

# IS ELECTROPHYSIOLOGICAL COHERENCE-BASED WELLNESS COHERENT?

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Coherence-based personal training regimens are emerging in the wellness industry to improve health (lowering blood pressure), neurocognitive performance (attention and reaction time), and mood (stress relief). Unlike psychotherapy that focuses on mood and behavioral problems resulting from outdated personal constructs and schemas (incoherence), the emerging coherence training programs focus on self-regulation and use biofeedback measuring entrainment of cardiorespiratory cycles associated with heart rate variability (HRV). Interestingly, some advocates of this form of biofeedback training recommend techniques that appear to cross boundaries of rational science—such as teaching trainees to activate heartfelt feelings such as love and appreciation in their heart area in order to achieve a higher level of entrainment. The aim of this process is to achieve “psychophysiological” coherence.

HRV spectral data represent contributions of autonomic nervous and neuroendocrine systems on HRV. Low age-adjusted HRV is an established predictor of cardiac death post-myocardial infarction and is predictive of all-cause mortality. Very low-frequency HRV reflects activity in intrinsic cardiovascular feedback loops that are stimulated by efferent sympathetic activity and hormonal factors such as the renin-angiotensin system inputs; low-frequency HRV reflects the contributions of the baroreflex system, which is involved in short-term blood pressure regulation; and high-frequency HRV reflects parasympathetic inputs as well as variability due to respiratory sinus arrhythmia (RSA) characterized by heart rate increases with inspiration and decreases with expiration optimizing blood flow at maximum alveolar ventilation.

Characteristic patterns reflect the following six psychophysiological modes of HRV and corresponding power spectral density (Fourier transform):

1. focusing on a simple task,
2. simple negative emotion as frustration and anxiety,

3. nonfocused relaxation,
4. meditation reducing experiences of emotion,
5. extreme negative emotion associated with intense fear or rage, and
6. psychophysiological coherence associated with positive emotions such as appreciation.

Achieving and maintaining psychophysiological entrainment is the goal of coherence biofeedback training, represented by a regular high-amplitude sinusoidal HRV pattern. Though intentionally engaging a 5-seconds-inhale/5-seconds-exhale breathing pattern without a mental focus can facilitate achieving this state, more is required to reach the highest levels of entrainment in the form of felt benevolent emotion.

Several years ago, I purchased an inexpensive handheld HRV monitor plus desktop computer software. I was dubious about the prospect of manipulating HRV with thoughts and emotions. Using the handheld HRV-monitoring device with its color metric indicator, my first experience noting how benevolent feelings rapidly led to coherence was such a surprise that the state transiently ceased.

Now convinced that certain emotions do modulate physiologic coherence as manifest in HRV, rationally accounting for this phenomenon has followed more slowly. It would seem that direct emotional regulation of such bodily states would have to be hardwired as well as demonstrate survival value for such capacity to exist and endure. As the vagus nerve is most strongly implicated in achieving high levels of HRV and coherence, following its trail may yield explanatory value.

Stephen Porges’s “polyvagal theory” combines insights from vertebrate autonomic nervous system phylogeny with a proposed “social engagement system.” Positing a primary mammalian task is to assess the safety of the physical environment, three potential danger response patterns evolved. For higher mammals, this sequence begins with the most highly evolved response first. If it fails to establish safety, there is reversion to more primitive responses. Beginning with the highest level response to danger, we use social communication (social engagement); failing that, mobilization (fight or flight); and failing that, immobilization (feigning death; vasovagal syncope; shutting down behaviors).<sup>1</sup>

Porges elucidates how a face-heart connection developed when source nuclei of vagal pathways shifted evolutionarily over

time—ventrally from the dorsal motor nucleus to the nucleus ambiguus: “This link results in bidirectional coupling between spontaneous social engagement behaviors and bodily states.”<sup>1</sup> Thus, vagal tone is related not only to HRV, but also to the domains of social engagement with mastication and facial muscles, larynx, pharynx, middle ear stapedius muscle, and head turning (orienting).<sup>1</sup> Is it possible that this linkage affects an association between positive emotions (as constructive social engagement) and facilitating vagally mediated coherence?

The nondualistic process philosopher Alfred North Whitehead postulated in 1929 that “‘actual occasions’ are the final real things of which the world is made up.”<sup>2</sup> An occasion of experience results from prehensions derived from antecedent moments that can be “an emotion, and purpose, and valuation, and causation.”<sup>2</sup> Using such a conceptuality, occasions of human experience involve multiple prehensions: unconscious general mood states associated with the brainstem and cerebellum; less conscious or unconscious affective states associated with the limbic system; and conscious experience associated with the neocortex. Recent evidence also suggests cortical experience of “mirror” neurons that unconsciously facilitate felt empathy with another.<sup>3</sup> Whitehead theorized that unconscious and conscious prehensions result in actual occasions whose aim is the satisfaction of the experiencing subject, as in achieving some value (“eternal object”).

Emerging evidence demonstrates that HRV coherence biofeedback training improves executive functioning, including sustained attention and working memory<sup>4</sup> and may be useful in the treatment of major depression<sup>5</sup> and hypertension.<sup>6</sup> It has been adopted by military units as a tool to assist with self-regulation, especially for controlling mood swings associated with posttraumatic stress disorder. Expanding research to more adequately characterize indications for HRV coherence biofeedback training, including intervals, frequency, and duration of use for specific conditions, is indicated. Such training should include contraindications to its use if any exist. Establishing a comprehensive evidence base for prevention tools should be as rigorous as those used to treat pathological conditions.

#### REFERENCES

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