



Hello all,

Since the introduction of Coherent Breathing in 2004, there are 2 questions that I've received most often. One regards the equal periods of inhalation and exhalation as specified by the Coherent Breathing protocol, where some breathers desire to exhale for a duration longer than they inhale. The 2nd question has to do with breathing rate, where some are keen to breathe at a rate slower than 5 breaths per minute. In this issue, ***Breathing Asymmetry***, we'll investigate the first matter and how heart rate responds to periods of exhalation and inhalation that are longer than 6 seconds. Regarding both matters, my consistent position has been that this is difficult to know without an instrument. I'll address rate in more detail in Swan & Stone, Issue 3, ***Resonance***.

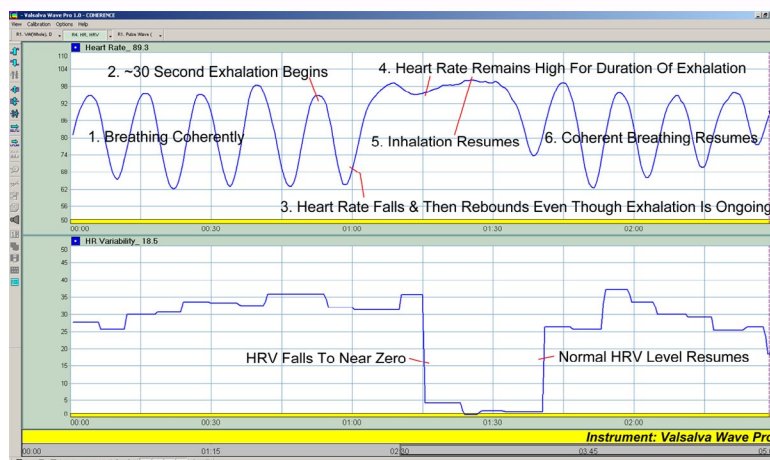


Figure 1: Coherent Breathing, then 30 second exhalation.

The general notion that exists behind both questions is that “slower is better” as it relates to elicitation of parasympathetic response, that a longer exhalation and a slower breathing rate yield a stronger response. As the human condition is one of sympathetic dominance, where I have argued that this is fundamentally due to sub-optimal (pathological) breathing, and have urged breathers to slow down from the average adult breathing rate of 17-19 breaths per minute to the nominal resonant rate of 5 breaths per minute, I accept some responsibility for the understanding that slower is better. My general aim has been that of bringing the breathing rate (with commensurate depth) to the resonant rate, the frequency at which adult physiology is naturally tuned.

In keeping with the focus of this issue, let us explore the Heart Rate Variability (HRV) record of Figure 1. This is a Valsalva Wave Pro recording of me breathing coherently for ~50 seconds, and at the end of the 5th inhalation I begin exhaling for a period of 30 seconds (Note 2). My heart rate falls for exactly 6 seconds and then it rebounds to 98 beats per minute, just as if I were inhaling – *even though I am continuing to exhale* (Note 3). At this point, it remains high (Note 4) until I once again inhale (Note 5) and Coherent Breathing resumes (Note 6). While Valsalva Wave Pro is recording the session, I am pacing my breathing using Coherence Clock (on my phone) at 5 breaths per minute, and not observing the record. I've repeated the experiment a number of times and there are two outcomes that are consistent: 1) my heart rate continues to mimic that of my Coherent Breathing heart rate for 12 seconds (falling and rising as though I am exhaling and inhaling), and 2) after my heart rate rebounds, it remains high until I resume inhaling and exhaling. In keeping with Coherent Breathing theory, this lasting period of elevated heart rate is indicative of parasympathetic withdrawal. Where the common notion is that a longer exhalation results in longer/stronger parasympathetic emphasis, the heart rate tells a different story. Why does this happen? My hypothesis is that with the delay of inhalation and consequent delay in the generation of negative pressure in the thoracic cavity, the right heart must work faster to maintain flow in the venous tree. If flow in the venous tree is not maintained, pressure in the arterial tree will rise.

At present, the only participants in this mini-study are Rajendra Palhan, myself, and Taylor, my 22 year old son. All of us are avid Coherent Breathers so entrainment can be playing a significant part in the outcome. Here I request that anyone with an HRV instrument give it a try. Please let us know of your results.



For completeness, and as a basis of comparison I've performed the same experiment with prolonged inhalation. (Note that I am inhaling very gently over a 24 second period.) I've examined this a number of times and while there is some variation, this recording is typical of the outcome. Here something similar happens relative to exhalation but with a mirrored result: 1) heart rate variability again persists for 12 seconds as if I'm continuing to breathe coherently even though Coherent Breathing's cyclic action has been suspended, and 2) where during prolonged exhalation the heart rate goes low, then it automatically goes high (as if inhaling), and then it stays high, during prolonged inhalation the heart rate goes high, then it automatically goes low (as if exhaling), and then stays relatively low, indicating parasympathetic emphasis. Why might this be? I anticipate that it is because prolonged inhalation mimics breath holding, to which the body responds by slowing internal systems so as to conserve oxygen and energy, but it is a question that requires research.

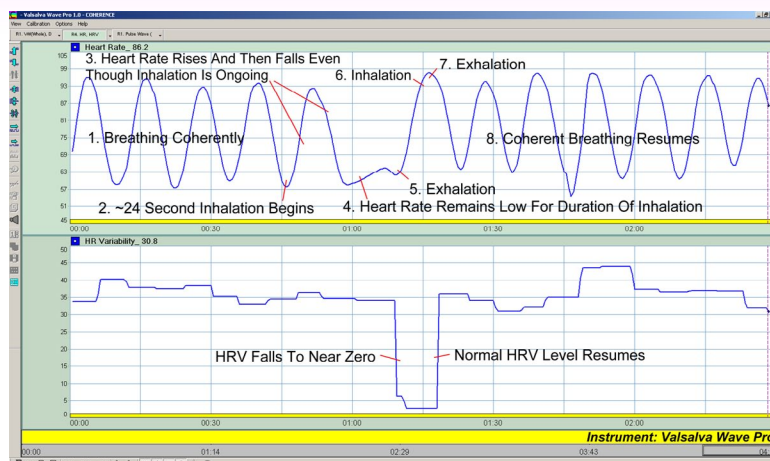


Figure 2: Coherent Breathing, then 24 second inhalation.

To recap the experiment, I am breathing Coherently for a few cycles, then I extend exhalation or inhalation, and then I resume Coherent Breathing. During Coherent Breathing autonomic emphasis is swinging like a pendulum, asserting efferent vagal flow coincident with exhalation and withdrawing that efferent flow during inhalation, thereby causing the heart rate to decrease and increase, respectively. This is balanced resonant action, like that of a pendulum. In these experiments, when the period of either exhalation or inhalation is prolonged, resonant action ends and HRV falls to near zero. HRV amplitude is exhibited in the lower panel of each figure. There we see variability falling from an average in the 20s to near zero, and then returning to an average in the 20s when Coherent Breathing resumes.

Using heart rate as the indicator of autonomic status and action, prolonged exhalation appears to result in *net* decreased parasympathetic emphasis and prolonged inhalation appears to result in *net* increased parasympathetic emphasis, where exhalation is concerned, the opposite of what might be anticipated. But I'm not quite sure. Using the body's own "biofeedback" system, there is a distinct comfortable sensation, what I like to refer to as an "exhalation induced relaxation response", that feels like water flowing downward through the body during exhalation. Readers may recall that Coherent Breathing (and The Six Bridges) make use of this response to "let it all go", that is, to let go of internal tension. The sensation of this feeling does not end abruptly when the heart rate rebounds upward. This must mean that the sensation accrues from something other than vagal efferent action associated with exhalation. To understand the phenomena more completely, I think the next step is to monitor heart rate and galvanic skin response simultaneously to see if the results during extended exhalation correlate.

I would like to acknowledge the contribution of Shri R.K. Palhan to this research. Rajendra is the CEO, New Delhi School Of Yoga, and pioneered the introduction of Yoga And Meditation (YAM) to India Railways, the largest corporately sponsored yoga and meditation program in modern history.

Stephen Elliott, President, COHERENCE

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