



Hello all,

Welcome to Volume 1, Issue 2 of [COHERENT BREATHING](#), a new YouTube channel dedicated to the science of Coherent Breathing. If you are familiar with *Swan & Stone*, it has been a mixture of information about Coherent Breathing and esoterica, as my interests lie in both areas, and the subject matter is intertwined, Coherent Breathing being foundational to many esoteric pursuits. The [COHERENT BREATHING](#) channel will be dedicated to the art and science of Coherent Breathing, its psychophysiology and application to health and healing across numerous fields, where the direction the research is taking is toward circulatory effectiveness. Henceforth, [Swan & Stone](#) will lean toward internal practices, including qi gong, tai chi, meditation, and kundalini, where we intend to make the channel more demonstrative and teaching oriented. Whereas, The Coherent Breathing Channel will be more demonstrative of the Coherent Breathing method, physiology, and technology, including live demonstrations of [Valsalva Wave Pro](#).

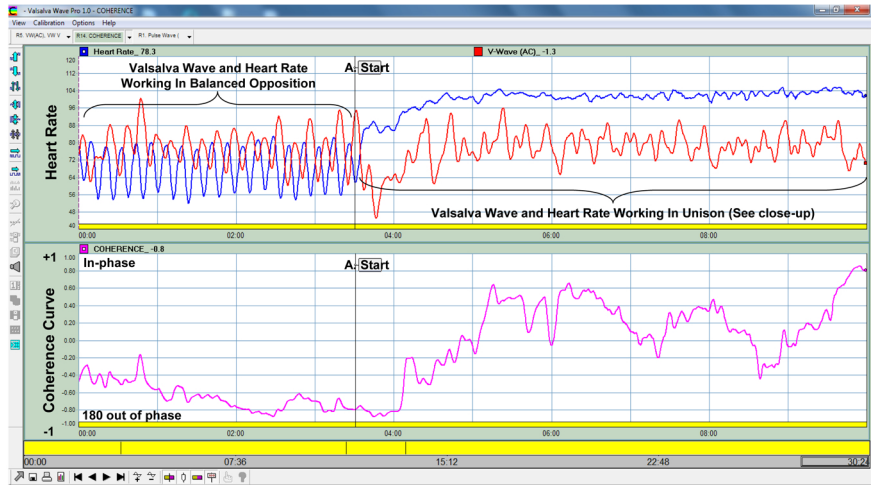


Figure 1: Valsalva Wave, heart rate, and coherence before and during exercise (observed at ear lobe). Click to zoom.

A common question we receive is this: How does [Coherent Breathing](#) relate to exercise, and can it be used to enhance performance and speed recovery, “both on the bench”, and recovery after injury. We’re confident that the answer is “Yes”, to both of these questions. Why? Because we’ve learned that Coherent Breathing is fundamentally about circulatory effectiveness on which everything else is dependent, literally all 100 trillion cells.

In this issue #2, *Coherent Breathing & Exercise* we discuss the relationship between breathing (diaphragm movement), Valsalva Wave, and HRV before, during, and after exercise – possibly the best place to begin our exploration of Coherent Breathing and exercise. Readers are familiar with the near 180 degree phase relationship between Valsalva Wave and the HRV cycle while breathing coherently when at rest or semi-activity. This 180 degree alignment is indicative of resonance, which I have posited represents circulatory optimality and balance when at rest or semi-activity. The objective of this research was to see if and how that relationship changes with exercise.

We’ve made the argument that a reason why the Valsalva Wave and HRV cycle are in opposition when at rest is to keep blood flowing in a circle without impediment, blood volume in venous and arterial trees being equal over time, thereby facilitating flow of all bodily fluids as a consequence of subtle pressure differentials presented across the ubiquitous capillary membrane and interstitium as a consequence of the combined action of the Valsalva Wave rising and falling and the heartbeat. It is the quiescent homeostatic state to which we should aspire when at rest or semi-activity.



Let's explore Figure 1. The instrument is COHERENCE Valsalva Wave Pro, the only biofeedback instrument that simultaneously feeds back what both the heart rate and the breathing induced blood wave (the Valsalva Wave) are doing with a single earclip.

This is a recording of me, Stephen Elliott, on a stationary exercise bike and breathing "coherently" for approximately 3.5 minutes. We can see the typical near 180 degree out of phase relationship between the

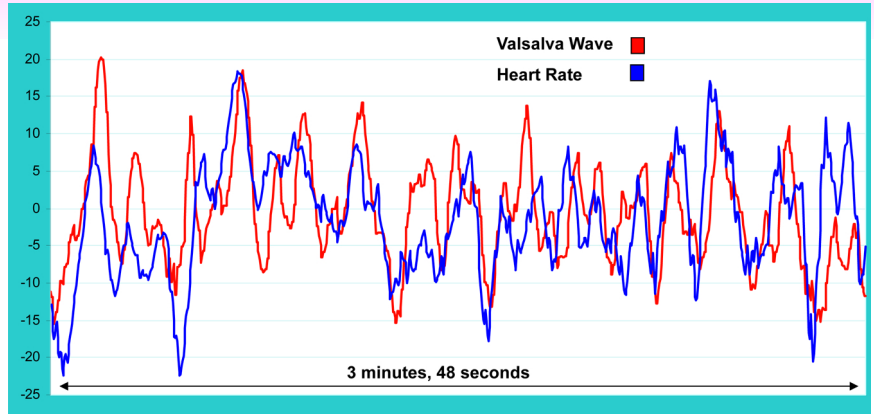


Figure 2: Valsalva Wave & Heart Rate During Exercise Of Figure 1 Overlaid And Magnified To Make Their Relationship Clear

Valsalva Wave (red graph) and the heart rate (blue graph). Their correlation in time is measured by the Coherence Curve which approaches -1. I argue that this is indicative of cyclic (circular) blood flow in the body where flow is maximized and unimpeded, again, the homeostatic state. The diaphragm and thoracic pump which includes the heart are working synergistically, venous blood flow toward the chest emphasized with inhalation and arterial blood flow away from the chest to the head and extremities emphasized during exhalation.

At ~3.5 minutes I begin pedaling the bike under relatively light load but enough load to make me perspire slightly. Perspiration is an important indication that I was looking for with this experiment. What we see is that while before exercise begins, the Valsalva Wave and the heart rate are in opposition, as exercise ramps up and continues the Valsalva Wave and heart rate align in phase, becoming supportive in moving blood from the chest toward the extremities. While the heart rate variability cycle becomes smaller, the Coherence Curve tells us that the two signals align in phase. We posit that the biological purpose of this alignment is "increased circulation" now powered simultaneously by both the diaphragm and the heart in synchrony such that working cells can be serviced, i.e. hydration, nutrition, waste removal, etc. As exercise winds down, we see the Valsalva Wave and heart rate return to their previous near-180 degree phase alignment.

*So we see two states*, the first state being where the thoracic pump (powered by the diaphragm) and the heart rate are "coherent" and working together in their characteristic arrangement during rest and semi-activity when breathing coherently where I argue that the heart and diaphragm share the burden of circulation, the heart tending to arterial flow and the diaphragm looking after venous flow (via the right heart). The 2nd state is where the pumping action of the diaphragm and heart become supportive, increasing blood flow in the arterial tree and by necessity the venous tree. Fluid exchange across the capillary membrane and interstitium increase to service working tissues and the energy producing cells of which they are made – muscles. We begin to perspire because of this increased fluid exchange and eventually we become thirsty, the need to replace the fluid that we lose during perspiration. Figure 2 demonstrates this supportive alignment, virtually 180 degrees different than that which we see when breathing at rest or semi-activity. I consider this an exciting finding – obvious in retrospect – but not possible to "observe" without the simultaneous monitoring of both Valsalva Wave and heart rate.

Thank you for your interest

Stephen Elliott, President, COHERENCE LLC

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