Hello all,

Welcome to the September ***COHERENCE Newsletter***. I apologize for the hiatus. With everything going on I decided to skip the month of August. For a good while the August image was a NASA photo of hurricane Irene.

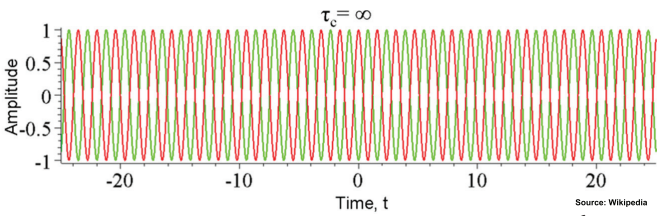

Figure 1:Temporal coherence demonstrating a perfectly coherent wave as compared to itself delayed by 180°. If added, the result is precisely zero.

I hope you enjoyed the July newsletter, *The Six Bridges, Body I/O, And Conscious Influence Over Nervous Function*. If you missed it, click here to read it now. This month's topic is "coherence". I write it in response to a question that I receive often, this being: *Is COHERENCE and HeartMath usage of the term "coherence" equivalent and do our respective instruments measure the same thing?* The short answer is that we have significant differences. Next month's newsletter will begin the ambitious *Substance Series*, a set of newsletters that explores the body mind's real time response to small amounts of popular "substances" including alcohol, coffee, herbs, and tobacco. Each will present simultaneous measurements of heart rate (heart rate variability or "HRV") and the Valsalva Wave before, during, and after partaking. I'm sure you'll be surprised. Also, one or more letters in this series will examine the correlation between heart rate variability and Valsalva Wave variability, a topic that to my knowledge has never been written about before.

Let's benchmark our discussion with the physics definition where "coherence" (specifically *temporal* coherence) refers to the value of a wave as compared to itself at two different intervals, where the fundamental physical attributes are amplitude, phase, and frequency. If amplitude, phase, and frequency are identical across two different but equal measurement intervals, then the wave in question is perfectly coherent. Another way to see it is that if a second wave of equal interval is captured, inverted, and added to a first wave, if perfectly coherent the result would be precisely "0". Figure 1 demonstrates a perfectly coherent wave (red) compared to a copy of itself shifted by 180 degrees (green), which when added yield "0". As waves occurring in nature are variable, *coherence* is a wholistic measure of their likeness or correlation. Applying this measure to biological waves, e.g., the Valsalva Wave or the heart rate variability cycle (technically the HRV cycle is an abstraction of a wave) would mean capturing and correlating consecutive samples, the stronger the correlation the more coherent, and visa versa.

With this definition established, let's discuss COHERENCE and HeartMath usage and implementation. Because "coherence" is a thread that runs through our respective philosophies, methods, and instruments, perhaps it is best to juxtapose our positions. The following table attempts to provide an accurate and objective "world view" based on knowledge of COHERENCE and information that I have gleaned from HeartMath's books, website, patents, and the use of emWave and its predecessor FreezeFramer over the course of many years. Of course I am able to explain my own usage and implementation about which I've written extensively. Where HeartMath is concerned, I am limited to offering an educated perspective, this in the absence of an explanation by HeartMath themselves as to exactly what emWave's coherence score is and how it is derived.

COHERENCE World View

Use of the term "coherence": Simultaneous synchrony of blood flow (the Valsalva Wave) with breathing and of the heart rate with blood flow. Click here for science.

Heart Rate Variability (HRV): HRV consists of 2 types: 1) Breathing induced HRV, otherwise known as respiratory sinus arrhythmia, and 2) variability of heart rate for all other reasons including autonomic regulation, emotions, etc.

The Role Of Breathing: Breathing with depth and regularity increases circulatory effectiveness and offloads the heart of the burden of venous return. This is a key reason why the autonomic nervous system facilitates synchrony of heart rate with breathing, i.e. it is "the path of least resistance".

The Role Of Mind: Mindful breathing with depth and regularity promotes an optimal physiological state via improved circulatory function, gas exchange, and energy production. In return, the body creates an optimal environment for the mind, including "balanced" emotions.

Method: Two methods are supported: 1) Synchronizing breathing with the heart rate variability cycle, exhaling at peaks and inhaling at valleys and learning to relax during exhalation (click here for explanation), and 2) Breathing at the nominal frequency of 5 breaths per minute with equal inhalation and exhalation, and learning to relax during exhalation.

Instruments: BreatheHeart and Valsalva Wave Pro monitor both heart rate and the Valsalva Wave. C*oherence* is a function of phase synchrony or correlation between the HRV cycle and the Valsalva Wave, i.e. synchrony of the heart rate with the action of the blood (which follows breathing). Click here to observe this synchrony.

References: www.coherence.com, www.breatheheart.com, www.valsalvawave.com, COHERENCE patents.

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HeartMath World View

Use of the term "coherence": Entrainment of multiple biological systems to the rhythm of the heart. Click here for science.

Heart Rate Variability: Heart rate variability is a function of the intelligence of the heart. (It is recognized that breathing modulates the heart rhythm and elicits variability but it is preferred that the heart influences the brain to facilitate HRV.)

The Role Of Breathing: The heart's rhythm modulates the breathing rhythm via the heart-brain connection and is the critical factor in achieving and maintaining coherence. It is recognized that breathing modulates heart rhythm, however, conscious breathing requires (too much) mental effort and may be too challenging for some to maintain.

The Role Of Mind: When we cultivate a positive emotional state, the intelligence of the heart facilitates optimal physiological functioning.

Method: Cultivation of positive heart centered feelings and emotions. Breathing is used to "jumpstart" the process.

Instruments: emWave monitors heart rate and derives the HRV cycle. While HeartMath patents describe that coherence is measured by analyzing the heart rate variability power spectrum, it appears to this observer that the emWave coherence measurement is primarily a function of ectopic (irregular) heart beats, fewer ectopic beats translating into higher coherence.

References:www.heartmath.com, http://www.heartmathstore.com/cgi-bin/category.cgi?category=sciencebehind, www.uspto.gov (search on "Childre".

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Thank you for your interest. I hope you find it of value. Feedback always welcomed.

Stephen Elliott - COHERENCE

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