UNIQUE NERVE SIGNAL PROPAGATION DISCOVERED IN CHIROPRACTIC OPENS NEW ACADEMIC UNDERSTANDING OF THE CENTRAL NERVOUS SYSTEM

By Dr Donny Epstein

Research continuing at the University of Southern California, USA, is studying the mathematics of a unique spinal wave generated in Network Spinal Analysis Chiropractic Care. This research on the electrophysiology of the Network Wave is reinforcing the paradigm suggested by Danish researchers Heimberg and Jackson, which proposes that the nervous system communicates through acoustic, or pulse pressure waves, and that the electrical signal is a likely by-product of this communication.

In the mainstream medical paradigm, and often for many chiropractic institutions, biochemistry has been the ruling system. Now biophysics is gaining ground as a way to more fully understand how information travels in the nervous system. A potential bridge between a neurobiophysical model and Chiropractic is available to be explored as a result of the research mentioned in this paper. If solitons, or tonal pulses, as mentioned below are the nature of the nerve impulse, does the "stretch" or tone on the nerve or spinal cord affect the quality of signal propagation?

The opportunity that now exists as a consequence of the nature of the results and the models revealed within, suggests links between D.D. Palmer's concept of "tone", B.J. Palmer's concept of multiple cord tensions and Alf Breig's concepts of Adverse Mechanical Cord Tension (AMCT) and now creates an even stronger case for the importance, and nature of Chiropractic care. AMCT may be generated by postural, chemical, emotional, mental and other stressful stimuli. Appropriate tension allows for the tallest amplitude wave and therefore the fastest signal travel. If a nerve is too taut or slack the wave amplitude will be smaller and slower resulting in incomplete information transmitted from the point of stimulus to the brain.

In this article I mention Network Spinal Analysis (NSA) as it is the technique means by which this wave is consistently produced, and it has been the subject of study at several universities for nearly two decades. Of particular note is the study of Central Nervous System mathematical modeling of spinal EMG signals. Careful consideration has been made in order to report accurately the nature of the process, and phenomenon elicited, in order to map the neurophysiology, mathematics and engineering nature discussed, as a matter of academic and research (ie. without promotional intent). While bold, the academic implications of what is described in this paper are not overstated. NSA is a low-force, tonal technique that produces global changes in the vertebral, muscular, connective tissue and neural tension patterns including a visible undulatory movement throughout the spine called the Network Wave.

Information and energy are two fundamental elements of waves. These two elements will modulate other factors such as frequency and amplitude to create unique configurations that allow for information to be encoded in the wave and decoded at a receptor site. The unique Network wave is dynamic and directly correlated to the level of care the practice member (patient) is experiencing. As care progresses, so does the complexity of the wave and correspondingly the complexity of the information that is able to move through the nervous system.

Researchers found that the Network Wave can have 1, 2 or 3 nodes or oscillators that affect the configuration of this wave, each associated with specific outcomes. At gross observation this unique wave appears as a standing wave, an undulation through the spine similar to a wave in a guitar string with two fixed ends. As researchers have looked deeper into the dynamic nature of this wave it is understood to be far more complex than the previously assumed standing wave.

A standing wave occurs when there are two equal waves moving in opposite directions through a double terminated medium or solution.

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The resulting visible wave is actually the result of the two waves moving in and out of phase. A standing wave is highly influenced by outside forces and has no inherent stability with dynamic or chaotic input. When more information enters the system, a standing wave will entirely change.

The Network Wave is demonstrating properties beyond the standing wave. It has been shown to be an acoustic wave. An acoustic wave is different than a standing wave simply by the fact that vibration matches the direction of travel. In our previous guitar string example, the string itself is operating as a standing wave made up of two waves traveling in and out of phase between the two termination points. The sound that is being produced and emanating from the string itself is acoustic. The vibration and direction of the wave are uniform. This is an important finding considering that D.D. Palmer stated that Chiropractic was founded on tone, and that disturbance in the tension of the "Neuroskeleton" created an alteration of the Universal Organizing Intelligence which manifested as dis-ease.

Further, there is an enduring property in the wave known as a soliton. A soliton is a wave that is non-linear and non-dispersive, meaning it doesn't lose energy or amplitude over time despite movement though a typically dispersive medium like water. Collisions with other waves also don't change the wave. When two solitons collide there are no additive results (such as there are with standing waves). Instead, the taller faster moving wave seems to pass through and replace the shorter amplitude slower wave in a non-linear fashion. Solitons typically exist in fluid models, which would point one to consider the CSF as the medium. It is possible that a soliton wave in the CSF could trigger mechanoreceptors in the spine initiating this movement.

Edmond Jonckheere Ph.D from the department of Mathematics and Engineering at the University of Southern California, USA has been the chief researcher of the Network Wave. He, along with other researchers noticed that the gross movement of the wave, and the sEMG data had the same properties discussed by researchers Heimberg and Jackson in their description of solitons.

This soliton and acoustic wave model challenges the Hodgkins Huxley model1 of neural activity through the action potential. This has been the widely accepted model since the publication of their paper in the early 1950's. As the understanding of the nervous system becomes more robust, that model has come under some scrutiny. Recent work by Heimberg and Jackson2 have shown that there is a thermodynamic impossibility that the action potential is how a signal moves along a nerve. If indeed the nerve communication was bioelectric in nature, there should be heat lost at the synapse. No such loss occurs.

It should be noted that B.J. Palmer's thesis stated that the mental impulse was the expression of a vibrational propagation, and was created by the brain's harnessing of a universal energy. He emphasized that the mental impulse, a transformed quantity of innate consciousness, was its unadulterated form and what chiropractors sought to liberate through the spinal adjustment. He clearly distinguished the mental impulse from the classical nerve impulse in his defining the vertebral subluxation.

This brings us back to our proposed challenges to Heimberg and Jackson's neurological bedrock supposition of these last 60 plus years. They recognized that the action potential model didn't account for large fluctuations in either heat or light energy in the nerve. If the action potential were the mechanism of signal propagation it should be producing far more heat than is actually measured. The action potential model of Hodgkins and Huxley is, at least, thermodynamically inaccurate. The soliton offers a solution to these inaccuracies because, as mentioned, it is non-linear and non-dissipative and accounts for the discrepancy in heat and light energy found in the Heimberg Jackson research.

Additional research on the Network Wave and the apparent effects on paraplegics reinforce the acoustic wave model. A paraplegic received care with Network Spinal Analysis3 and it was shown that the wave produced and measured by sEMG moved through the site of the lesion, again, in a non-dissipating manner. A linear standing wave would have been disrupted by the cord injury and information would not have moved beyond the site of lesion; a soliton could do this.

It was recently found that the Network Wave demonstrates the mathematical signature of a Central Pattern Generator (CPG), a completely unique–to–the-individual neurological behavior organizing mechanism. There are very few known CPG's and this may be the first that is externally initiated. Gait is the process generated by the most commonly studied spinal CPG but until now no CPG has been known to be initiated from an external source.

In fact, additional research by Heimberg and Jackson on anesthesia4 suggests that the mechanism for a patient losing consciousness is not strictly chemical, but that the anesthetic effect is physical, acting on the lipid membrane tension reducing the ability to transmit signals. This is another bridge between conscious awareness, Chiropractic and the nervous system.

Future research will explore the hypothesis that the Network Wave, as a CPG, is an innate phenomenon that demonstrates the specific algorithm for nervous system self-correction and self-organization. Self-correction and self-organization point to how a low force Chiropractic technique promotes spinal self-adjustment, creates global pattern changes and regulates spinal behavior, posture and nervous system function to higher levels of sustainable efficiency.
Both the future and current research are leading towards a greater understanding of the principles of CNS self-organization and coherence demonstrated by the wave. Coherence is a property of a system that is healthy and adaptable. Systems out of coherence tend

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to breakdown, and in the case of biological systems, move towards pain and disease. Researchers Roberto Martin-del-Campo and Edmond Jonckheere suggest "The spinal wave is a coherent movement elicited by a Central Pattern Generator, opening the road for the potential of this coherence analysis to become part of a neurological suite."5 This is suggesting that coherence in the nervous system created by this specific chiropractic technique, should be considered as part of a foundational analysis of health in the nervous system.

The physiologic process engaged through chiropractic application mentioned in this paper adds to the most current research in neurology and physics. It demonstrates on a macro, spinal level what is occurring on a cellular level, an acoustic wave demonstrating novel properties for upgrading complexity in the human nervous system in addition to producing never before seen changes in health and wellbeing.

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