

*Assessing a Patient's Adaptive Reserve:*

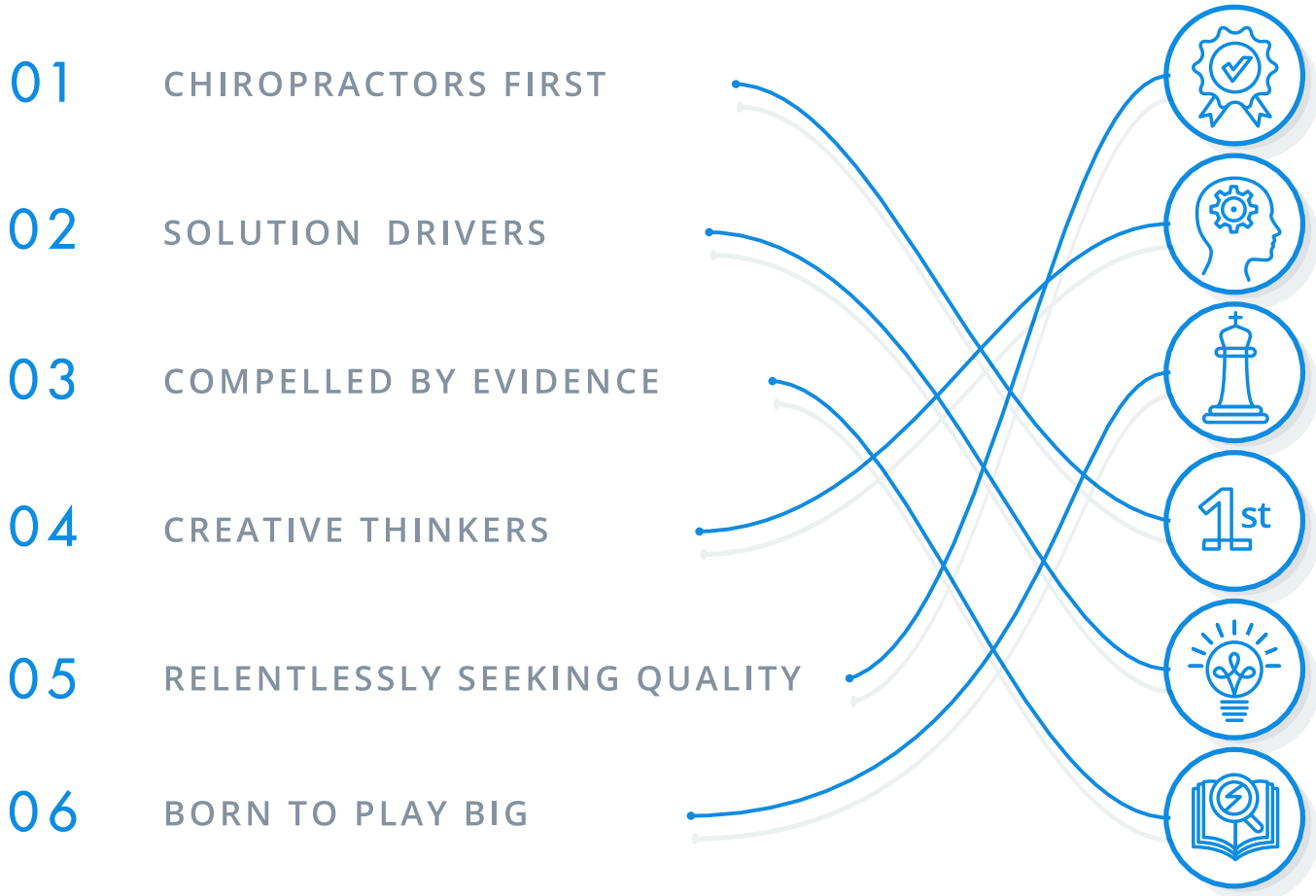
# Utilizing Heart Rate Variability in a Chiropractic Practice

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## CLA's Mission and Core Values

Our mission is that every chiropractic office has INSiGHT™ Technology at the hub of their practice to create a standard of care for chiropractors to measure and communicate their results with certainty.

When you invest in us, you invest with a team that is made up of experts who are:



## Assessing a Patient's Adaptive Reserve:

# Utilizing Heart Rate Variability in a Chiropractic Practice

Dr. David Fletcher, DC, FRCCSS(C), President, CLA



**In the cluttered health care marketplace**, chiropractic must distinguish itself as unique, powerful and certain. It has the ability to offer a hopeful plan for restoring function and arousing the health and wellness potential in individuals and families. One of the greatest challenges in practice is communicating and defining the transition from symptoms towards wellness. What is the ongoing value of consistent chiropractic care in the asymptomatic patient?

### Complex yet simple...

To define chiropractic in a limited musculoskeletal model diminishes the impact of how chiropractic adjustments improve the functioning nervous system. At all times, a reorganizational intelligence is working to redefine the efficient management of momentary and accumulated stressors. This innate responsiveness relies on a well-balanced and fully charged Autonomic Nervous System to optimize

the adaptive response. Although there is significant value in observing postures, palpating the tone of tissues and assessing spinal mobility, looking deeper into the functioning nervous system offers a more complete perspective when communicating and advising future care objectives. An array of instruments such as surface EMG and thermography have become the mainstay of chiropractic neural assessments. However, an exciting newer approach, designed to calculate the patient's adaptive capacity has emerged especially within the past decade. Advanced technologies that have become the gold standard in observing and managing stress reactions in cardiology, sports performance and psychology practices are now available to chiropractors. Heart Rate Variability (HRV) is a simple and accurate test that uses complex mathematical calculations to analyze the rates and rhythms of the resting heart beat pattern. The data can be evaluated to reveal the intricate balance between the Sympathetic(S) Nervous System and the Parasympathetic(PS) Nervous System.

CLA has developed a proprietary HRV technology specifically for chiropractors. The neuroPULSE™ is research-grade technology that allows the staff or doctors to quickly assess the effect that accumulated, long term stress is having on the general state of a patient's well-being. Additionally, a neuroPULSE scan is an ideal way to monitor the overall improvements accomplished while under chiropractic care. It is precision technology that allows the clinician to measure and discuss the vital changes while inspiring the patient to continue towards wellness care. HRV testing has become a significant tool in developing retention and compliance within a practice.

The neuroPULSE is unique because of its technology combination that measures heart rate while monitoring anxiety levels and temperature ranges simultaneously. An embedded Galvanic Skin Response (GSR) measurement ensures that collection of data is collected while the patient is at their physiologic and emotional calm. The three-minute, unattended test, with a patient's hand cradled on a sensing platform, captures the full spectrum of the heart rate and rhythm while monitoring the patient's emotional state and physiological temperature ranges. The neuroPULSE can actually be regarded as an Autonomic "adaptation station". In addition to its fixed hand sensors, the neuroPULSE offers two accessory sensing devices for use in pediatric settings. An ear clip and finger sleeve can be utilized to accommodate smaller hands while reducing the impact of uncontrolled hand motion, commonly encountered in younger patients.

### How does HRV measure the effects of Chronic Stress?

The origins of Heart Rate Variability go back to clinical studies 40+ years earlier. At that time, the ANS was viewed through a Stimulus-Response model and not examined as a complete system interacting with psychological and physiological factors. Polygraphs were the first bridge to "show" how an emotional state impacted the physiology. In those years the accuracy of measuring the heart's R-R interval was limited and so HRV was relegated as an anomaly. With the advent of digital processing, the milliseconds of the interval and the degree of variability can now be calculated accurately. This has led to the explosion of the use of HRV in all health and fitness disciplines. A challenge for clinicians however, is the collection of accurate and reproducible data. Ectopic beat patterns affect the data and so the utmost care must be taken to ensure precise collection and calculations. Only the neuroPULSE allows a level of certainty that the test has been performed at rest and not influenced by unusual movements or interrupted by moments of anxiety.

HRV offers a look into the balance between the Sympathetic(S) and Parasympathetic (PS) portions of the ANS. The beating heart is regulated via the A-V

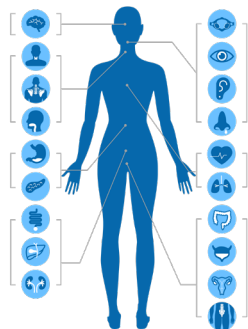
node whose neural connections include PS-feeds from the Vagus nerve and S-feeds from the upper thoracic spinal nerves. These neural connections maintain a coherent state, allowing the entire body to respond and adapt to stress. The level of coherence and adaptability is directly related to the balance and amplitude within the functioning nervous system. Vertebral subluxations have been shown to distort this balance and coherence so the use of HRV is an excellent indicator of the presence and the effects of the subluxation.

The heart rate can be measured using wired ECG leads or photoplethysmography(PPG) as seen in the neuroPULSE. Both of these sensor systems collect a vital metric known as the interbeat interval (IBI). This R-R interval represents how the timing of each beat is being regulated by the instantaneous interplay between the S and PS nervous systems. If you were to take your pulse, you would collect a string of pulse waves using your finger tip as a sensor. The accuracy is limited. When using digital sensors to measure the IBI an accuracy level to the third decimal point can be attained. Interestingly, these R-R intervals vary as the instantaneous demands are adapted to by the nervous system. A consistently high degree of variability means that the patient is remaining in a highly adaptive state. When S-dominance is occurring because of unmanaged distress and lower PS tone, a less coherent state exists. This in turn can lock the nervous system into low responsive state. An interesting paradox is at play here. Intuitively, one would anticipate that a high degree of variability would equate to instability. However, that is not the case. A highly adaptive system is awake and alert to the demands of the environment; ready to respond with optimal force. If there is lowered variability of the heart rate then there is decreased resilience and the patient becomes vulnerable to any added stressors.

Lifestyle stressors, derived from physical, emotional and biochemical sources, constantly push people towards an S-Dominant state. The sympathetic nervous system reacts in a Fight-Flight response to these overt stress demands. To balance this adrenergic effect, the body produces a Parasympathetic response.

To be clear, this is not a simple teeter-totter action between the S and PS systems. Stress adaptation is a complex array of interactions but the end result of the body's innate, best strategy at managing exogenous stress can be viewed by using HRV. The more unbalanced the response, the less coherent the system is to respond efficiently and effectively. Using time and frequency domain calculations, a string of heart beats offers a remarkable amount of neural processing data. The ratio of the S and PS frequencies can be easily calculated to show an Autonomic Balance Index (ABI). The more complex calculations that look at the degree of variability in a string of interbeat intervals, takes into account the amplitude of the S and PS frequencies to reveal the Autonomic Activity Index (AAI). This shows how much adaptive reserve the entire ANS has to respond to lifestyle demands.

A decrease in variability has been linked to any number of pre- degenerative or morbid, deteriorating

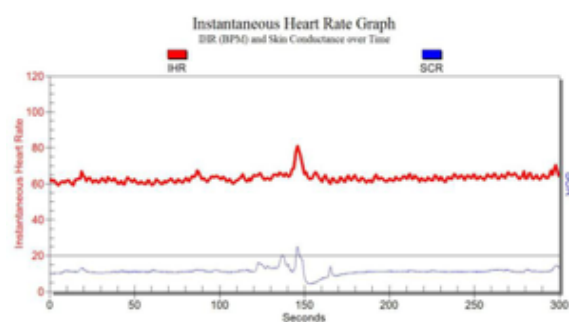


physiologic states. HRV is not an exact diagnosis of disease but rather an indicator of the present state of adaptability. Chronic increases in health risk can be observed and reported when sequential HRV reading are obtained.

The ANS is involved in all disease states and is inherent in promoting a desirable state of wellness and performance. By producing neurotransmitters such as adrenaline and hormones such as glucocorticoids, the sympathetic system stimulates a Fight-Flight response. The heart rate increases, and the vasomotor tone of the periphery constricts (as seen in para-spinal thermal scans). A “vagal brake”

is applied by the medullary circuits ending in the myelinated, Vagus motor nerve. This slows down and rhythmically balances the heart rate.

HRV measures the tonic baseline of the sympathovagal state of normal sinus rhythm. If there is cardiomyopathy present, HRV will be diminished. However, from a chiropractic perspective, our interest lies in modulating the neural input to regulate the S-PS balance and increase the efficiency of the ANS.



Chronic stress leading to dis-stress will swing the balance and reduce the variability. An increased S-tone is associated with overt or quiet inflammatory states. A chronic skewing towards the S side indicates a lowered PS response. The PS readings can be viewed as an indicator of the level of the restorative response. Low PS and higher S

readings combined with a low variability indicate a declining state of health and adaptability. One can easily identify the amount of “reserve” a patient has by looking at the amount of variability. If there is a low level of reserve then the patient is more vulnerable to negative type stress.

### Chaos Theory and Fractal geometry

Natural systems are non-linear in their response to stimuli. The randomness of this response originated the advent of the Chaos Theory which is defined as the study of multivariable, non-periodic and nonlinear systems. The heart rate is, by design, slightly variable, due to the Respiratory Sinus Arrhythmia (RSA). Fractal or quantum analysis is necessary to account for the non-periodic measurements of this variable system.



## Here is what you can hang your hat on...

HRV is the gold standard in analyzing the status of the adaptive state of the individual. Multivariable, non-linear events play upon the psychophysiology of everyone. You can now benchmark their current status and report, with accuracy, the direction they are headed. They are either stuck in a survival state as witnessed by an S-Dominant scan or achieving a thrival state of a well-balanced and fully charged ANS.

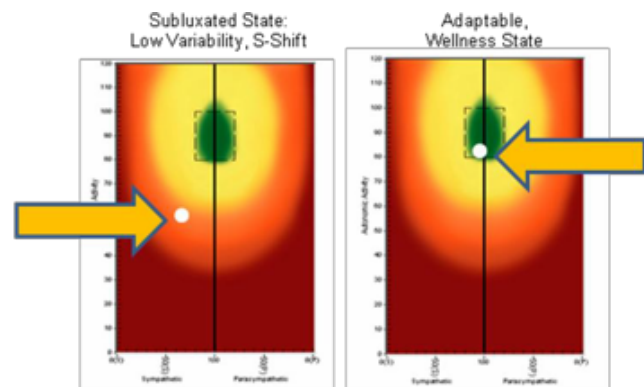
Chiropractic has been proven(1) to positively influence the variability as measured using HRV. Combined with regional readings showing the patterns of memorized adrenaline load (neuroTHERMAL scans) we can track the emerging state of health and discuss wellness options with our patients. Adding in the sEMG can tell us the energetic efficiency of their posture(dysponesis) and help us to understand where the wasteful, paraspinal motor response is occurring. Using inclinometry and algometry to complete the spinal-neural profile, we can inspire the patients to take their spinal core dynamics seriously and help them understand that back pain is not the only issue at hand.

## Powerful Communication; Powerful Solutions

Chiropractic is much more important than being relegated to the role of a spinal therapy. It is positioned at the leading edge in managing and promoting performance and unlocking human potential. Understanding and utilizing HRV to map a patient's adaptive reserve allows the conversation to extend beyond symptoms. Here is an example

of how using HRV helps redefine a chiropractor's role as a health and wellness care provider. In these two neuroPULSE graphs, the same patient was asymptomatic and unaware of the impact of a subluxated nervous system. The green zone represents a well-adjusted nervous system and the centerline represents the ideal balance between the S(Left) and PS(R) activity. Both tests were done with the patient at calm rest. On the left graph, the nervous system exhibits S-Dominance and a low activity level. The patient has no awareness that their nervous system is subluxated and is constantly reacting, at rest, with a Fight-Flight response that has become their normal. By adjusting the subluxations and balancing the nervous system, this same patient was able to activate their PS controls, reduce the S-Dominant response and begin to "recharge" their adaptive reserve. Their HRV scores reflect this coherent and productive state.

The graphs and scores provided with the neuroPULSE make communication of stress, health and adaptability the cornerstone of a chiropractic family practice.



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