

MINDFULNESS MEDITATION AND TELOMERES IN TEN STEPS A SHORT PRIMER AND PROPOSAL

(1) Short telomeres without telomerase are at high risk for fusion, senescence and apoptosis. In their 2004 study, Epel, et al, found that objective stress (years of caregiving) and perceptions of life stress were both related to shorter telomere length.¹

(2) Shortened telomeres have been found in major depression² and lower socioeconomic status.³

(3) Coping mechanism for stress are dependent upon whether events are appraised as a threat or a challenge. Threat appraisals are linked to cell aging in Epel's model. Threat and Challenge Appraisals prompt emotional states. Appraising a standardized stressor as more challenging than threatening may be related to longer telomere length.⁴

(4) HPA axis and ANS are mediators between emotional stress and illness. Chronic stress leads to:

- blunted diurnal rhythm of cortisol and/or elevated basal levels. Flattened diurnal rhythm can predict coronary calcification and **metastatic breast cancer progression**.
- depressed levels of Heart Rate Variability (decreased HR with exhale and increased HR inhale) is associated with stress, depression and low socioeconomic status. Heart Rate Variability is an indices of Vagal Tone. (Parasympathetic Brake — or Vagal Brake — on arousing Sympathetic Nervous System.)
- suppression of anabolic hormones (DHEA and Insulin-like Growth factor). Testosterone appears to suppress catabolic and sympathetic stress response. In vitro evidence suggest that IGF-1 and estrogen can promote telomerase activity while insulin and insulin resistance are related to telomere shortness.
- increased levels of insulin and visceral fat.
- increased levels of oxidative stress. Oxidative stress shortens telomeres.⁵

(5) Mindful Meditation positively modulates stress-related cognitive processes and this is proposed to be linked to cellular aging.⁶ Although the original

exposure to “mindful meditation” was around Buddhism, currently, in the scientific community “mindfulness” does not have any religious affiliation and is defined as:

Paying attention, on purpose, in the moment, without judgement. Some also add with curiosity and compassion.^{7 8}

(6) Different meditations have been used in studies with the results listed below. The most common programs are MBSR (Mindfulness Based Stress Reduction — currently offered at the Susan Samuel Center), CFSR (Cognitive Based Stress Reduction), and others described in studies. Mindfulness has been correlated with:

- a “Left Shift.”⁹ A left shift is the ability of the left prefrontal cortex to calm the right amygdala (arousal node) influencing emotional resilience and ameliorating stress.^{10 11 12}
- Eudimonia (vs. hedonia) which is correlated with increased telomere length.¹³ Eudimonia is a life view that involves purpose, meaning and connection (equanimity). Hedonia is a life view that involves seeking bodily pleasure not attached to anything other than the thrill of the somatic experience.
- Increased activation of positive emotional circuitry.¹⁴
- Increased grey matter density.¹⁵
- Increased cortical thickness.¹⁶
- Increased anti-body titers.¹⁷
- Increased gamma band activity.¹⁸ Gamma band activity (25-40 Hz) are thought to be involved with our sense of conscious awareness.

(7) Cortical Field Re-education (CFR), is a system of healing through mindfulness learning that increases attention and heightens perception.¹⁹ Unlike the more well-know technique of MBSR (Mindfulness Based Stress Reduction), CFR mindfulness program not only increases the perceptual net for early detection of stress and its catabolic output like all mindfulness programs, it also includes *biomechanical exploration activating the sensory/motor cortex resolving orthopedic dysfunction. This obviously has a direct impact on musculoskeletal issues that also contributed to stress.* See patient testimonies. (<http://www.cfrhealing.com>).

In addition to refining biomechanics, *CFR opens lymphatic drainage.* (Personal case history with post-reconstruction breast cancer patient.) **After care is a key issue with breast cancer patients according to Dr. Alice Police of Pacific Breast Care Center.** All of the other benefits of mindfulness meditation discussed in Epel’s work are included in CFR:

- enhanced alertness
- increased attention related responsiveness
- increased present moment re-perceiving (“I am feeling depressed . “ vs. “I am depressed person.”) This reorienting allows for more objectivity and choice in coping strategies for emotional distress which elicits (1) perception of control or (2) acceptance and emotional regulation resulting in psychological thriving.
- more likelihood of Challenge appraisal vs. Threat appraisal with stressors
- anabolic vs catabolic neurohormonal response
- emotion regulation
- more robust Emotional Salience Network (Insula, Anterior Cingulate Cortex, Temporal Lobe) processing every physical/emotional sensation from pain to feelings of love and disgust. Also theorized by Craig to be the “seat of consciousness.”²⁰

(8) CFR addresses not just physical limitations but also the emotional, mental, energetic and spiritual aspects that must be included for true healing. When muscular contractions, energetic blocks, and compensating patterns release, new choices in movement, belief and behavior become possible, and, I propose, **systemic alterations in the immune system, cardiovascular system and genomic components by the global recalibration of the Autonomic Nervous System and the HPA** via Stephen Porges’s Polyvagal Theory.²¹

(9) Stephen Porges is a Psychiatry Professor at the University of North Carolina and the author of *The Polyvagal Theory*. Prior to being at UNC, he was Director of the Brain-Body Center in the Department of Psychiatry at the University of Illinois in Chicago. Porges summarizes:

*The take-home point is that the neural circuit of social interaction and social engagement is the same neural circuit that supports health, growth and restoration. It is not two disorders, or two diseases, or two disciplines. It's not an internal medicine on one side and a psychology and psychiatry on another side -- it's an integrated physiology that is not only regulating health, growth and restoration, but it's an integrated physiology that fosters and supports social interaction to create safety for the individual. . . . safety is the critical feature here. If our nervous system detects safety, then it's no longer defensive. When it's no longer defensive, then those circuits support **health, growth and restoration**. It's a hierarchy, and the most important thing to our nervous system is that we are safe. When we're safe, magical things occur. They occur on multiple levels -- not merely in terms of social relations, but also in accessibility of certain areas of the brain, certain*

areas of feeling pleasure -- being expansive, being creative, and being very positive as well.

(10) Study Design - Open to Suggestions

25+ post op breast cancer surgery patients. 12 week CFR program including two introductory full days (8 hours) and twelve, 2-hour weekly classes. Participants also do a 20 minutes Self-Adjustment Tool (SAT) learned in that week's class at home during the week along with journaling. Blood draws for telomerase activity, 3D motion capture for biomechanical tracking, fMRI for morphological changes, extremity circumference measurements for lymphatic flow changes, completion pre and post of a subjective well being scale.

¹Epel, E.S., et al, "Can Meditation Slow Rate of Cellular Aging? Cognitive Stress, Mindfulness, and Telomeres," *Ann N Y Acad Sci* 2009 Aug; 1172:34-53.

²Chandola, T., A. Britton, E. Brunner, et al. 2008. Work stress and coronary heart disease: what are the mechanisms? *Eur. Heart J.* 29:640-648.

³Carney, R.M., J.A. Blumenthal, P.K. Stein, et al. 2001. Depression, heart rate variability, and acute myocardial infarction. *Circulation* 104: 2024-2028.

⁴ Epel, E.S., E.H. Blackburn, J. Lin, et al. 2004. Accelerated telomere shortening in response to life stress. *Proc. Natl. Acad. Sci. USA* 101:17312-17315.

⁵ Epel, et al. 2009.

⁶ Epel, et al. 2009

⁷ Dan Siegel. Mesa Lectures. 2013

⁸ Kabat-Zinn, Jon. *Wherever You Go There You Are*. Mindfulness Meditation in Everyday Life. (New York: Hyperion Books.) 1994.

⁹Richard J. Davidson et al., "Alterations in Brain and Immune Function Produced By mindfulness Mediation," *Psychosomatic Medicine* 65 (2003): 564-70.

¹⁰ Daniel Goleman, *Focus: The Hidden Driver of Excellence* (New York: HarperCollins, 2013).

¹¹ Davidson, et al. 2003.

¹² Epel, et al. 2009.

¹³ B. L. Fredrickson and M. Losada, "Positive Affect and the Complex Dynamics of Human Flourishing," *American psychologist* 60, no. 7 (2005): 678-86.

¹⁴ Lutz, A., Brefczynski-Lewis, J., Johnstone, T., Davidson, R. "Regulation of the neural circuitry of Emotion by Compassion Meditation: Effects of Meditative Expertise." *PLoS ONE*. March 2008 | Volume 3 | Issue 3 | e1897.

¹⁵ Britta K. Hölzel et al., “Mindfulness Practice Leads to Increases in Regional Brain Gray Matter Density,” *Psychiatry Research: Neuroimaging* 191 (2011): 36-43.

¹⁶ Sara W. Lazar, et al., “Meditation Experience is Associated with Increased Cortical Thickness,” *Neuroreport* 16 (17), (2005): 1893-1897.

¹⁷ Davidson et al. 2003.

¹⁸ Aviva Berkovich-Ohana et al., “Mindfulness-Induced Changes in Gamma Band Activity,” *Clinical Neurophysiology* 123, no. 4 (April 2012): 700-10.

¹⁹ CFR is based on, and has expanded beyond the works of Moshe Feldenkrais, PhD. See Norman Diodge’s NY Times Bestseller just out, *THE BRAIN’S WAY OF HEALING*, (Chapter 5) for a complete history on Feldenkrais’s 1940-1960’s progressive ideas that are now being confirmed by neuroscience.

²⁰A.D. Craig “How Do you Feel — Now? the Anterior Insula and Human Awareness,” *Nature Reviews Neuroscience* 10, no1 (January 2009): 59-70.

²¹ Stephen Porges, *The Polyvagal Theory* (New York: Norton 2011).