



Happy New Year All,

Welcome to *The State Of Coherent Breathing – 2019*. The Coherent Breathing® method is taking off in the world. As I keep up with these things, there are now 15,900 Google hits on the exact term “Coherent Breathing”, originating from all over the world, and there are new articles popping up on the web every day. This is a delightful outcome and something we’ve worked hard to see happen for ~20 years. Thank you all for your support, and particularly to Drs. Brown and Gerbarg for their advocacy and incorporation of Coherent Breathing into their Breath-Body-Mind program, and their application of it to their disaster relief efforts. We are also particularly proud to be non-profit supporters of the Veterans Administration with their inclusion of Coherent Breathing into their integrative medicine program in the Northeast.

As a reader you may know that I’ve been hot on the trail of what I will call the role of breathing relative to circulation. Figuring this out has been a fundamental goal since the writing of the 2nd edition of *The New Science Of Breath* (2006). So, I’d like to use this issue of January 1, 2019 to bring everyone up to speed on the present theory of how Coherent Breathing works and what is actually going on when we breathe “coherently”. When I began this research circa 1998 I was using EEG, HRV, EMG, breathing, earthing, and meditation simultaneously and I was seeking to understand the neuro-physiological connection between them, as I knew there was one. Though elusive, I’d felt it, and I’d seen it via instrumentation. In the end, I converged on synchronous breathing (now Coherent Breathing), relaxation (now supported by The Six Bridges exercise), and *stillness* to be the key. When one engages in these practices simultaneously, it produces desirable biometrics including an HRV signature approaching resonance and a brainwave signature approaching Awakened Mind. Please note that while I employed meditation to study the biometrics, the conclusion that I arrived at did not employ “meditation” per se, but that the method elicited the meditative state automatically. We now know that this state typically ensues within 8-12 minutes of practice, whether one knows anything of meditation or not. Now as to why...

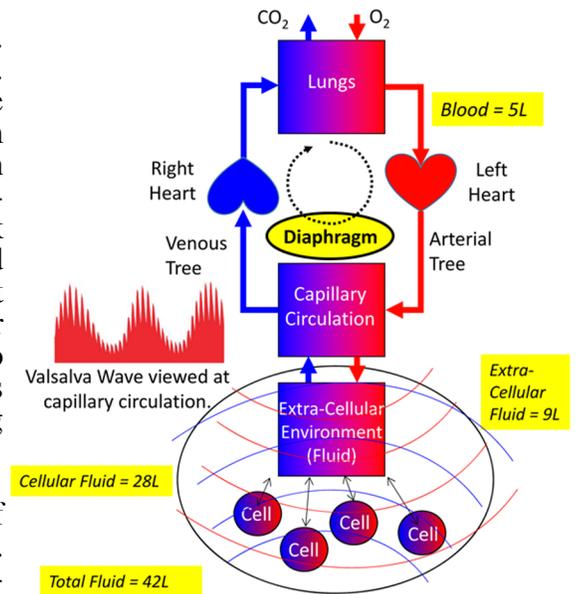


Figure 1: Circulatory System (C) Blood Flows In A Circle, Hence “Circulation”.

Synchronous breathing at the rate of 5 breaths per minute with corresponding depth and without pause creates a large wave in the circulation. Using Valsalva Wave Pro this wave can be seen in the capillary circulation, the arterial circulation where accessible, and the venous circulation. As viewed at the capillary circulation, the amplitude of blood activity doubles, i.e. a respiratory wave develops and is equal in amplitude to the heartbeat, which begins to ride atop the respiratory wave. Given that the frequency response of Valsalva Wave Pro is flat from 0 Hz upward, this says that the pressure differential (and resulting flow) double as compared to that of autonomic (automatic) breathing, which would have us breathe at ~20 breaths per minute (a state of breathing where the respiratory wave component isn’t visible). This is because the pumping mechanism, principally the diaphragm, is working so rapidly that it is moving without depth or range. When we breathe at 20 breaths per minute the diaphragm is moving up and down ~1 cm or less with each breath, where it has a maximum range of ~ 5 cm up and down (i.e. 10 cm in total). We’ve seen many cases where this breathing pattern results in a “flat line” steady heartbeat with absolutely no respiratory wave component visible. When we breathe rapidly we cannot achieve the depth that we can when we breathe slowly. This is common sense.

*Here I’d like to emphasize previous assertions I’ve made that this is an unhealthy breathing pattern for homo sapiens, because we are erect, i.e. we hold our heads above our chest.* My hypothesis is that the diaphragm evolved in vertebrates with erectness or verticality to aid in circulation, the giraffe being the extreme case, the land vertebrate with the largest diaphragm, though its heart is no larger than other animals relative to its size. In January of 2017, with the help of Dallas Zoo we had the opportunity to make an exciting discovery regarding giraffe circulatory physiology. With VWavePro, we found something that other giraffe researchers had not. Personally, I consider it one of our foremost research achievements. I urge you to read about it.



In the 2009-2012 timeframe a colleague and I found that Coherent Breathing produces brainwaves that are 10X those of functional waves, delta, theta, alpha, and beta. When Coherent Breathing stops, the 10X waves stop. Now, if this is correct, then it is important for us to breathe with depth when we are erect, otherwise, blood flow to the brain is potentially half of what it might be. Of course, the legs are also of concern where the force of gravity tends to cause the blood to pool, this is a causative factor for venous thrombosis. When we inhale, we vacuum blood from the feet to the chest, such that it doesn't languish in the venous system of the legs, or anywhere else in the body.

A 2nd major health consequence of not using the diaphragm with adequate depth is that the right heart bears the burden of venous blood motility, where I argue that it is the anatomical responsibility of the "thoracic pump", in which the heart resides, to generate the negative pressure to which venous blood naturally returns via the right heart which is organized to act as a low pressure check valve, not a vacuum pump. If we allow the right heart to carry the burden of generating needed negative pressure for many years, then in time it wears out, a primary symptom being "congestive" heart failure, the failure of the 42L of fluids in the average adult body to move, specifically, not returning to the chest via the venous circulation. *Fluids fail to circulate.* The strong structure of the thoracic pump and in particular the diaphragm exist to perform the circulatory function of venous return. The right heart is relatively fragile and is not meant to bear this burden. (Thoracic Pump.)

As understanding the reality of Heart Rate Variability (HRV) has been a compelling interest of mine and an early impetus for undertaking this work, I'd like to offer a current perspective on this topic. This was a compelling question for me in the early phases of research, circa 1998. Remember that this was at a time when HRV had a very new age mystique and was shrouded in mumbo jumbo. At the time, HRV instruments had low frequency filtering in them so that the Valsalva Wave was not visible – they had long ago been optimized as "heart beat" instruments. The same was true for EEG systems, where "respiratory signals" were considered "unwanted physiologic noise" and were removed via low frequency filtering. Note the thinking of the time, that the heart and brain were logically separate from the rest of the body and were to be studied independent of the larger system in which both reside – a distinctly Western medical perspective. This led to an out of context understanding of the phenomena being studied in both fields for almost 50 years. What has this lack of understanding meant to the field of cardiology over this period? A troubling question...

*Breathing (rhythmic diaphragm motion under control of the phrenic nerve) is a circulatory function during which gas exchange occurs. The circulatory function of breathing is that of moving the blood, and specifically that of venous return, where the heart and muscular arterial tree are primarily responsible for arterial flow. Of course, gas exchange occurs in the process. The signature of diaphragm movement is the Valsalva Wave, blood volume rising in the arterial tree during exhalation and rising in the venous tree during inhalation. A primary function of the wave is fluid exchange across the pervasive capillary membrane of the body to nourish the ~100 trillion cells that exist in the interstitial environment. We estimate that the wave action doubles the pressure differential across the capillary membrane and results in a doubling of fluid exchange between the blood stream and the interstitial environment. It is hypothesized that the diaphragm evolved in man as in other erect vertebrates for the purpose of moving blood against the force of gravity. Breathing induced Heart Rate Variability is an outcome of diaphragm activity, resulting wave activity, baroreception, and other "thoracic pump" mechanisms that exist between the diaphragm and heart. Breathing induced HRV isn't mysterious. "Resonance" is mysterious and is the field that needs exploration, simply because we don't know enough about it. If it equates to circulatory optimality, it could hold great promise for human health and humanity in general. What if the conscious use of the portion of the brain that controls the phrenic nerve, results in overall brain development via enhanced circulation resulting in increased "humanity", higher order faculties of love and compassion – a positive feedback loop. What if increased brain circulation reduces the incidence of dementia and Alzheimer's? As posited, what if increased flow across the capillary membrane and through the interstitium offers more effective delivery of herbs, nutrients, and medications to the 100T cells of the body? What if more efficient circulation keeps the cellular environment cleaner and less prone to disease? **This is where we need help.***

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