the tips of all chromosomes which gradually get shorter with age. Short telomeres are linked with premature ageing and many diseases. By measuring telomere length scientists can see how fast someone is ageing, and calculate their biological age. This data can then be used to predict life expectancy.

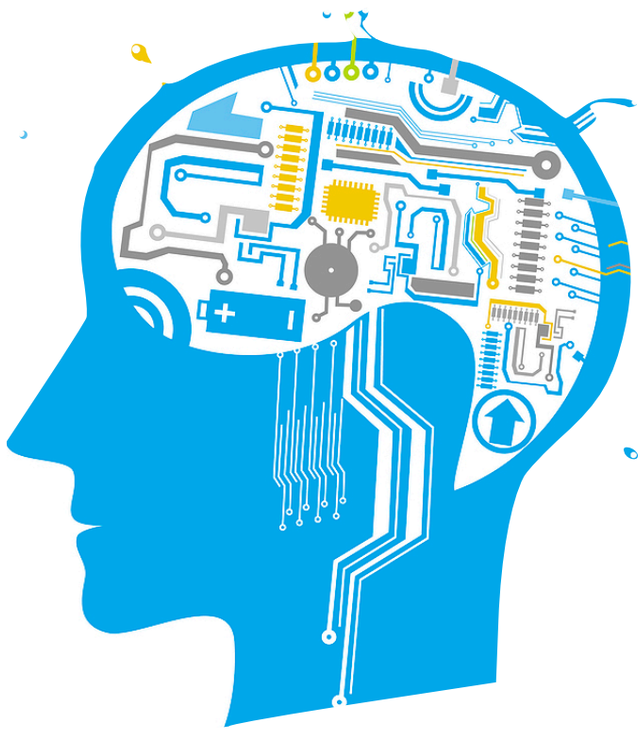


Courtesy David Vago

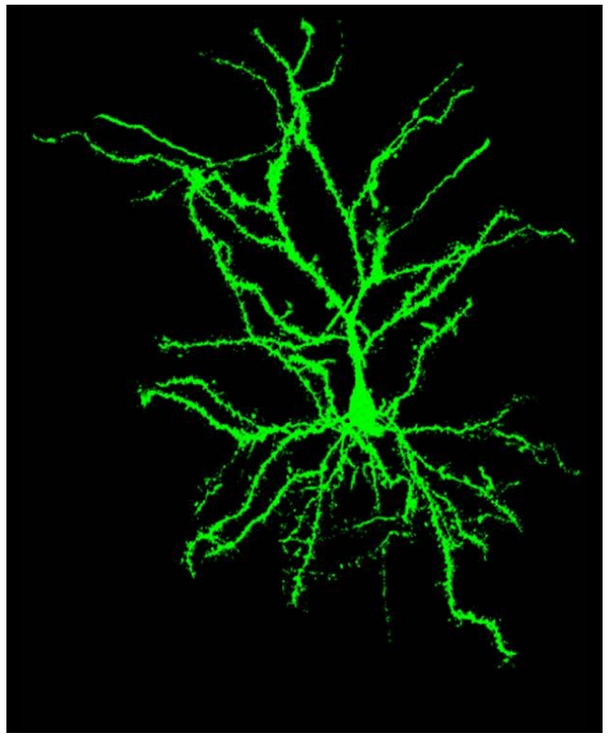
The Revolution of Neuroplasticity: Towards a New Paradigm of Mind/Body Illness and Optimal Health

In the late 1980's and early 1990's, research from several labs began to show that neurons were not hard wired but plastic—they were constantly shaped and reshaped by the neural activity that supported any lived experience or learning, much as muscles grow and are sculpted based on how we use them.



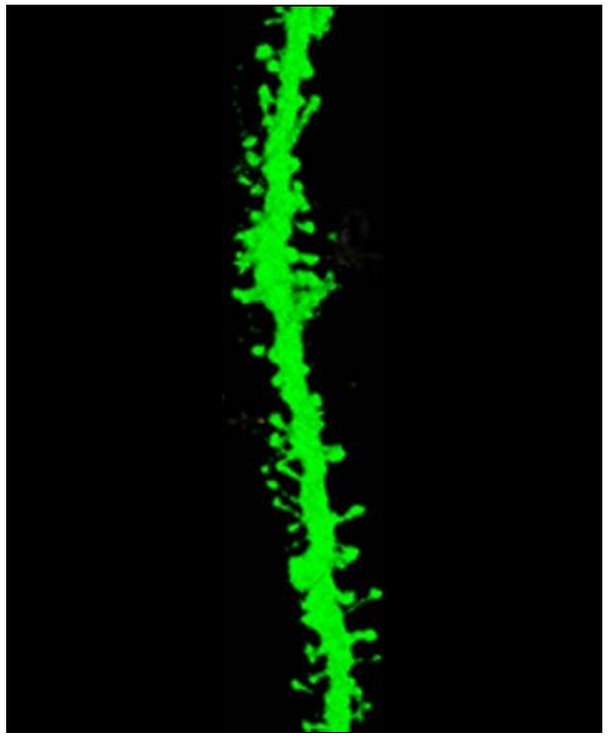


Remodeling of Neural Architecture and the Science of Memory Reconsolidation



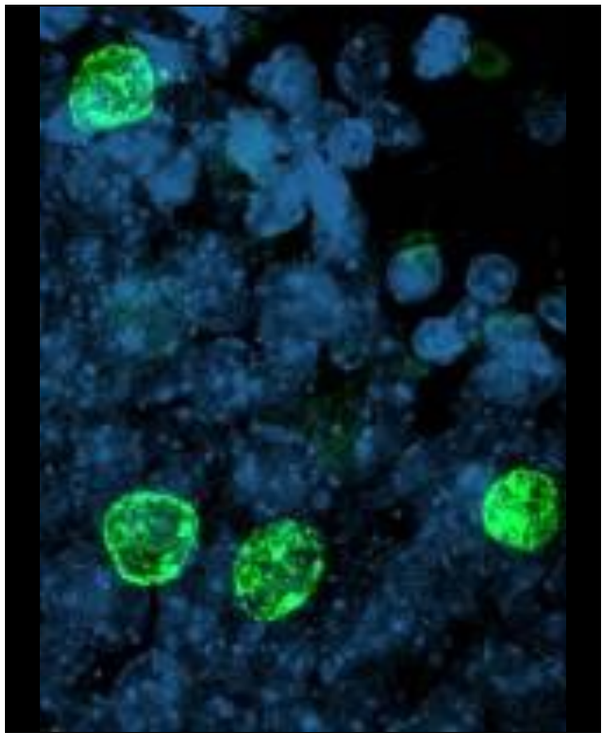
Dendrites

Shrink and expand



Synapses

Dissolved and replaced



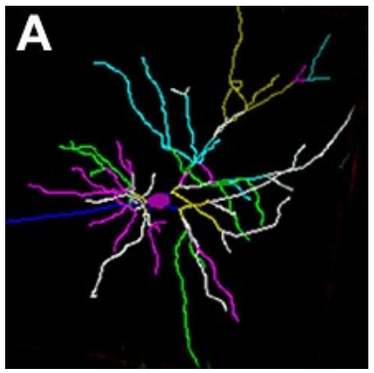
Neurogenesis

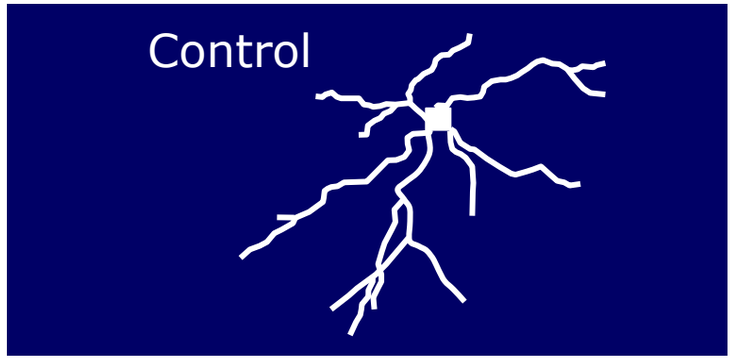
Continues in some areas

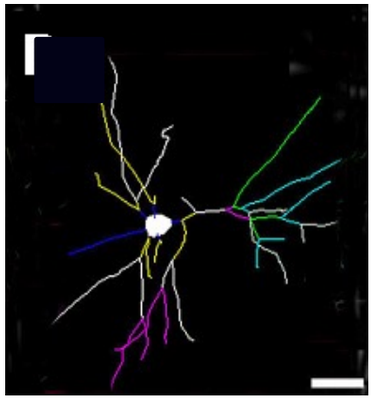
Courtesy Bruce McEwan

However promising this new science may be, neuroplasticity is a mixed bag—it can but does not necessarily change our brains for the better. In fact, chronic stress can wear down healthy brain structures and networks at the same time as it grows stress-reactive structures and networks, adapting us to an insidious cycle of hypervigilance, stress-reactivity and stress-related pathology.

Chronic Stress Shrinks Integrative Brain Circuits, Grows Stress-Reactive Trauma Circuits





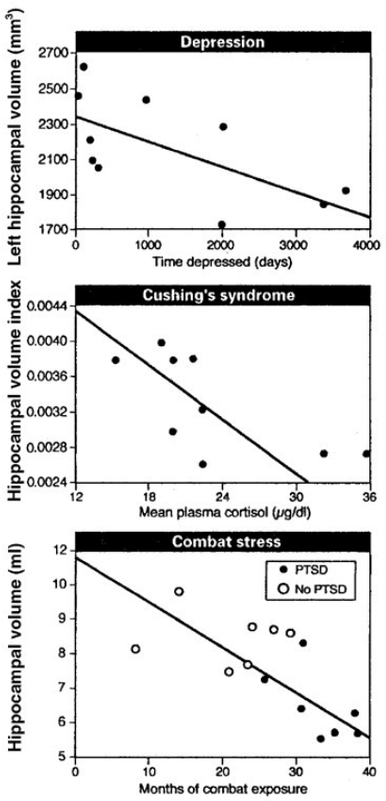


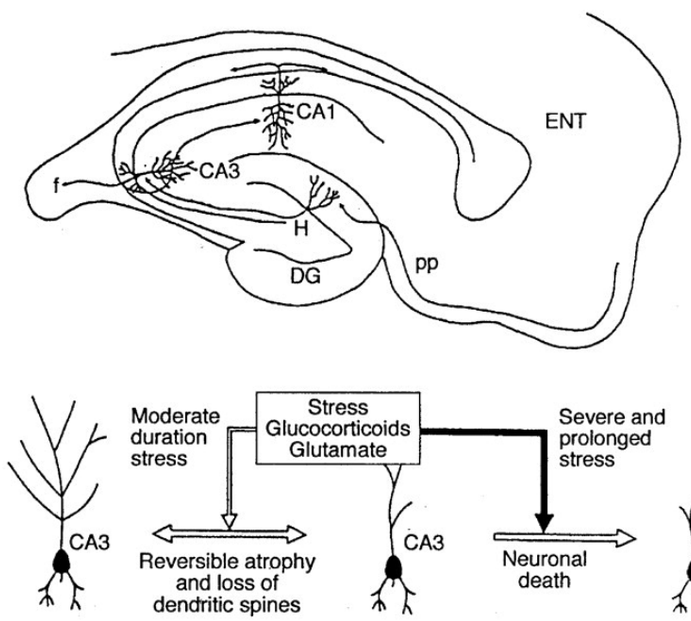
Medial prefrontal cortex and hippocampus

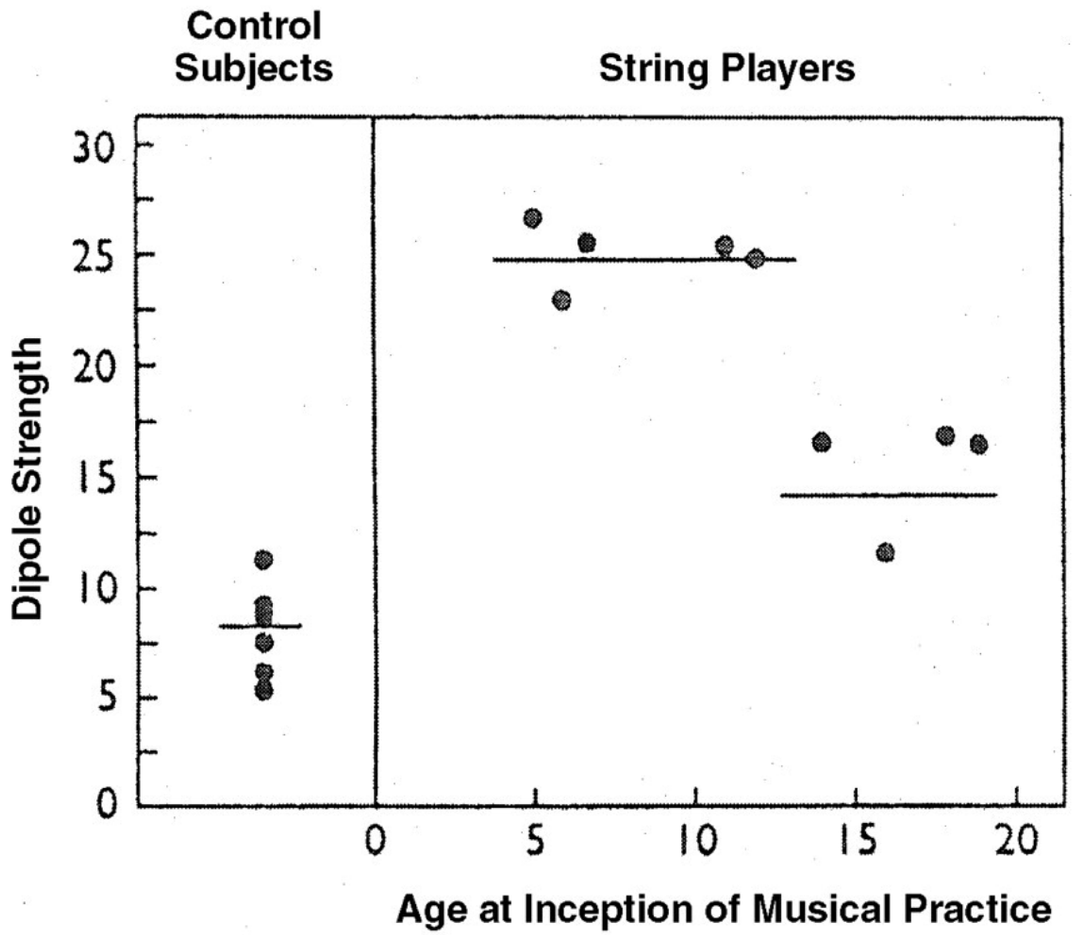
Amygdala, orbitofrontal cortex

Courtesy Bruce McEwen

Kandel's New Paradigm: Stress-Related Wear and Tear versus Use-Dependent Plasticity







Kandel, 2000

Fortunately, alongside negative neuroplasticity, recent research is providing ample evidence that our nature also primes us for positive plasticity—the growth of integrative structures and networks that promote well-being and social engagement—at least in the context of safe connection and secure empathic bonds...

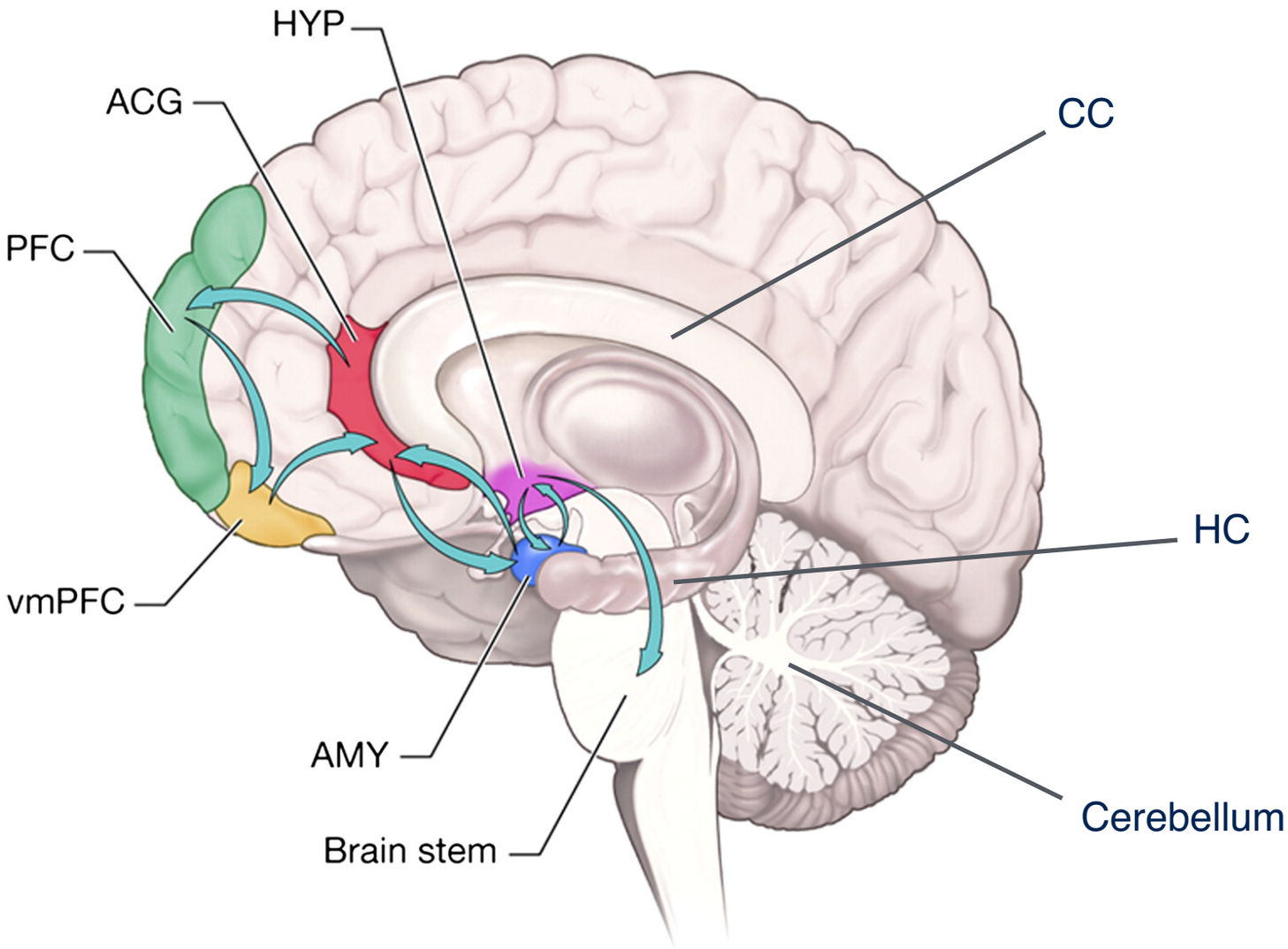
Definitions: What is Resilience?

- Resilience vs. grit—bouncing back is not “toughing it out”
- Catching, disengaging, shifting from stress to well-being
- Resilience occurs at at levels of the brain and body
- Perceptual resilience bounces back from stress appraisals
- Emotional resilience bounces back from stress emotions
- Visceral resilience bounces back from stress reflexes
- Adaptive resilience shifts from surviving to thriving
- Resilience can be a momentary state or installed trait

Prosocial Integrative Brain Structures:
The Neuroscience of Resilience and Well-Being

- Prefrontal cortex: "the conductor" of neural integration
- Insular cortex: mind-body sensory integration
- Corpus collosum: left brain/right brain integration
- Cingulate cortex: action, empathy, self-awareness
- Hippocampus: emotional and narrative integration
- Hypothalamus: autonomic and endocrine integration
- Myelinated cranial nerves: social mind/body integration
- Cerebellum: planning, execution, performance integration

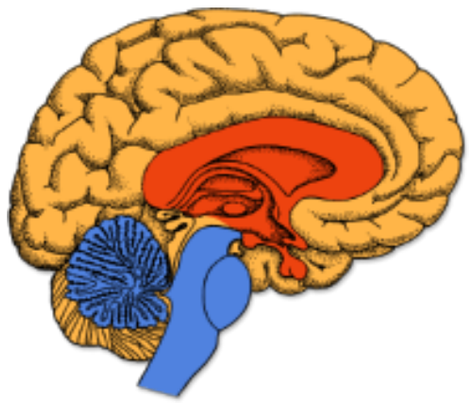
Diagram of Integrative Structures



These converging research trends make a compelling case for rigorous study of the differential impacts of stress and trauma versus positive mind states, social emotions and interactions on brain processing and development at all levels.

The Neurobiology of Stress and Trauma: Social Engagement Networks versus Self-Enclosing Networks in the Brain

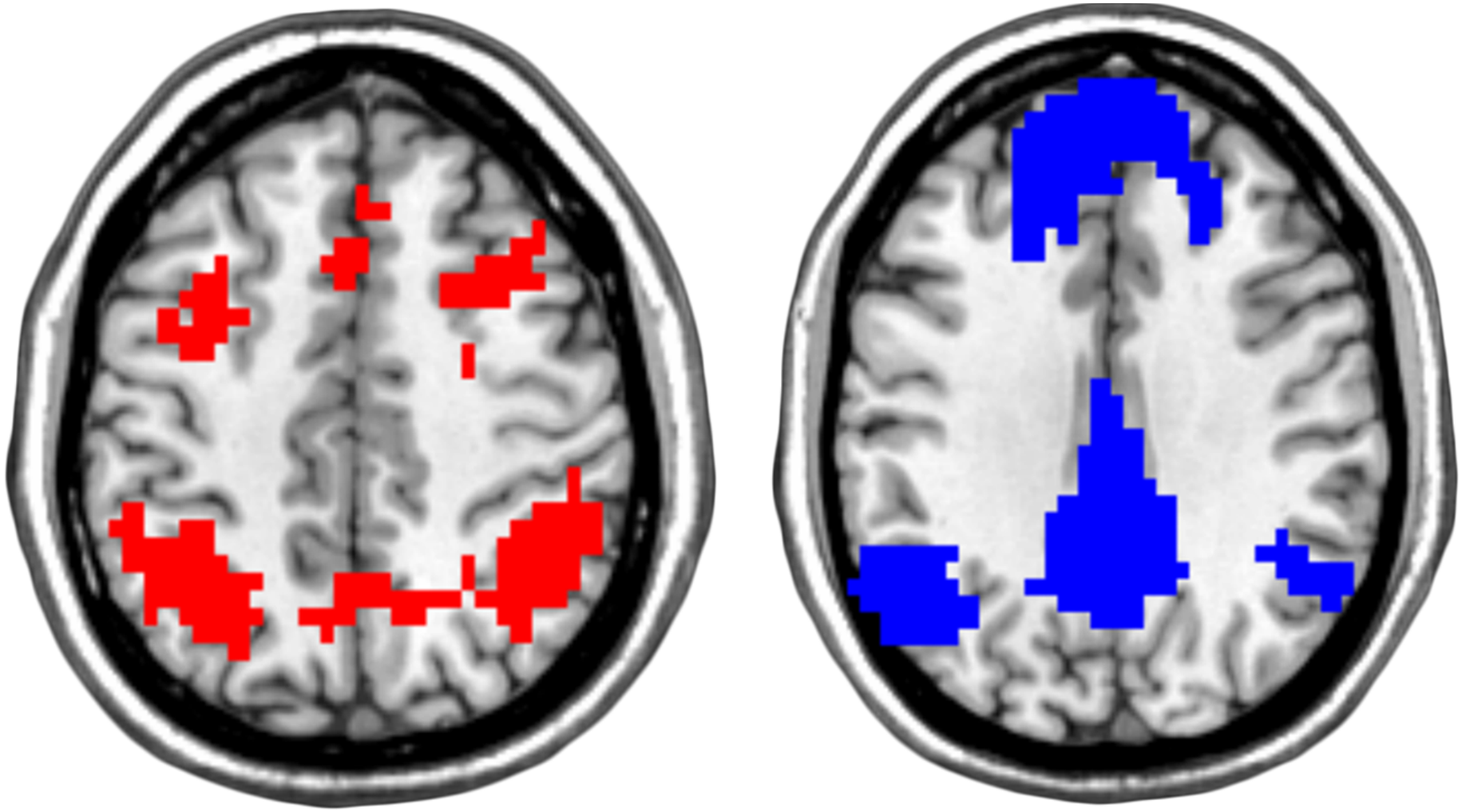
structure	engaged mode	enclosed mode
neocortex	**executive network**	**default network**
limbic brain	**empathy network**	**reactive network**
brainstem	**social autonomic**	**reflex autonomic**



The Central Executive Network (CEN): The Cognitive Brain's Present Executive

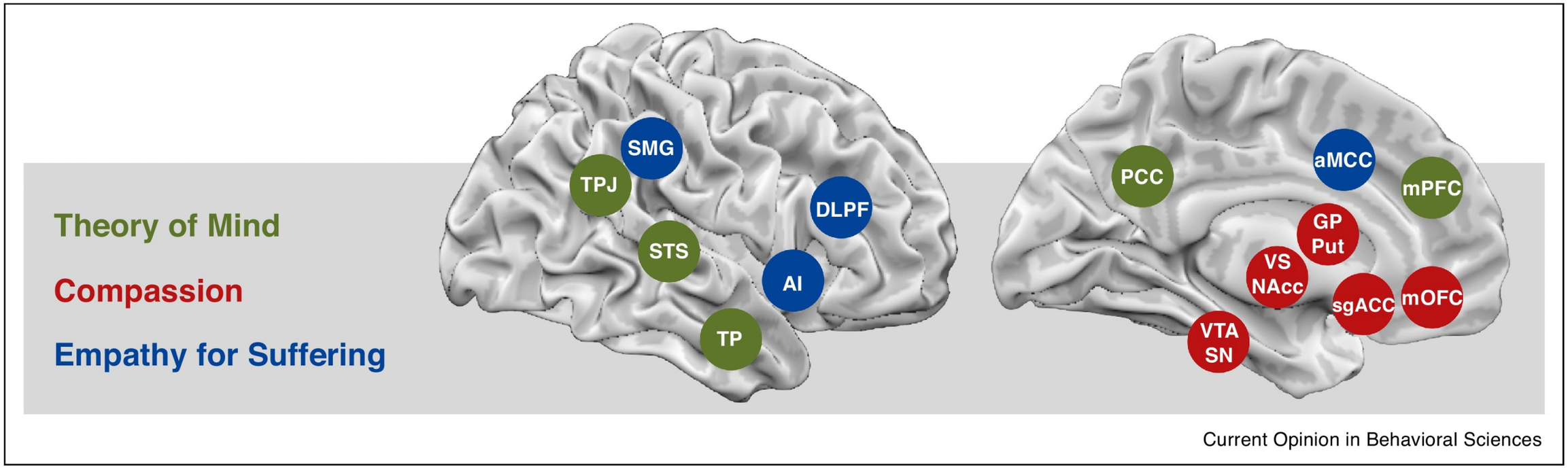
CEN

DMN



(Rhiannon et al, 2016)

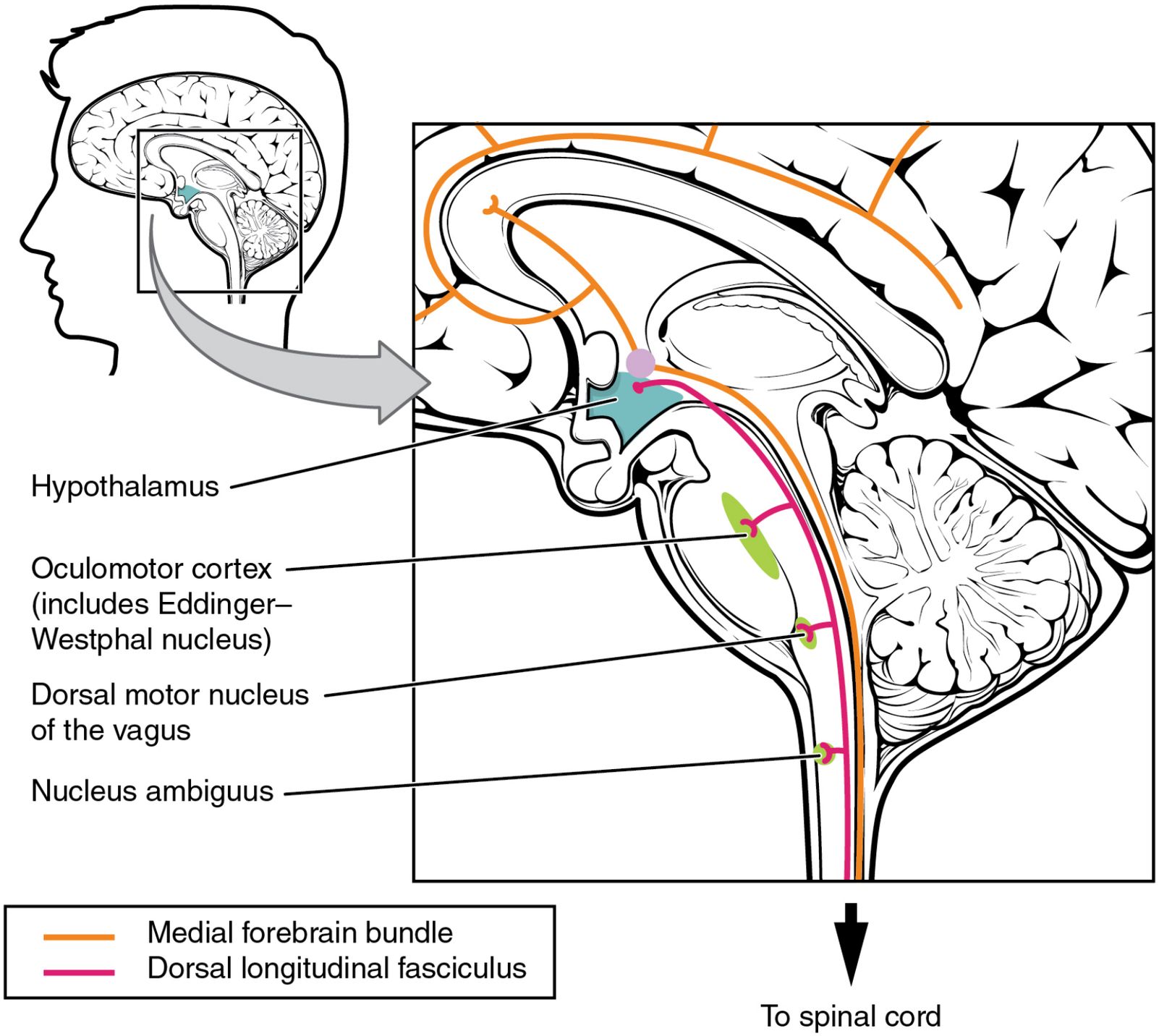
Limbic Social Engagement: The Empathy/Emotional Memory (Theory of Mind) Network



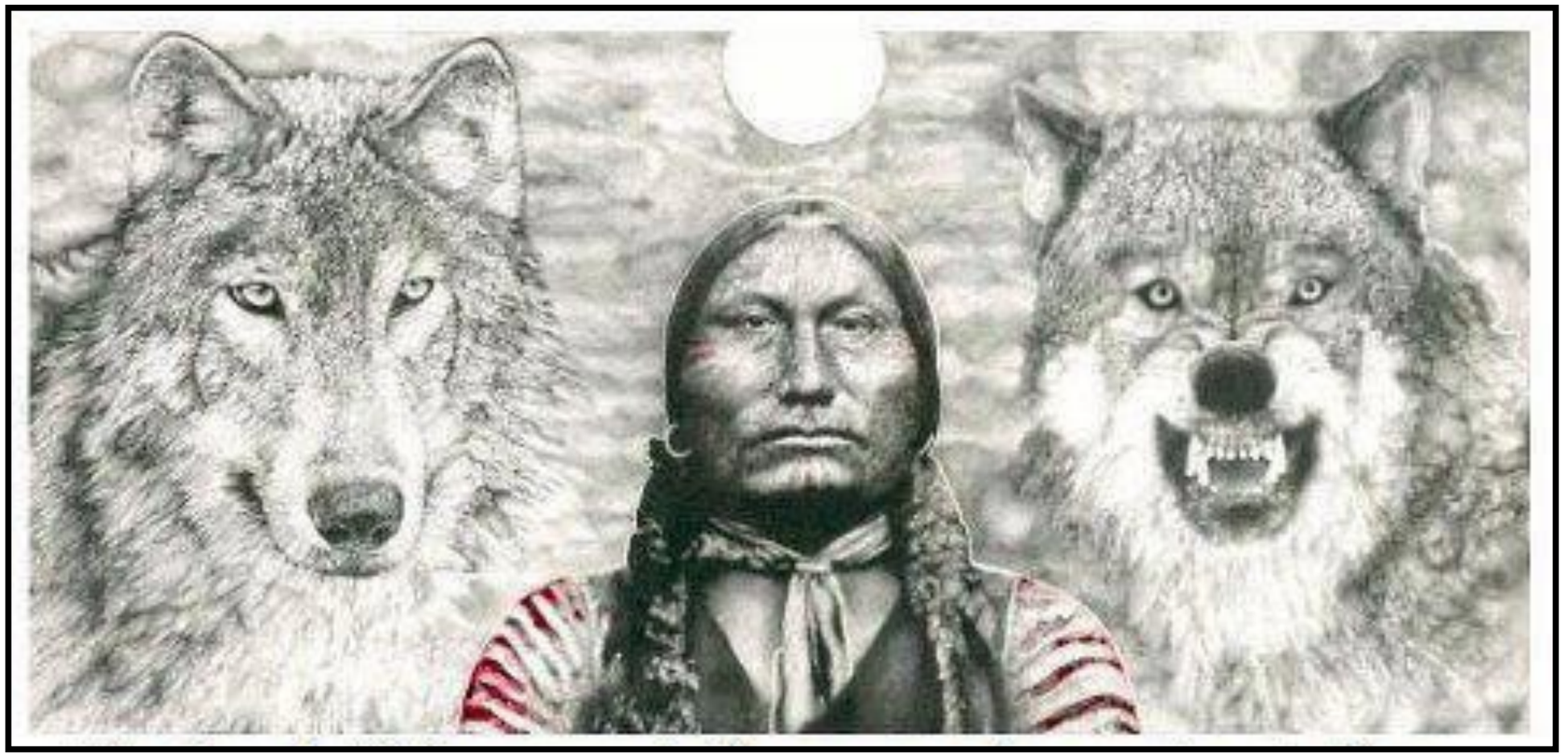
Current Opinion in Behavioral Sciences

(Prekel et al, 2017)

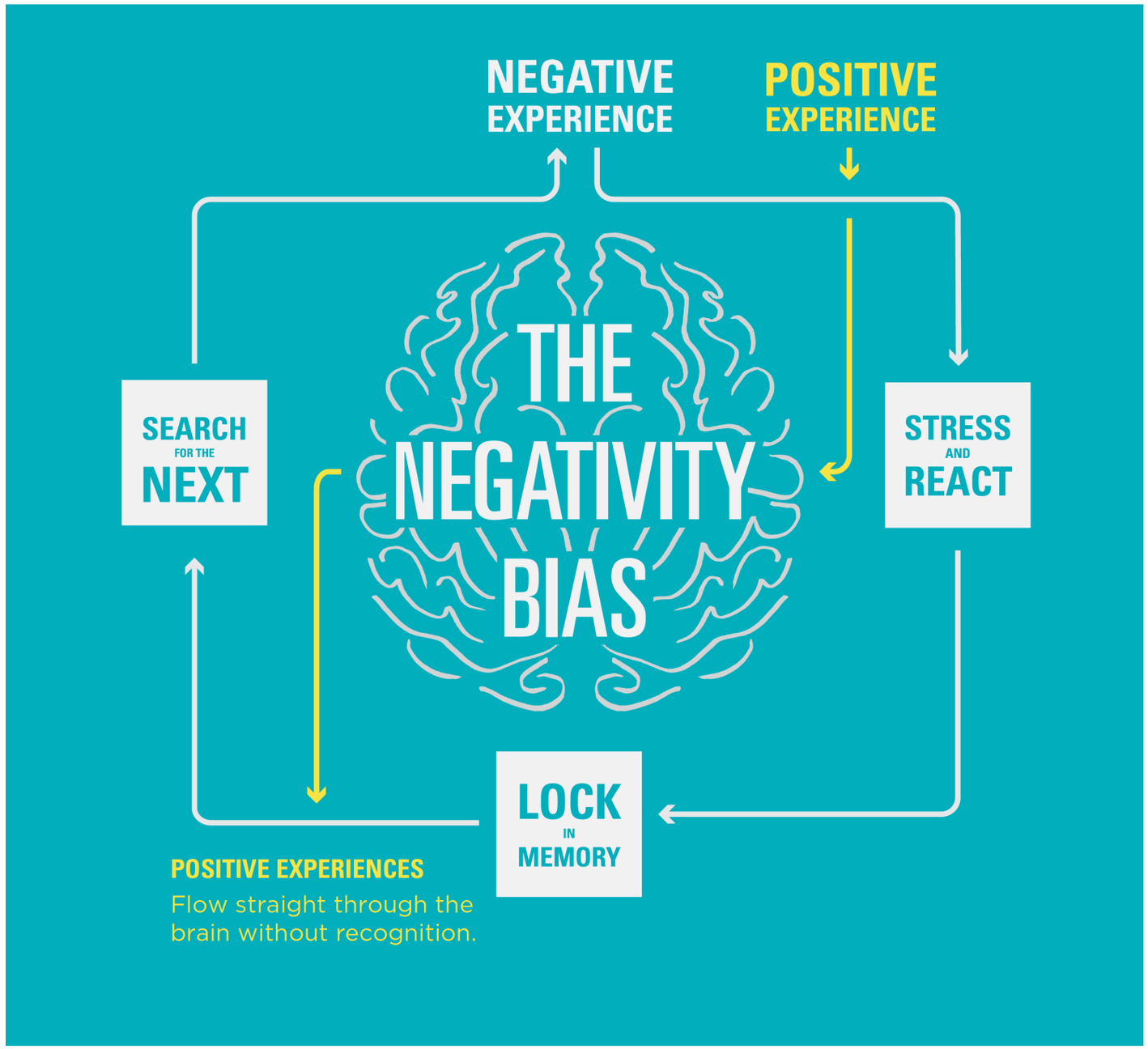
The Mammalian Brainstem: The Social Autonomic/ Internal Reward Network



By nature we're born on the fence—prepared to survive in the wild, and equally prepared to thrive in community. Given neural plasticity, the question is—what side of our nature do we practice? As a Cherokee proverb says, which wolf will we feed?



Hanson: "Survival Has Wired Our Brains to be like *Velcro* for Suffering but like *Teflon* for Happiness"



Rick Hanson, 2015

Conscious Neuroplasticity: Mindfulness, Compassion and Embodiment Skills for Optimal Health

Plasticity, Integration, and Contemplative Practice: The New Science of Self-Healing and Transformation

- Dan Siegel, Norm Doidge, Richie Davidson cite positive neuroplasticity as the basis for stress-reduction, brain integration, and optimal health—

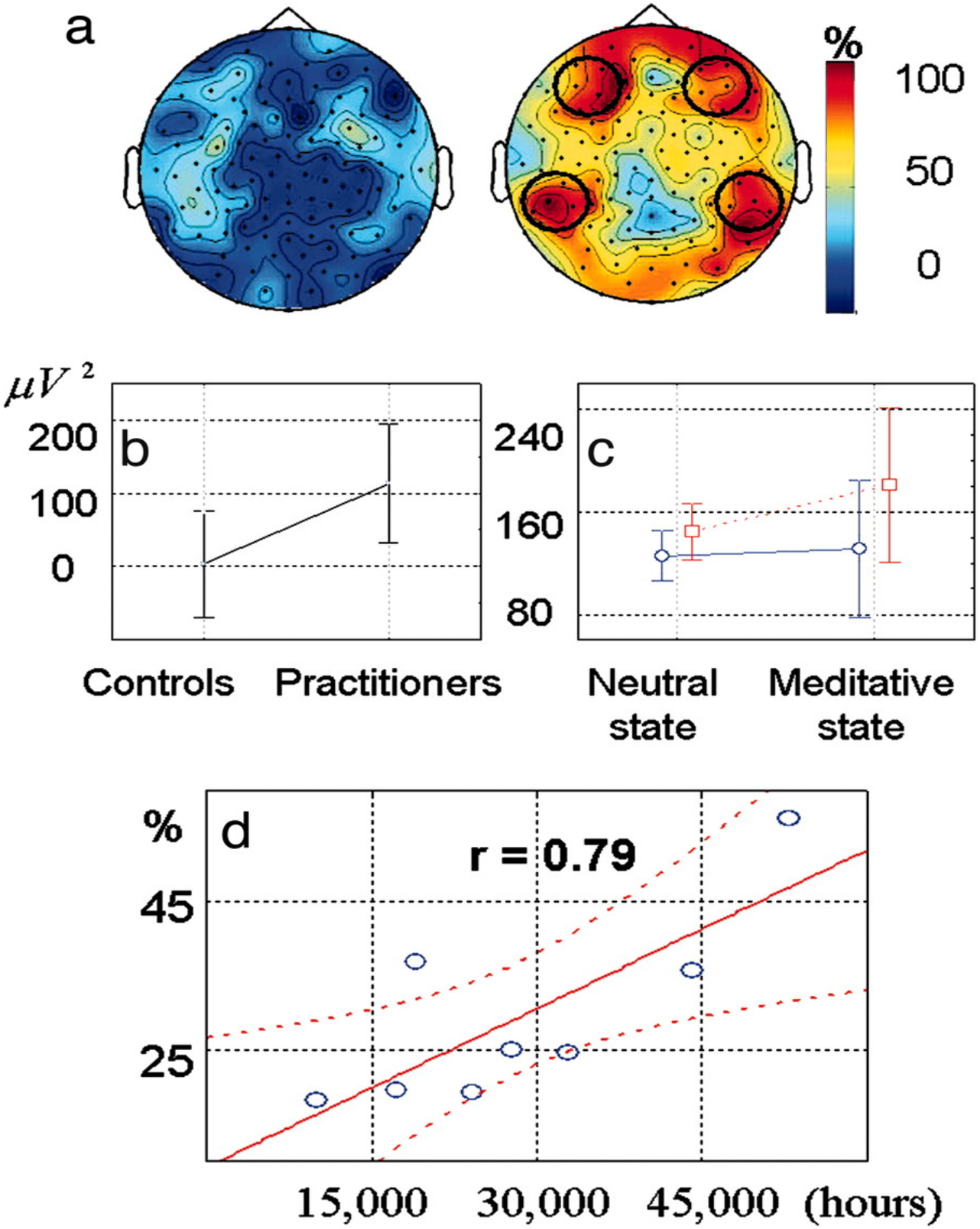
- Integrative structures wired by brain-training practices use plasticity to prune self-enclosed stress circuits and grow socially engaged circuits—

- Brain training practices like mindfulness are best practices for stress-reduction, neural integration, trauma recovery, resilience and well-being

Neuroscientists at Rockefeller University Dialogue with Contemplative Scientist HH the Dalai Lama

Contemplative Practices: Training Integrative Structures that Fully Engage the Social Brain

- Plasticity and integration linked with mindfulness (Davidson, 2003)
- Meditators self-generate hi-frequency gamma wave synchrony (Lutz et al, 2004)
- Gamma synchrony linked with plasticity, learning, and cortical coherence
- 2004 Lutz *et al* article in *PNAS* puts meditation at crossroads of neuroscience

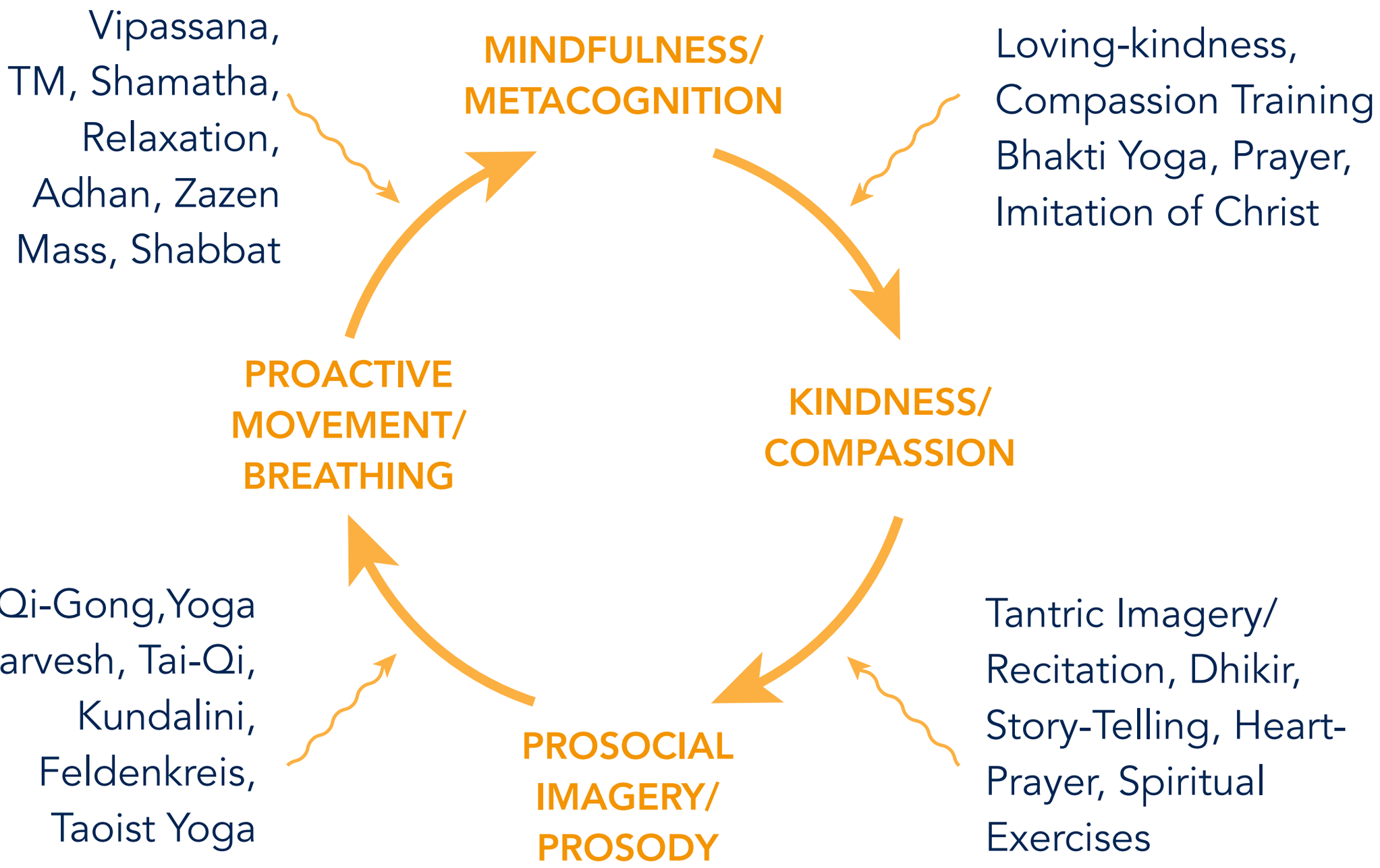


Gamma wave activity near zero in controls (left–blue) but exceptionally high and synchronous over the cortices of meditators (right–orange/red)

Lutz et al, 2004

Biologist-Monk Matthieu Ricard with Neuroscientist Richard Davidson

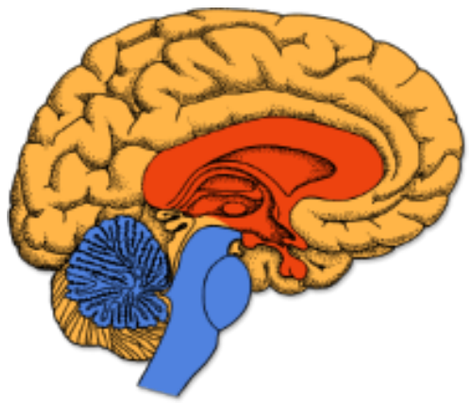
Many Cultures, Many Practices: The Healing Circle of Conscious Self-Regulation



Linking Practices with the Triune Brain

Each main contemplative practice type helps shift one level of the brain from reactive self-enclosure to proactive social engagement:

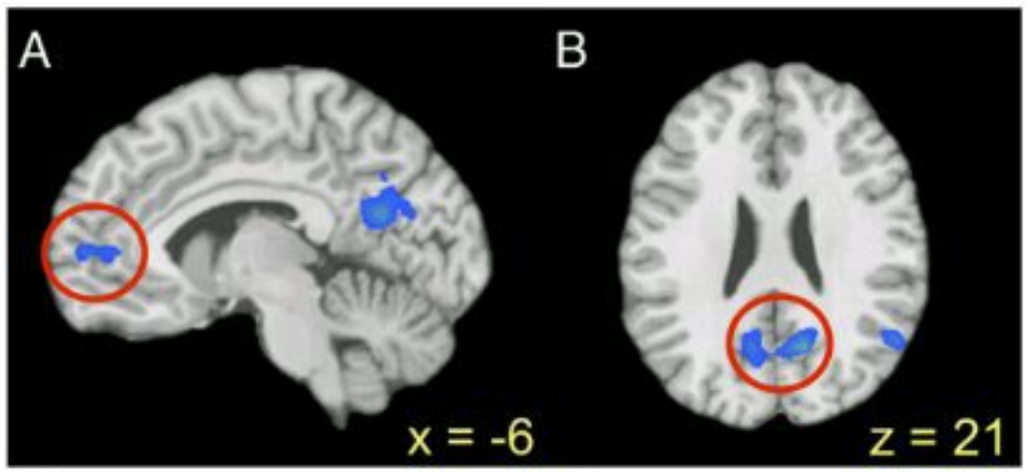
neocortex	mindfulness training
limbic system	compassion training
brainstem	embodied practices

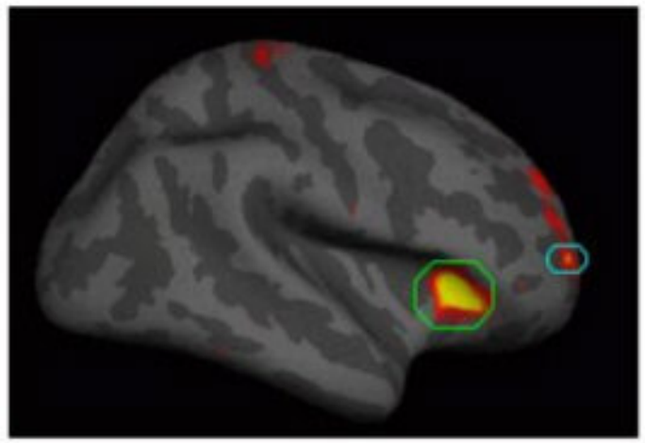


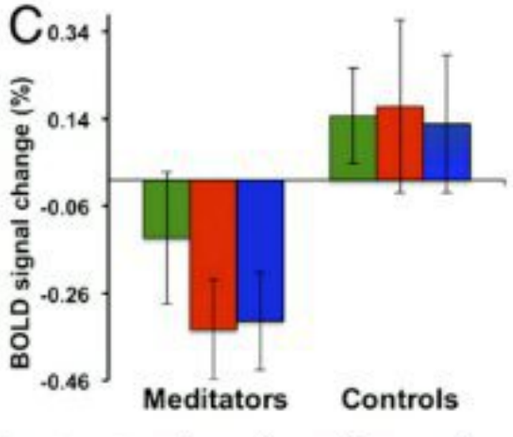
Definitions: What Is Basic Mindfulness and How Does It Work?

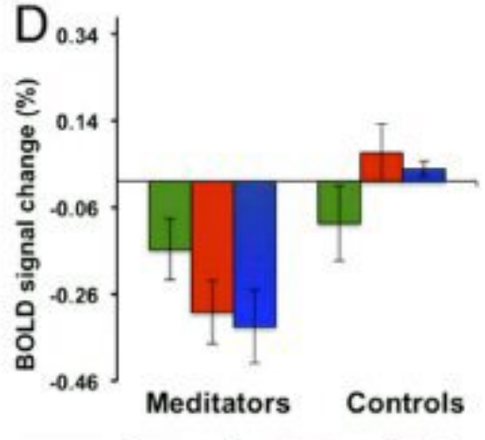
- Paying clear, calm attention to your experience in the here and now
- Observing what is—without aversion, clinging or inattention
- Centering awareness by calming distraction, arousing dullness
- Focus on breathing body, sensitivity, awareness, whatever comes up
- Makes space and time—a gap—for wiser assessments and decisions

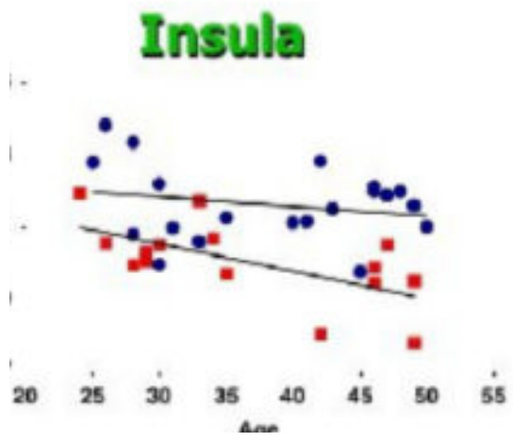
Neocortical Engagement: Mindfulness Training Shifts DMN Self-Enclosure to Prefrontal Presence

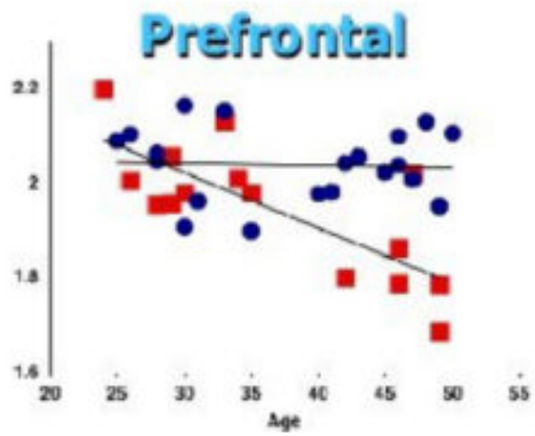




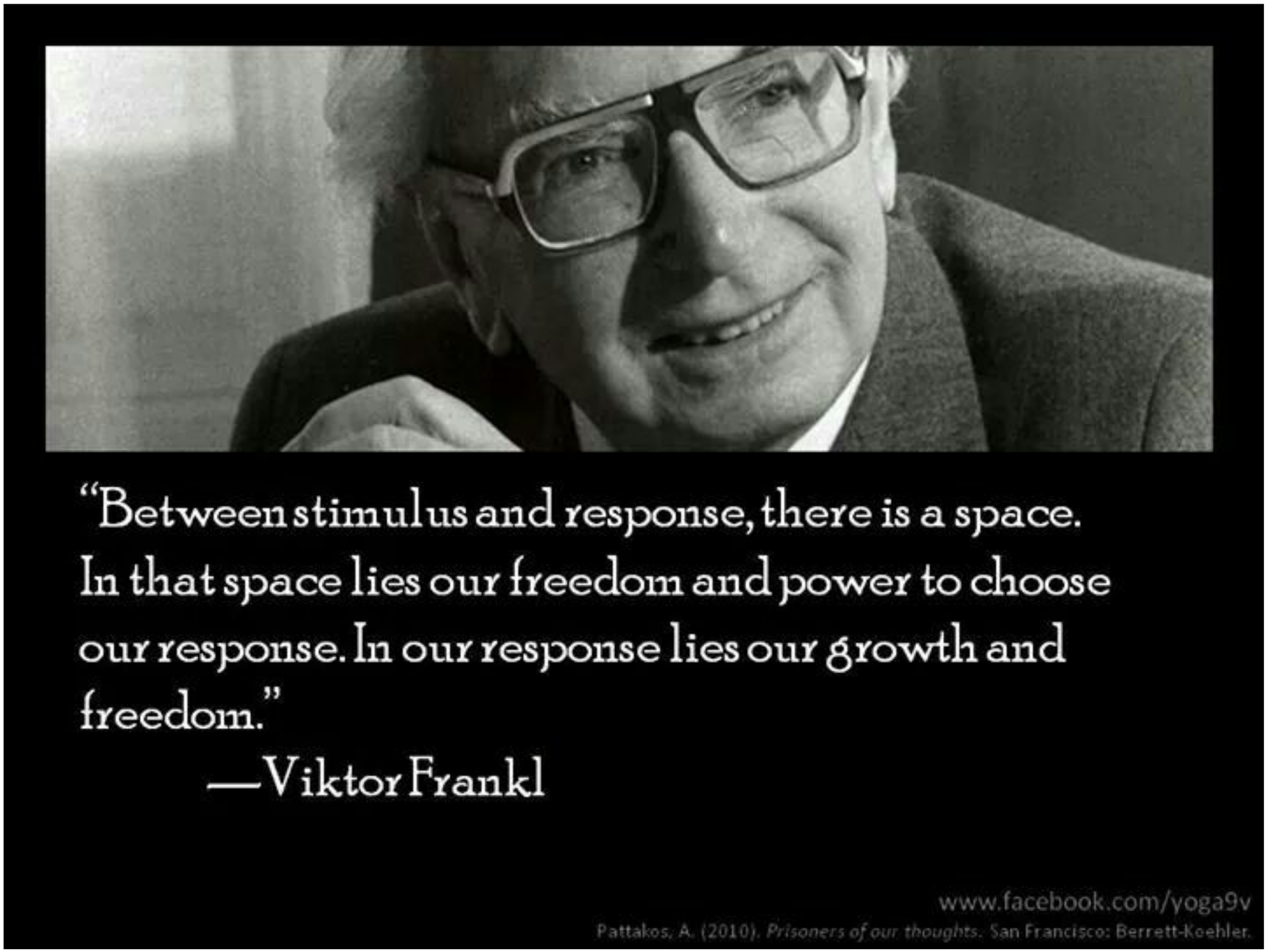








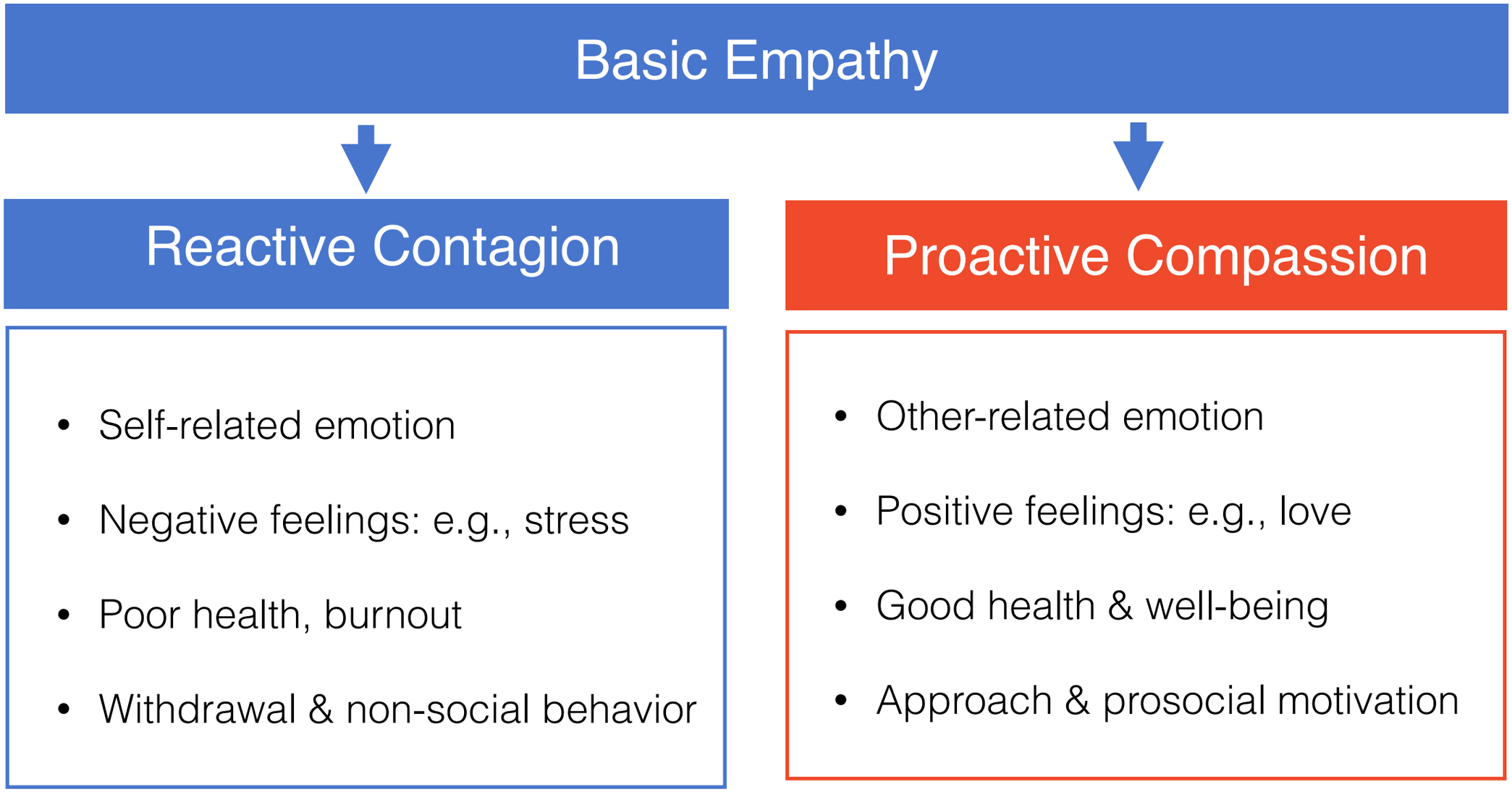
Brewer et al, 2011; Lazar et al, 2005


"Between stimulus and response, there is a space.
In that space lies our freedom and power to choose
our response. In our response lies our growth and
freedom."
—Viktor Frankl
www.facebook.com/yoga9v
Pattakos, A. (2010). Prisoners of our thoughts. San Francisco: Berrett-Koehler.

Definitions: What Is Compassion and How Does It Work?

- Start with mindfulness of what's ailing you, here and now—
- Accept your suffering as human, without shame or blame
- Investigate your suffering to reveal root causes and conditions
- Meet your own needs when you can and ask for help when you can't
- Gradually widen your circle of care to mentors, friends, strangers, challengers

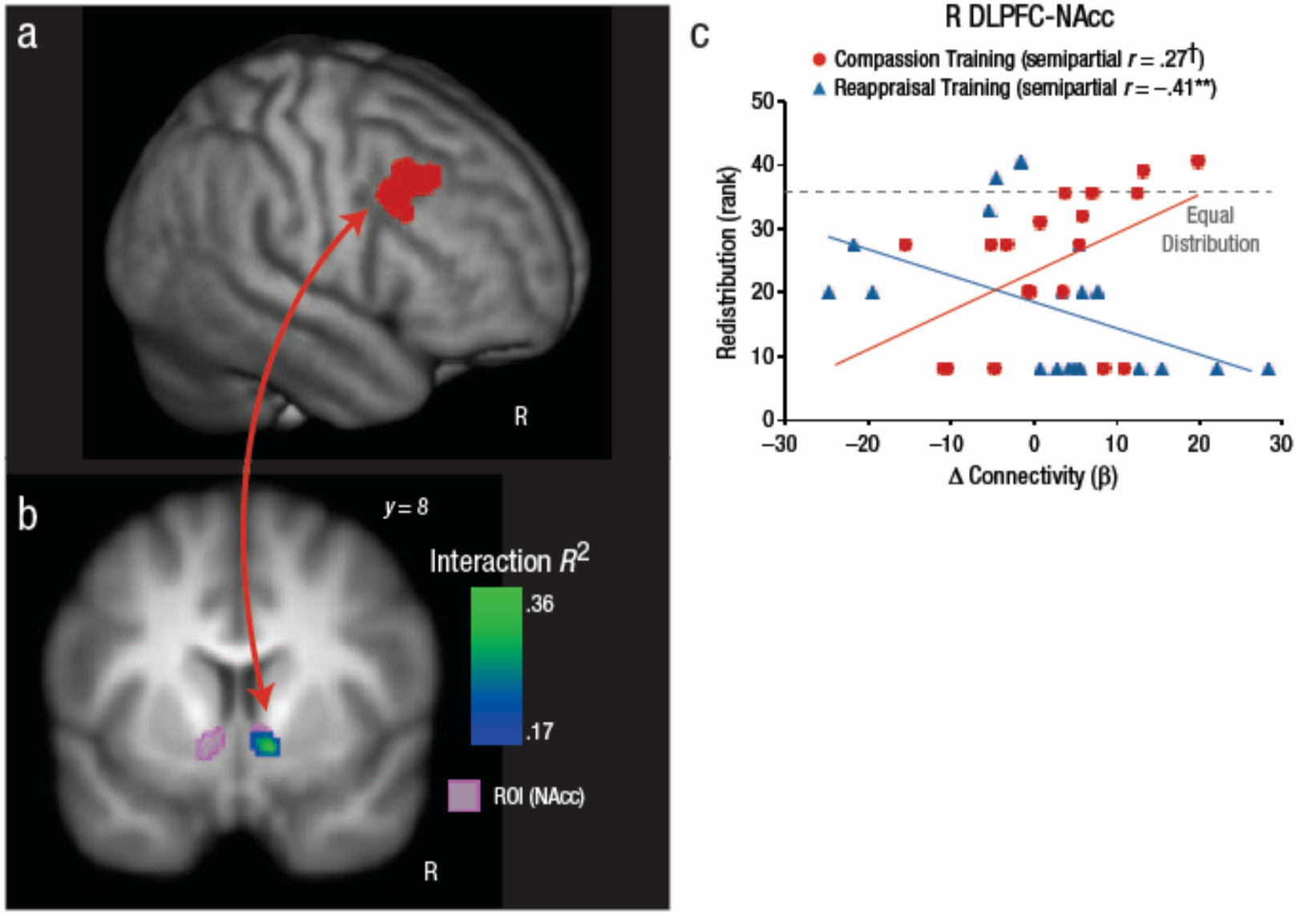
Limbic Engagement: Compassion Training Shifts Reactive Contagion to Proactive Compassion



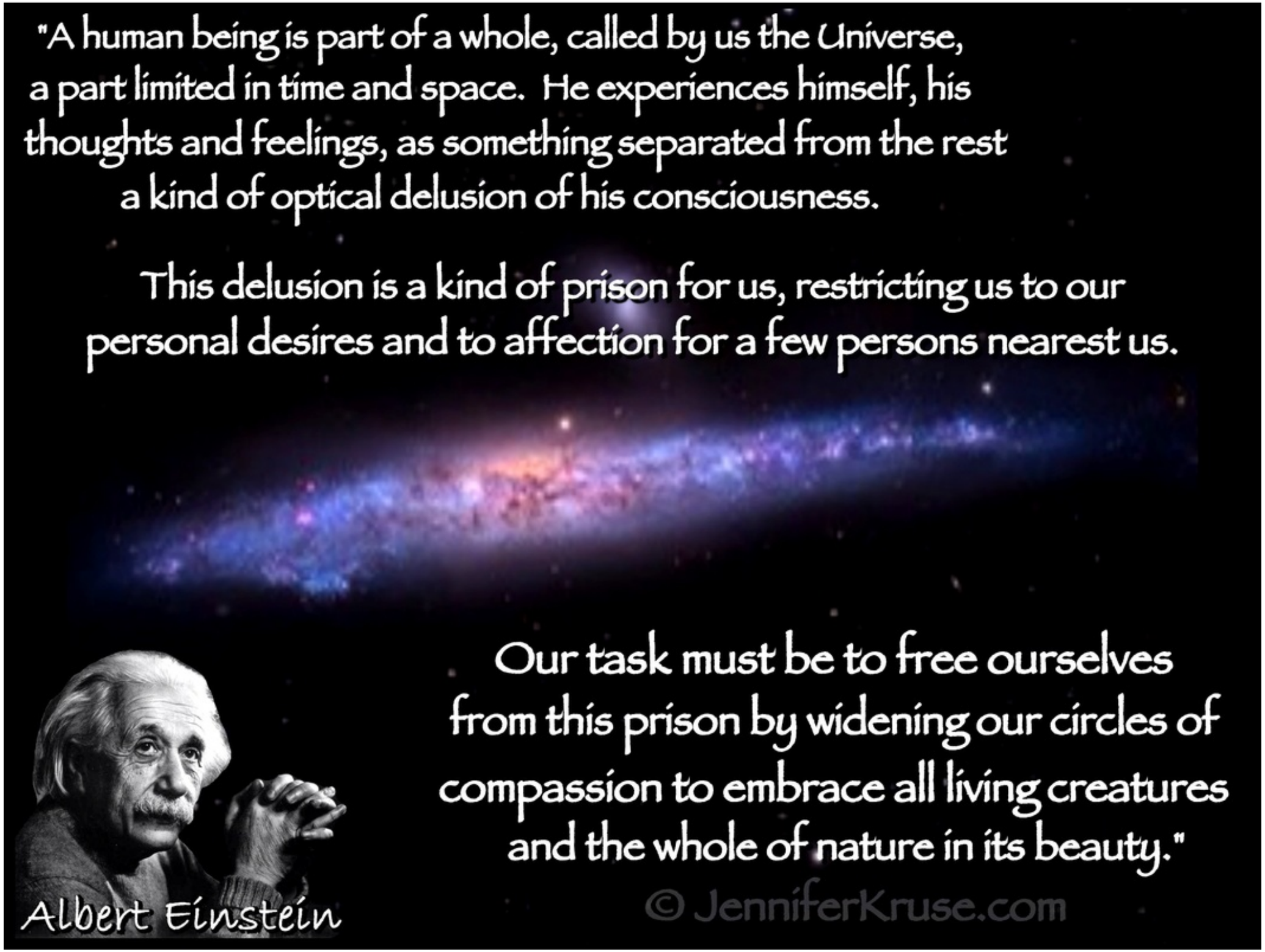
Current Biology

Singer & Klimecki, 2014

Limbic Engagement: Compassion Training Links Prefrontal Executive with Limbic Reward System



Weng et al, 2013

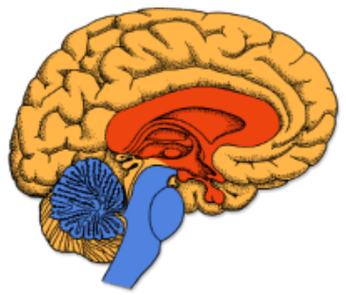

"A human being is part of a whole, called by us the Universe,
a part limited in time and space. He experiences himself, his
thoughts and feelings, as something separated from the rest
a kind of optical delusion of his consciousness.
This delusion is a kind of prison for us, restricting us to our
personal desires and to affection for a few persons nearest us.
Our task must be to free ourselves
from this prison by widening our circles of
compassion to embrace all living creatures
and the whole of nature in its beauty."
Albert Einstein
© JenniferKruse.com

Definitions: What are Embodied Practices and How Do They Work?

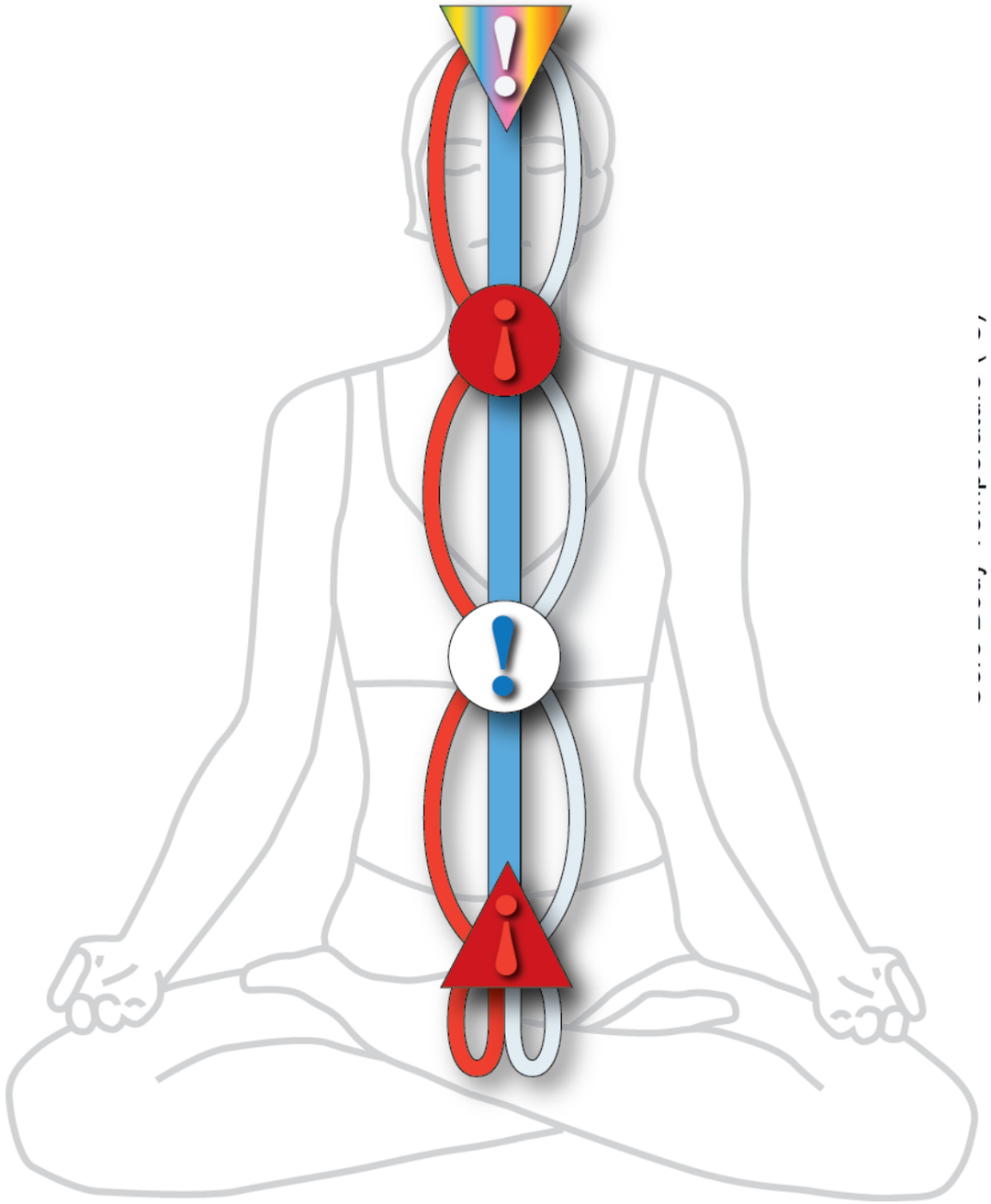
- *Top-down tools*: imagery, narrative—*bottom-up*: posture and breath-work
- Role-modeling imagery helps internalize caring self-other states
- Recitation helps revise traumatic self-story into resilient vision and narrative
- Resilient posture and breathing tap flow states to fuel vision and narrative
- Breath-induced flow states help fire and wire adaptive resilience traits

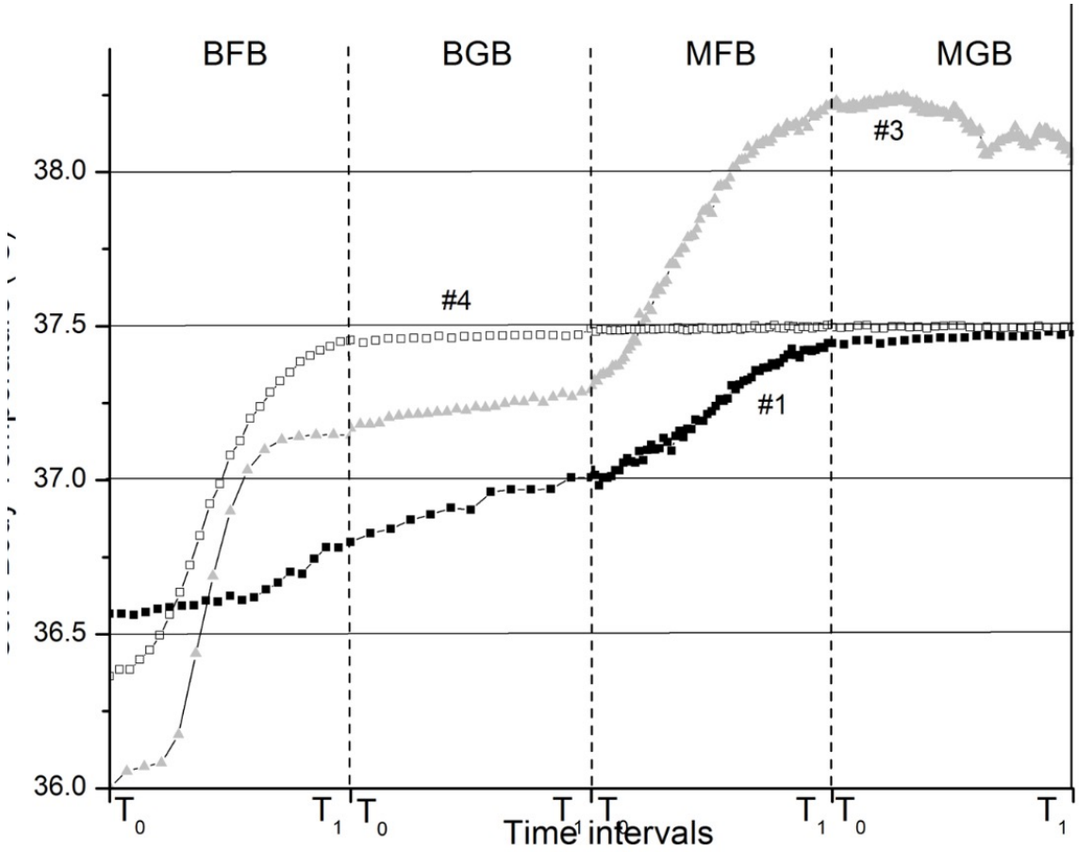
Imagery, Recitation and Breath-Body Work Enhance Hypothalamic and Brainstem Resilience

- Recitation modulates hypothalamic control of vital rhythms (Harinath et al, 2004)
- Imagery and recitation promote flow states of peak balanced arousal (Amihai & Koshevnikov, 2014)
- Tibetan breath-work boosts social autonomic network, raises core body temperature (Koshenikov et al, 2013)
- Embodied flow practice grows gray matter of vagal complexes in the medulla (Vestergard-Poulsen, 2009)

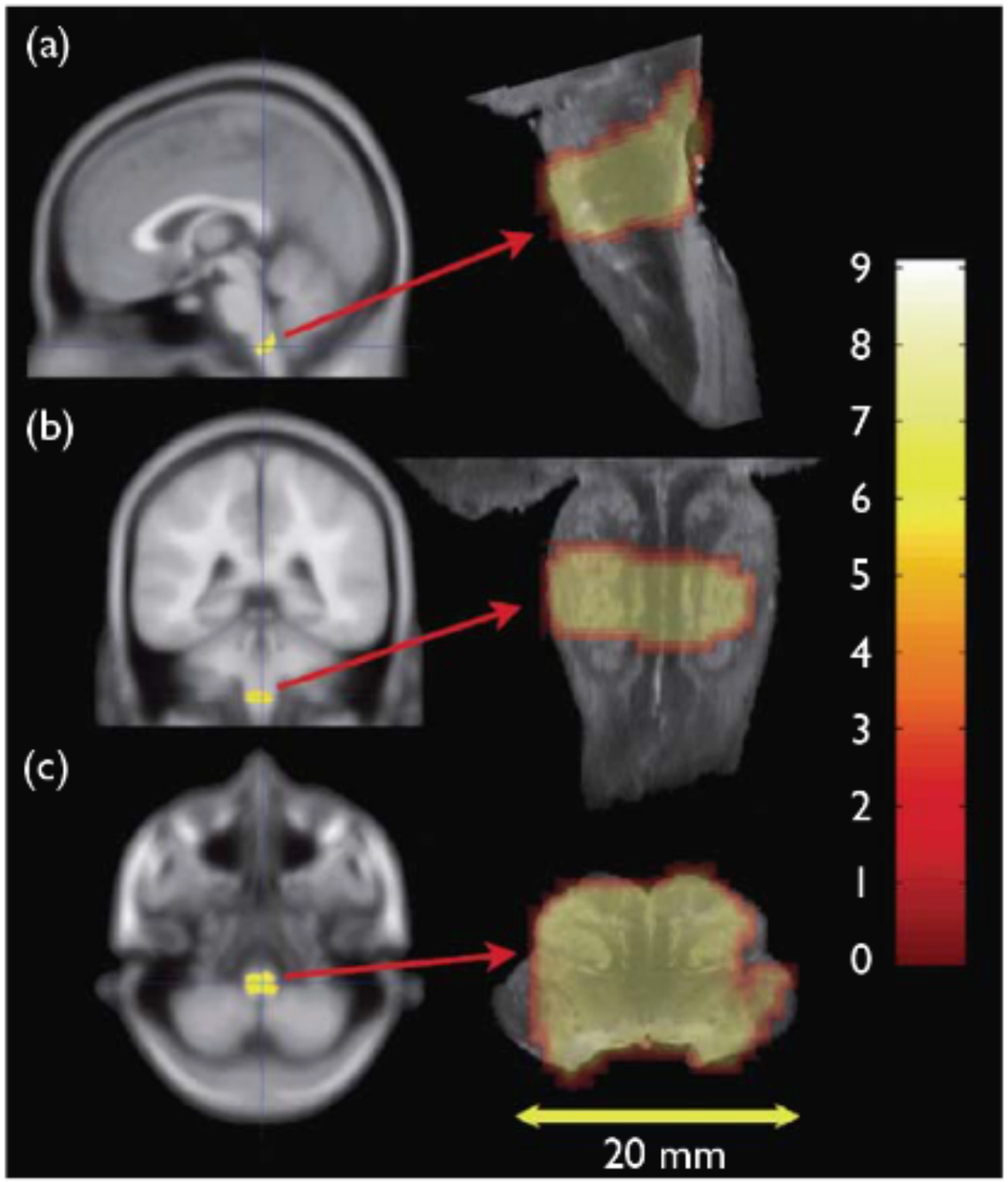


Tibetan Breath-Work Prompts Social Autonomic Arousal, Cuts Metabolism



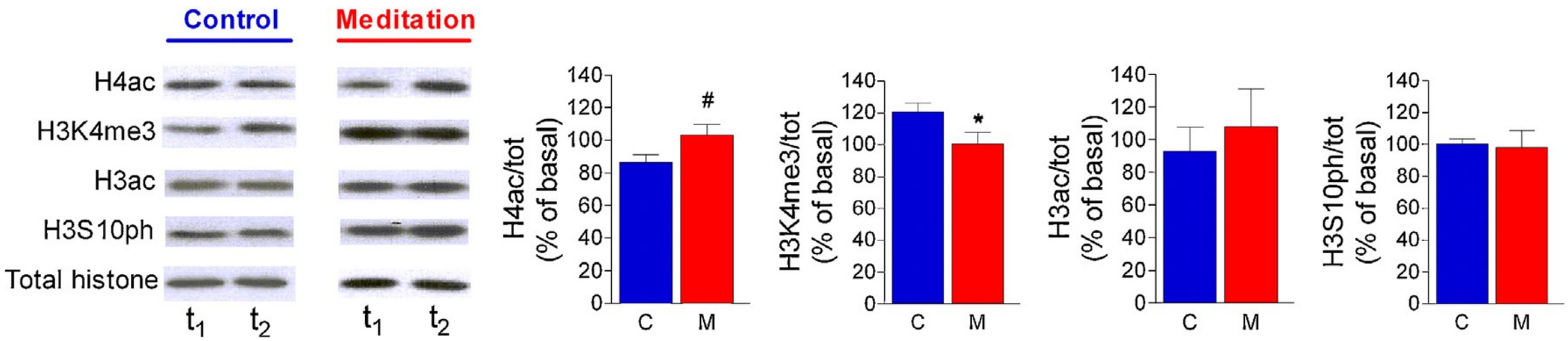


Embodied Flow Awareness
Grows Vagal Social Engagement System



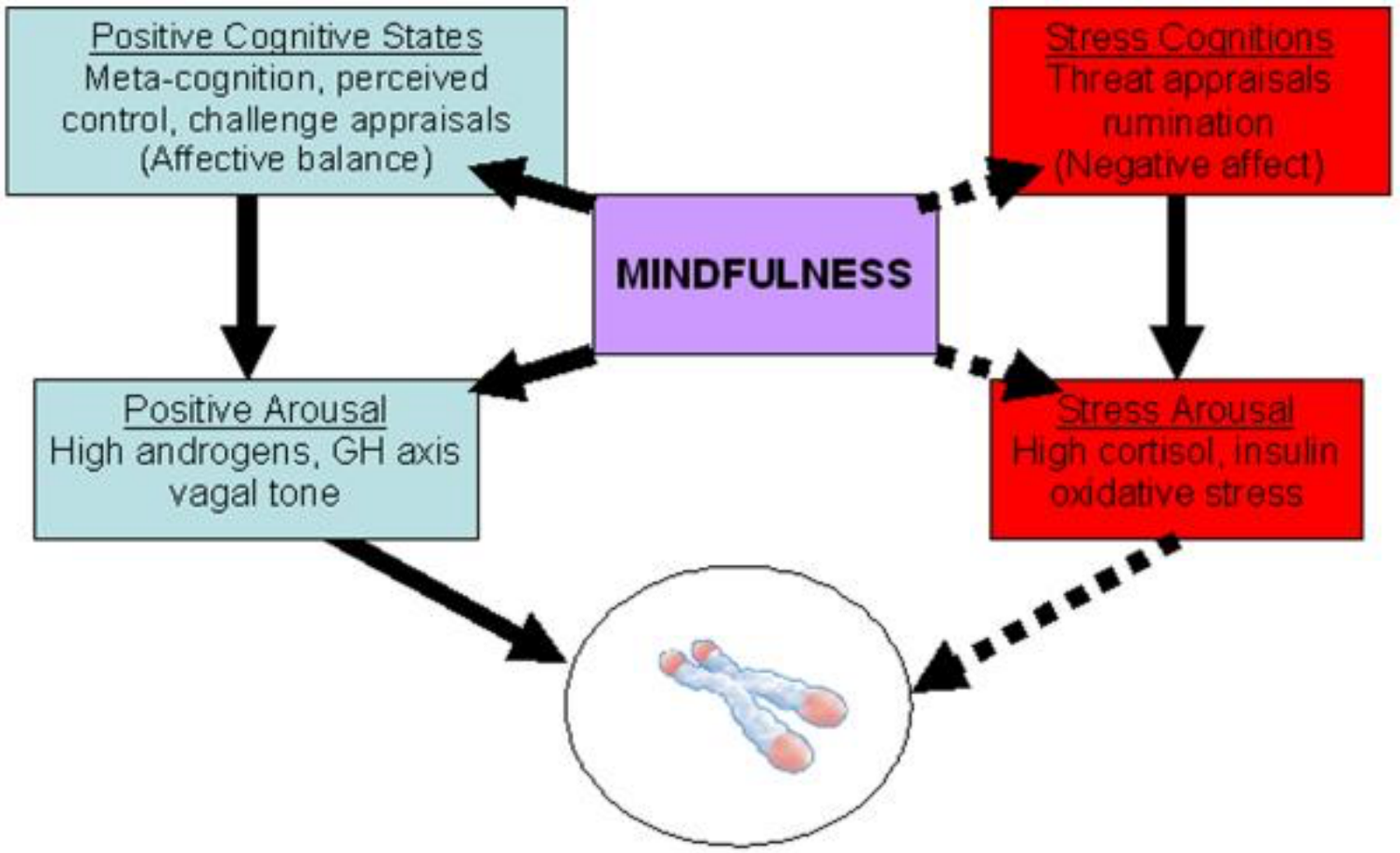
Vestergard-Poulsen et al, 2009

Epigenetic Resilience: Experienced Meditators Downregulate Proinflammatory HDAC, RIPK2, COX2 Genes in a Single Meditation Session

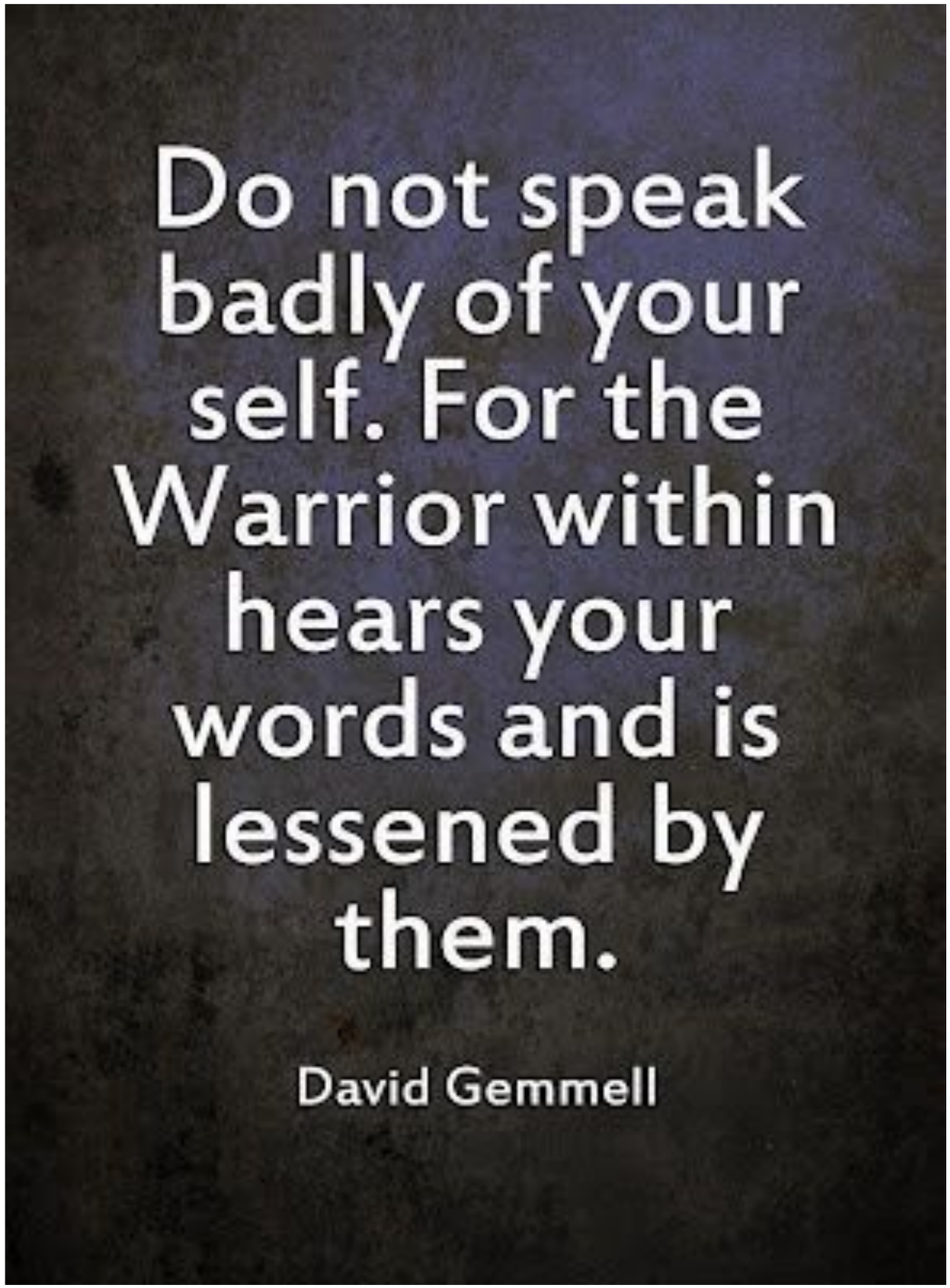


Kaliman et al, 2014

Genetic Resilience: Meditation Increases Telomerase, Protecting Against Gene Mutation

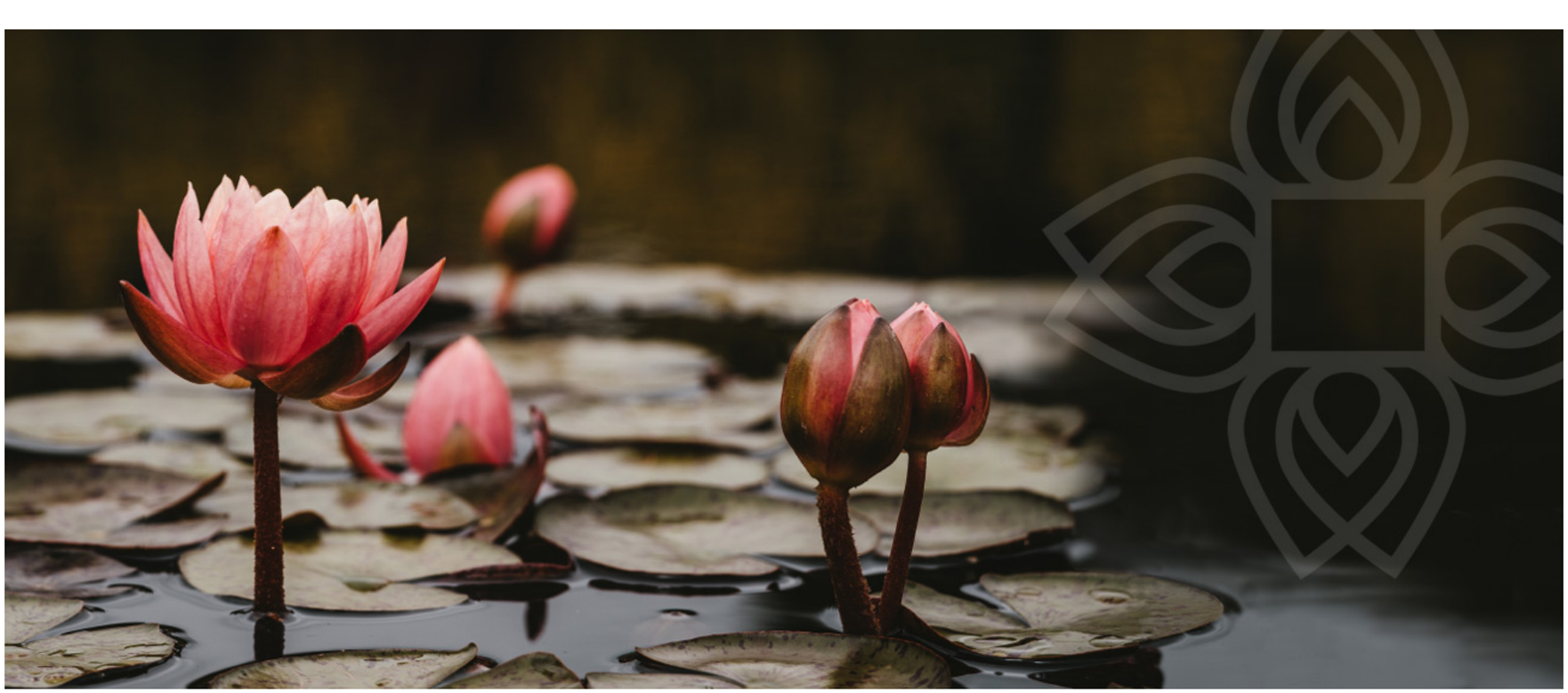


Epel et al, 2009, Jacobs et al, 2010


Do not speak badly of your self. For the Warrior within hears your words and is lessened by them.
David Gemmell

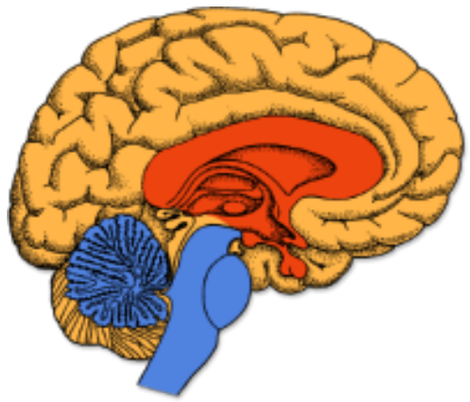
Compassion-Based Resilience Training (CBRT): A Complete Basic Training in Contemplative Stress-Reduction and Self-Healing

CBRT is the most complete evidence-based method of teaching the contemplative science and skills people need to reduce stress, restore health, and cultivate lives of well-being, engagement, and purpose in our ever more interdependent world.



The Neural Basis, Practice, and Competence of Stress-Reduction & Healing through CBRT

brain basis	practice	competence
neocortex	**mindfulness**	**presence**
limbic brain	**compassion**	**resonance**
brainstem	**embodied**	**confidence**



CBRT was developed in 1998 by Joe Loizzo, MD, PhD, by integrating timeless techniques of contemplative self-healing and transformation from India and Tibet with contemporary breakthroughs in neuroscience, positive psychology, and optimal health.

It has been offered continuously since 1998 at New York Hospital, the University Hospital of Columbia and Cornell, as well as a range of metropolitan area schools and businesses including two underserved NYC public schools, The Calhoun School, The Rebecca School, Appnexus, and the NY Public Library.

CBRT for Staff at the Rebecca School in NYC

“It’s amazing how quickly the time has flown…We are so grateful for the trainings you and your team brought to us. It’s been a transformative journey for so many of us. With gratitude…”

—Dr. Ismini Georgiades

The training consists of eight modules that can be taught in compressed or extended formats, typically in eight ninety-minute to two-hour weekly classes.

Modules I-IV Build Perceptual and Emotional Resilience through Mindful Insights and Skills

- I: Embracing Suffering with Body Mindfulness
- II: Stopping Reactive Habits with Mindful Sensitivity
- III: Breaking the Stress Cycle with Mindful Awareness
- IV: Mindful Insight: The Lifelong Path of Self-Healing

CBRT for Children and Parents at Tibet House US

Modules V-VII Build Visceral and Adaptive Resilience through Compassion and Embodied Skills

- V: Disarming Social Bias and Reactivity with Equal Empathy
- VI: Healing Reactive Emotions and Beliefs with Self-Compassion
- VII: Cultivating Prosocial Emotions with Wise Give and Take
- VIII: Embodying a Resilient Self and Life with Caring Imagery

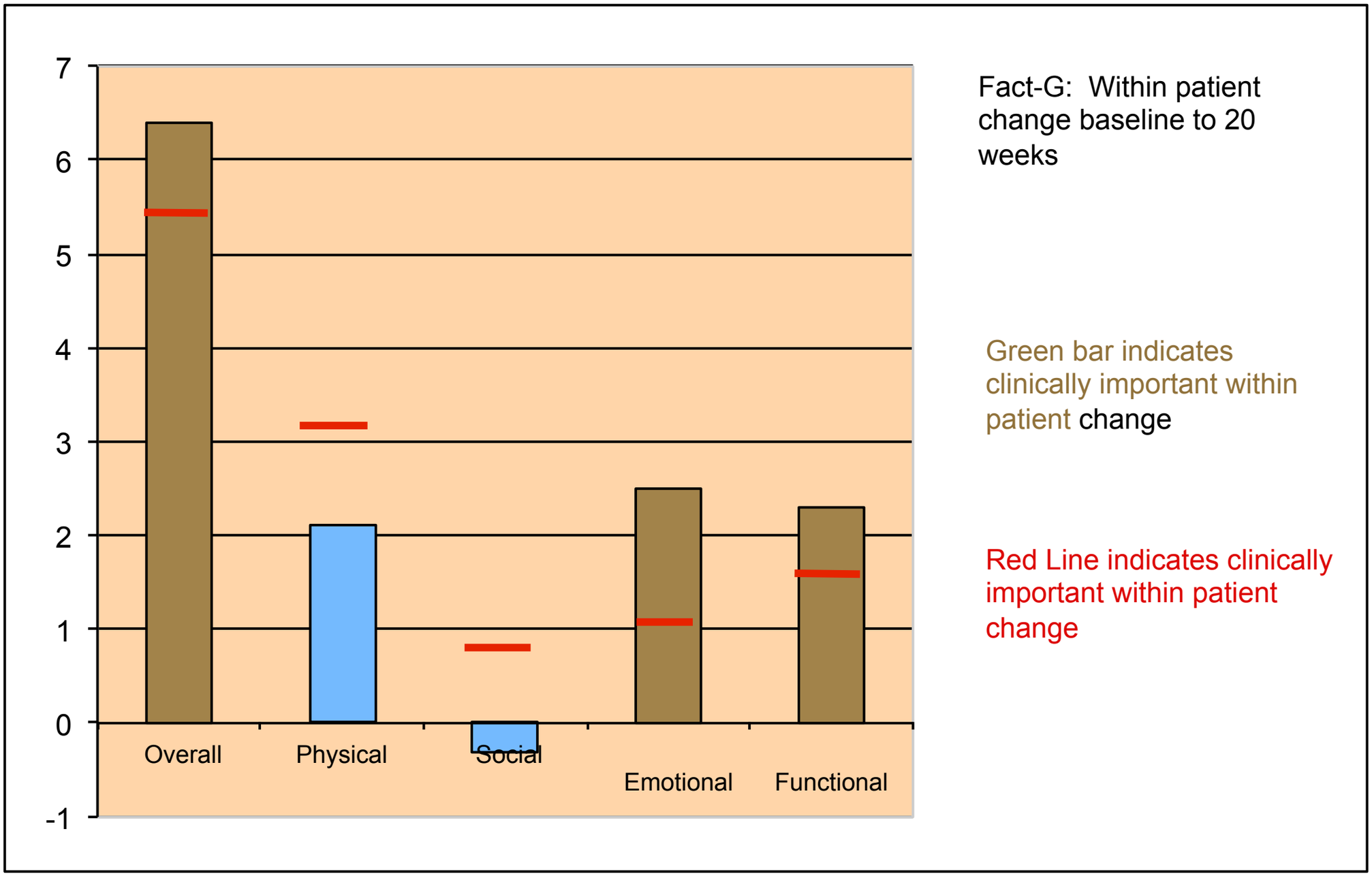
Research on CBRT at Weill Cornell Medicine and Albert Einstein College of Medicine

- Improves biomarkers of stress—cortisol and heart rate
- Reduces social-emotional and cultural role stress
- Enhances resilience
- Improves overall functioning
- Reduces post-traumatic avoidance
- Reduces intrusive negative thoughts

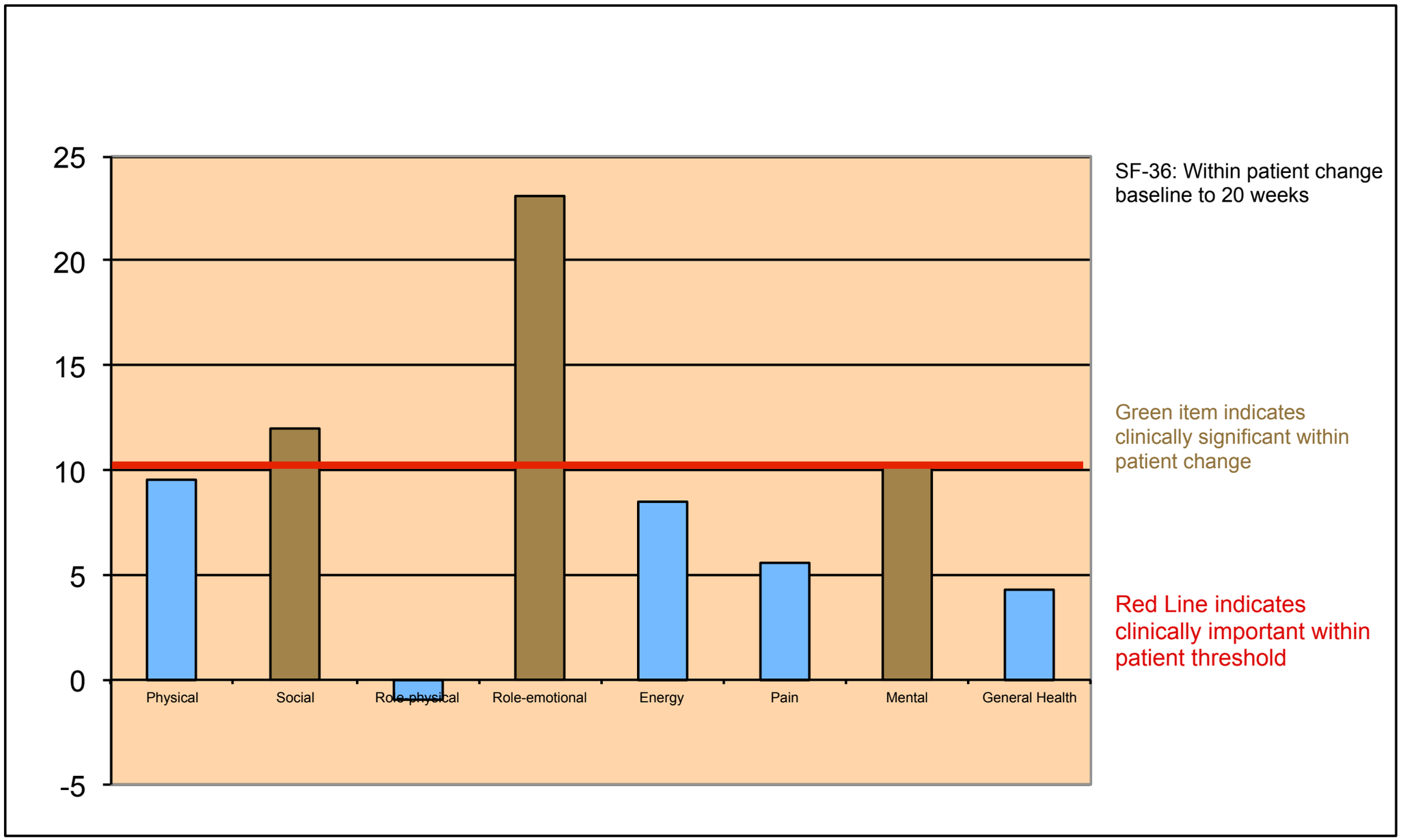
Loizzo et al, 2010: An Effective Program in Compassion-Based Resilience Training

- Weill Cornell Center for Integrative Medicine, Avon Foundation
- Pilot study of 56 women with breast and gyn cancers
- Offered in window just after acute treatment
- Clinically significant within patient improvements
- In FACIT General, Emotional, and Functional domains
- In SF 36 Health Survey
- In AM cortisol and resting heart rate

Major Gains in FACT G: Overall Mind/Body Health, Emotional Resilience, and Functional Well-Being



SF 36: Significant Gains in Mental, Social, and Role-Emotional Health and Well-Being



Significant Gains in Biomarkers of Resilience: Restored Vagal Heart Brake and Circadian Cortisol

TABLE 2 Biologic Measures Assessed Preintervention and Postintervention

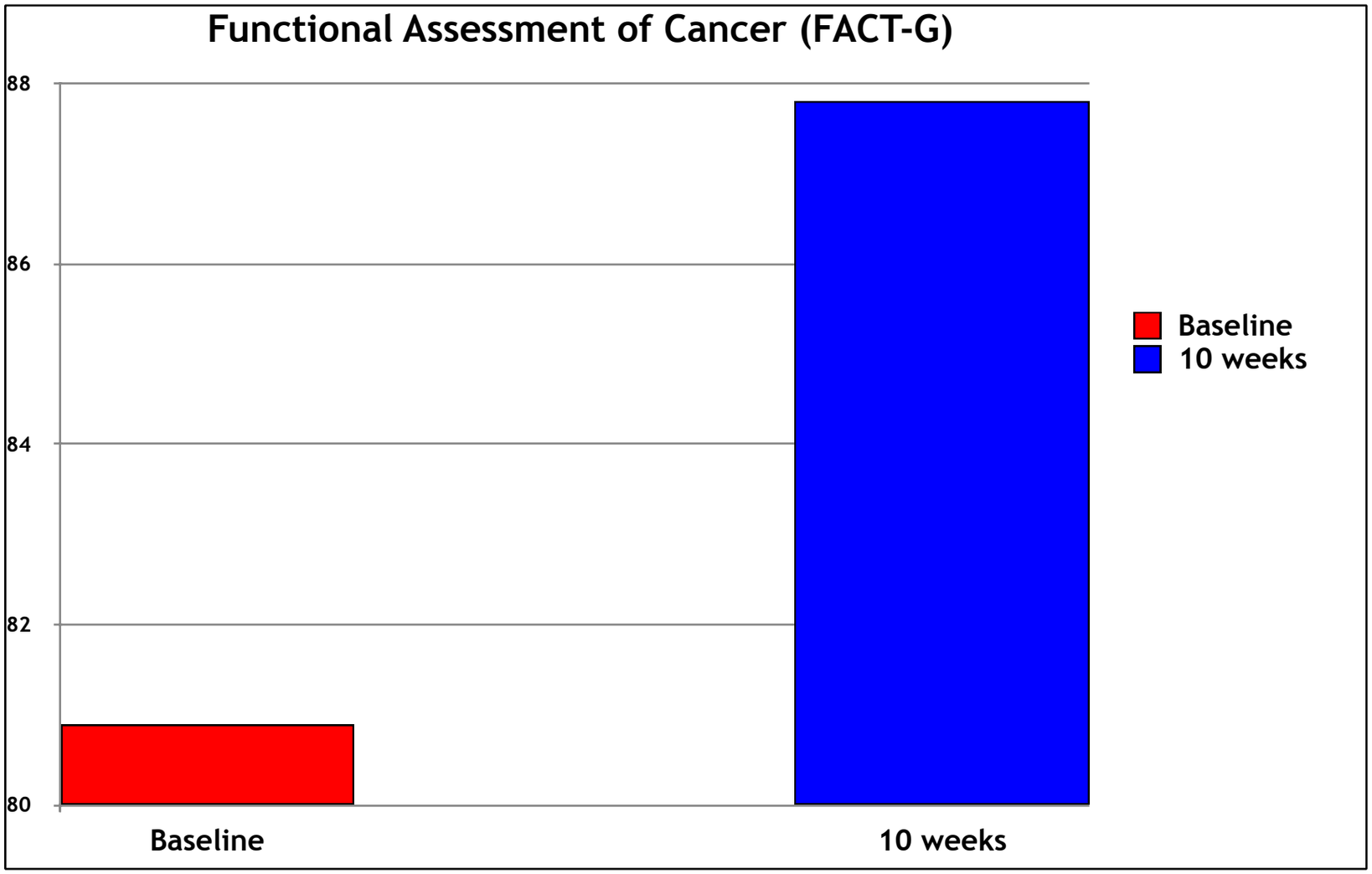
	Before Intervention	After Intervention at 20 weeks	Within-patient Difference Between Baseline and 20 Weeks
Interleukin-6, n = 23	3.9	3.6	.30
Natural killer %, n = 16	12.1	12.4	-0.44
Cortisol Circadian amplitude, n = 14	.45	.57	.12
Wake up change, n = 14	.02	-0.02	-0.05
AM cortisol max, n = 14	.57	.67	.09*
8 PM and 11 PM cortisol mean, n = 14	.11	.12	.003
Vagal tone (heart rate variability), n = 23	4.8	5.0	.22
Heart rate, n = 23	75.5	72.0	4.0*

*Statistically significant change with treatment.

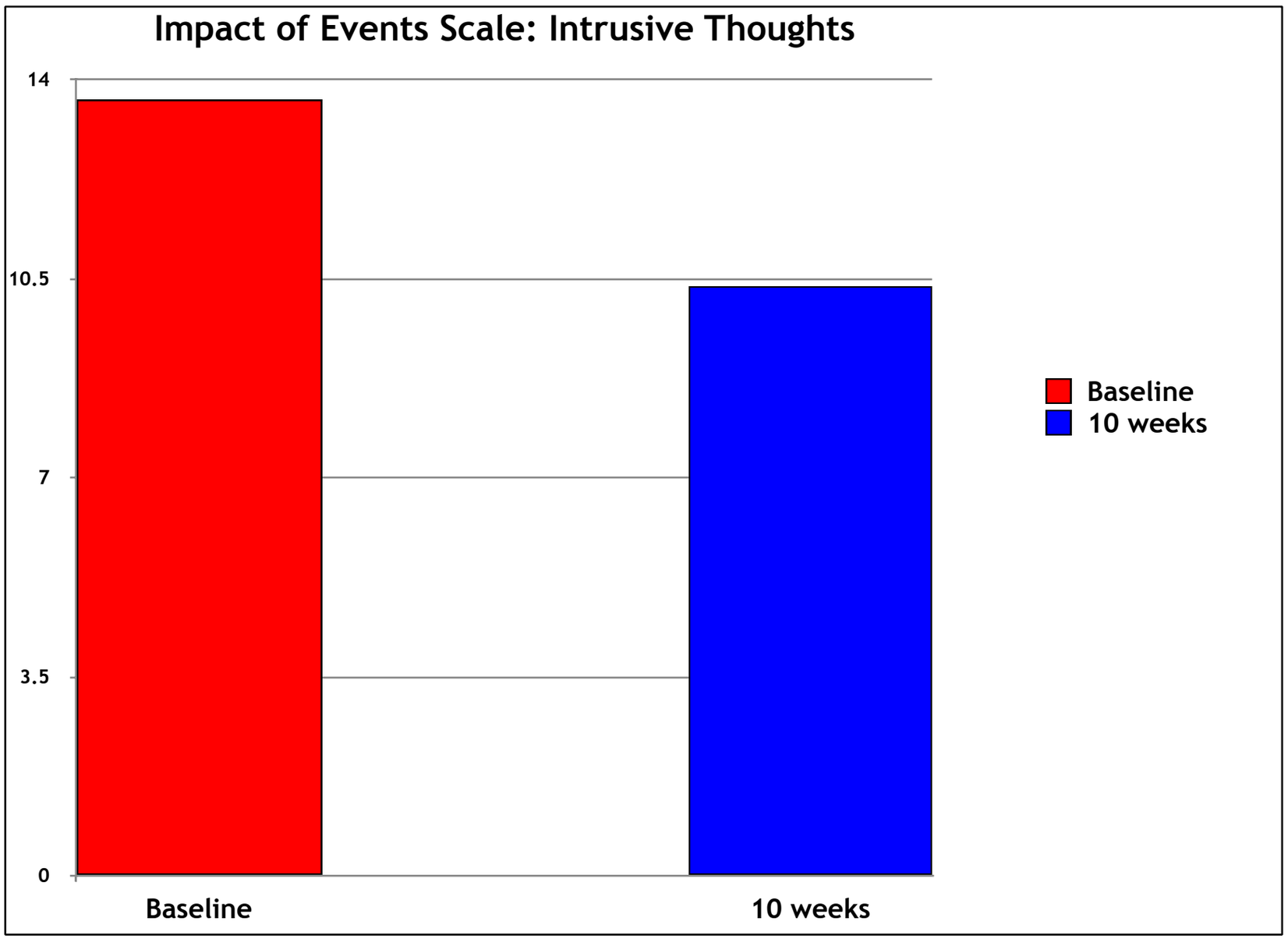
Charlson et al, 2014: Findings Replicated with Five Interventionists in Underserved and Found Reduced PTSD

- Albert Einstein Department of Psychoncology
- 42 Mostly Minority Breast Cancer Survivors
- Four Newly Trained Program Interventionists
- Similar FACT-G Gains of 3.7 (4.6 Corrected)
- Gains Despite Higher Stress & Lower Compliance
- Significant Reductions on Impact of Events Scale
- 6.3 Overall Reduction on IES
- 3.9 Reduction in Traumatic Avoidance

Replicated Gains in Social-Emotional Resilience and Quality of Life



PTSD Resilience: Markedly Reduced Traumatic Avoidance and Intrusive Thoughts on IES



Offidanti et al, 2017: Decrease in Traumatic Thoughts and Avoidance Replicated in Brief Intervention

- Four Week Program at Weill Cornell Breast Center
- 106 Survivors in Program, 64 Participated in Study
- Study Found Significant Reductions on IES
- Women With Higher Stress Had Greater Reductions
- Those with Family Stress: 4.0 Overall Reduction on IES
- Those with Job Stress: 10.0 Reduction in Intrusive Thoughts

What Participants Say…

- “In combination with learning about the science of meditation, I learned to meditate in a way that alleviates anxiety…The benefits are great—beyond estimation.”
- “It has made a subtle but huge difference in almost every area of my life and has given me hope which I never expected to have that I can change, and handle challenges in a way that satisfies me more.”
- “Excellent, wonderful, mindful experience that has reduced a great deal of stress. Dr. Loizzo, the group of women, and the openness of the sessions have changed my life for the better.”
- “Although I have done some form of mindfulness practice for years, the study jump started me into beginning a more serious meditation practice.”

What Participants Say…

- “I LOVED the feeling I had during and after each meditation session, and felt a great sense of community. I’ve been hard on myself for still having such anxiety over my illness, not being able to move on with life. It was comforting to see I’m not alone.”

- “It was exactly what I needed. It gave me even more than I hoped for. I took the class because of my fears, but it also helped me relate to my husband and enhance my meditation practice. It helped give me a purpose. I feel so grateful!”

- “It has been immensely helpful. I feel much happier and able to cope with life’s changes. I feel so grateful to have been able to participate in the study and learn from Dr. Loizzo.”

Ongoing Clinical Trial:
Weill Cornell Breast Center

- Manualized Program delivered in two modules
- Four week basic mindfulness skills module
- Six week advanced outlook and lifestyle change module
- Home study-practice guided by reading and audio files
- Groups from 10 to 30, all conditions and populations
- Can be delivered wholly or partly online

The Fear of Recurrence Program at Weill Cornell—Acknowledgments

- Sponsored by: Weill Cornell Breast Center
- Weill Cornell Center for Integrative Medicine
- Nalanda Institute for Contemplative Science

- Supported by: The Avon Foundation
- Anne Moore Breast Cancer Research Fund
- The D’Alessandro Foundation
- The New York Community Trust

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Thank You!

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