

Polyvagal Theory and Sound Healing

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The Polyvagal Theory and Sound Healing

The human nervous system consists of two major branches, the Central Nervous System and the Peripheral Nervous System. The major components of the CNS are the brain and spinal cord. The PNS consists of the nerves and ganglia outside the brain and spinal cord. The signals between periphery and brain are both afferent (toward the brain) and efferent (exiting the brain).

The Peripheral Nervous System connects the CNS to the organs, limbs and skin and provides the pathway for information between these components. It also contains the Autonomic Nervous System/ANS which regulates the involuntary body functions such as heart rate.

The ANS has been understood for many years to contain two branches, the Sympathetic (fight/flight) and the Parasympathetic (rest/digest). Within the last 30 years there have been clinical discoveries and theories proposed to recognize a third branch of the ANS which has been most notably named the Social Engagement System by Steven Porges. In Porges' early graduate and post graduate research he looked for ways to measure/monitor physiological states that would assist therapists in a clinical setting. The hope was to find consistent supportive evidence to his polyvagal theory which would open the doors to new understanding of conditioned reflex/reactions in the arena of emotions, attachment, communication and self regulation.

The purpose of this paper is to give a brief explanation of the Polyvagal Theory proposed by Steven Porges and its importance in the work of sound therapy.

Polyvagal Theory

“Three neural circuits form a phylogenically ordered response hierarchy that regulates behavioral and physiological adaptation to safe, dangerous and life-threatening environments”

-Stephen Porges, Polyvagal Theory (Norton2011)

As described in the opening paragraphs, the ANS has been known to operate as a 2 part antagonistic system, with our physiology following the cues from the environment to either shut down or carry on. In considering this on/off paradigm Porges noted that many human behaviors could not be explained/understood and therefore therapeutic actions were not widely successful. He looked at the ANS as it evolved from reptiles to mammals and began to see that a third system had developed. He named this newest system, the Social Engagement System. He describes the systems of the ANS and their responses as follows:

Parasympathetic (most ancient)

“A primitive passive feeding and reproduction system creating a metabolic baseline of operation to manage oxygen and nourishment via the blood.”

Sympathetic (newer)

“A more sophisticated set of responses enabling mobility for feeding, defense and reproduction via limbs and muscles.”

Social Engagement (most modern)

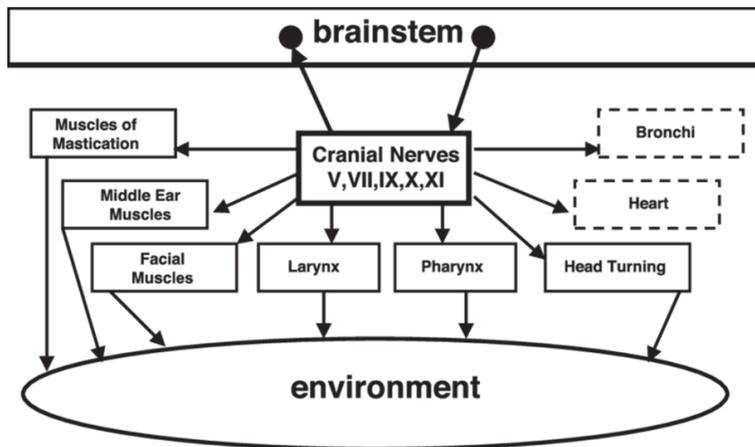
“A sophisticated set of responses supporting massive cortical development – enabling maternal bonding (extended protection of vulnerable immature cortex processors) and social cooperation (language and social structures) via facial functions.

In essence, (and extremely simplified) the primal vertebrate had the ability to take in nourishment, use what was needed and excrete what could not be used. As vertebrates evolved and limbs made them more mobile, a second system evolved to enable those primary tasks in a larger environment that had more variety and possible dangers (ie, moving from water to land). And most recently, mammals evolved with another system that would allow for preservation and community of the species.

Explanation of the Vagal System and Other Anatomical Changes

It's important to note that there are two branches of the vagus with the diaphragm being the dividing line. The subdiaphragmatic vagus deals with the organs and muscles below the diaphragm and is involved in breathing. The supradiaphragmatic deals with the upper organs and muscles that regulate laryngeal, pharyngeal, auditory and facial muscles activated during speaking, toning and singing as well as listening

The Parasympathetic, the earliest branch of the ANS and the most recent, the Social Engagement system, originate in the cranial nerves at the base of the skull. Specifically Cranial Nerves V, VII, IX, X and XI. Below is a chart that shows how these particular nerves correspond to various sensing and expressing organs and muscles. (image and description from The Polyvagal Theory, Stephen Porges)



“Social communication is determined by the cortical regulation of medullary nuclei via corticobulbar pathways. The social engagement system consists of a somatomotor component (special visceral efferent pathways that regulate the muscles of the head and face; solid blocks) and a visceromotor component (the myelinated vagus that regulates the heart and bronchii; dashed blocks) “

An evolutionary anatomical change worth noting occurred as vertebrates evolved from reptiles to mammals. The structure at the end of the mandible detached and over time developed into the modern middle ear. This allowed the mammal to temper the volume of low frequency noises (danger) and allow the differentiation of sounds to identify the higher frequency sounds of the voice. This physical separation of the jaw from the skull allowed changes to the brain including the development of the neocortex. As a result, the behaviors available to mammals due to the ability to hear differently increased from the primitive fight/flight or rest/digest options to include options created from communicating and cooperating with others.

The last term I consider important to understand in order to put this all together is neuroception. Porges uses the term neuroception “to describe how neural circuits distinguish whether situations or people are safe, dangerous, or life threatening. ... neuroception takes place in primitive parts of the brain, without our conscious awareness.” If safety is determined, prosocial behavior follows. If danger is detected, defensive behaviors are triggered. Even though we are not cognitively aware of the danger or safety of a situation, our neurobiology has already set in play the appropriate response; social engagement, fight/flight, or immobilization/death feigning.

Porges distilled his research to 4 principles to sum up the importance of the phylogenetic changes of heart regulation which allowed him the basis to test his theory that the neural mechanisms of survival have shifted from the fight/flight or death feigning to social engagement. I summarize them as follows:

- 1) There are evolutionary changes in regulation of the heart from endocrine communication to unmyelinated nerves and finally to myelinated nerves.
- 2) There is development of neural mechanisms of excitation as well as inhibition that allow us to regulate quickly.
- 3) There are evolutionary changes that allow communication and neural regulation of the heart via neural pathways that regulate the face and head, forming an integrated social engagement system.
- 4) With increased cortical development the cortex exhibits greater control over the brainstem. Through the neural pathways of the cranial nerves V, VII, IX, X and XI, it controls the muscles of the face and head.

John Hughlings Jackson (1835-1911) known as the father of English Neurology, published his Theory of Dissolution, which Porges’ research supports and he quotes.

“The higher nervous system arrangements inhibit (or control) the lower, and thus, when the higher are suddenly rendered functionless, the lower rise in activity.”

John Hughlings Jackson (1835-1911)

Porges states that there is a hierarchy of response which is described in the following two charts. (from The Triune Nervous System poster- Colorado School of Energy Studies) In essence, in an individual with a resilient and healthy ANS, when faced with a situation that up regulates the nervous system (novelty or a stressful situation), the neurophysiology will first attempt to regulate through the Social Engagement system, if that fails then it will go to the Sympathetic System and if that fails then it will draw on the tools of the Parasympathetic System.

Normal Functions of the ANS A high percentage of health conditions center on the Autonomic Nervous System, including immune system disorders, attention deficit conditions, psychosomatic issues, post-traumatic stress effects and others.

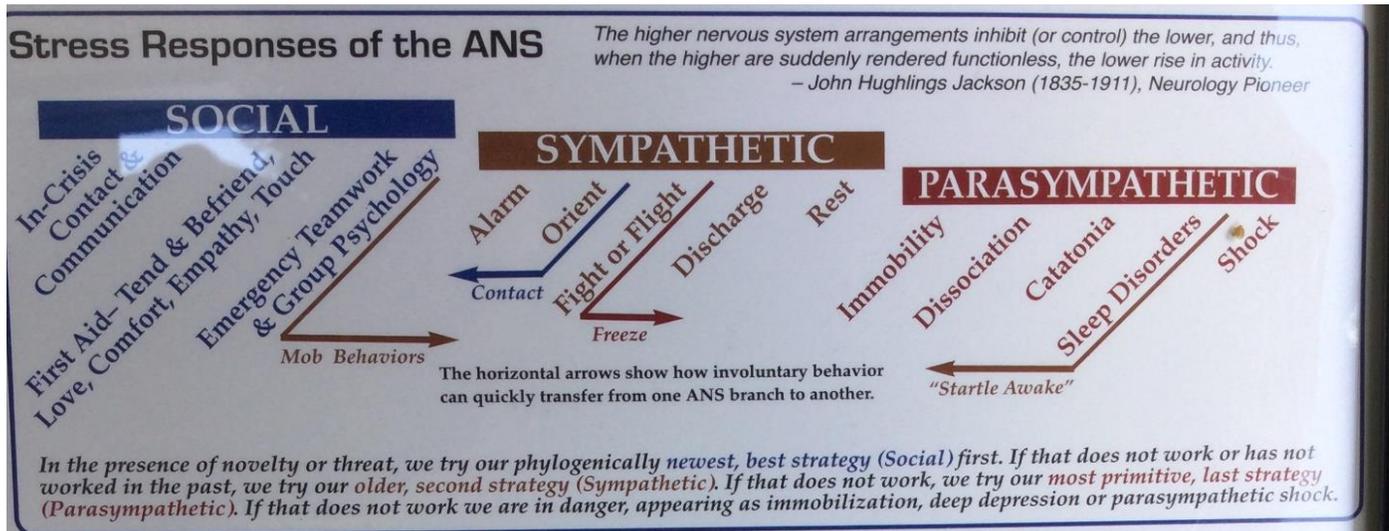
SOCIAL	SYMPATHETIC	PARASYMPATHETIC
“Love” Language Social Organization Sex- Afterglow Breath, Prosody, Vocalization Interaction & Reciprocal Play Contact & Communication	Mobilization for Daily Challenges Recreational & Vocational Excitement & Muscular Activity Sex- Climax Daytime Alertness & Metabolism	Rest & Rebuild Meditative States Sex- Arousal Sleep (4 stages) Baseline Metabolism (Heart, Breath, Digestion)

Normally, ANS stages flow and interchange rhythmically based on routine stimuli and biological sequences such as circadian rhythm, digestion and the sexual process. ANS fixation or loss of flow is a sign of PTSD.

Voluntary and involuntary functions overlap significantly- most of the actions listed here could be either- but they can be identified by close observation. Autonomic responses are immediate and universal across differences of age, gender, education and culture. The conscious mind cannot fully control face and body expressions; the ANS itself seems to be mainly incapable of inauthenticity or deception (Paul Ekman, 2009).

With the addition of the Social Engagement System the possibility of immobilization without fear as a normal and healthy response is available. The SES enables us to acquire the feeling of safety through contact and communication. This can be illustrated in the case of a mother nursing her child, or the face and voice of a reassuring stranger when one is immobilized due to injury ie, car accident.

In the case of an extremely stressful event, an individual with unresolved trauma or otherwise unregulated chronic stress, the responses will be as follows.



The development of a Social Engagement System and certain evolutionary anatomical changes allow mammals to regulate their nervous system through listening as well as expression. These expressions can also be an indication of physical and psychological well-being. Here are some examples of how humans use/demonstrate the Social Engagement System in order to ensure their feeling of safety and what happens when we are feeling threatened.

- A baby cries or makes faces to communicate to those around him/her to communicate specific needs for nourishment as well as safety.
- A parent coos or speaks with prosody to the infant to calm; or as with an older infant, speaks in a way that conveys to the child that it is safe to explore
- When in a dark alley or dangerous situation our ears narrow the bandwidth of frequency that is audible, focusing on what might be dangerous or threatening (low tones), heightening our awareness toward safety.
- In a dangerous situation our ability to use the full range of our vocal tone and ability to breathe is diminished.
- In a social situation in which we feel safe the muscles of the ear allow us to focus on the human voice which enhances the experience of nervous system regulation from the listening as well as expressing activities.
- When in a safe situation and feeling healthy, we move the muscles in our face to convey happiness, joy, comfort and reassurance. (smiles, eyebrows lifted)
- In cases of ill health or dis-ease (mental or physical) we often have a flat facial affect as well as flat vocalizations.
- Taking long slow exhales have a calming effect whether it is due to focused breathing or playing a wind instrument.

Porges' research and that of his colleagues have further demonstrated that the more we can regulate our nervous system the more resilient and healthy our systems are. Building this resilience is a normal response to healthy engagement of all three nervous systems.

Polyvagal Theory in Sound Therapy

As Porges took his theory out into the therapeutic world scientists, therapists and engineers created therapies and technologies to assist people to create more resilience in their ANS. Many of the initial offerings were focused on developmental disabilities and autism. In the world of trauma therapy there have been many successful treatments especially noticeable in the growing field of Somatic Psychotherapy.

One such technology and protocol is called the Safe & Sound Protocol (SSP). This is an adjunct therapy which is geared toward helping the patient process external input and remain in or create homeostasis more effectively. It is accomplished through listening to prerecorded music through noise cancelling headphones for 1 hour a day for 5 days. Best results are obtained after 4 to 6 weeks of this protocol.

Other technologies and protocols involve speaking, movement, meditation and breathing exercises. All of these are used in conjunction with professional guidance and a therapeutic plan. The desired result is always an improvement in vagal tone, vagal efficiency and autonomic self regulation.

As practitioners of Sound Healing, it is important to know how these various states of the ANS manifest, in fact it's a good thing to know for life in general. Below is a table put together by Babette Rothschild and copied from poster from Colorado School of Energy Studies.

Recognizing ANS Phenomena		
<i>SNS & PNS Reference: Babette Rothschild, <u>The Body Remembers</u> (Norton, 2000), p 48.</i>		
SOCIAL	SYMPATHETIC	PARASYMPATHETIC
Eye and voice contact	Faster respiration	Slower, deeper respiration
Capacity for empathy & social interaction; Spontaneous feelings in social contexts	Quicker heart rate (pulse)	Slower heart rate (pulse)
Involuntary motor actions of face, mouth, throat	Pupil dilation	Decreased blood pressure
Facial warmth, tingling	Pale skin color	Pupil constriction
Interpersonal responses & awareness; involuntary physical responses to contact with, or memories of, significant people and events.	Increased sweating	Flat affect
	Cold skin (possibly clammy)	Dry skin (usually warm) to touch
	Decreased digestion & peristalsis	Increased digestion & peristalsis
	Mobilization behaviors including anxiety, anger and fear.	Immobilization behaviors including indecisiveness, seclusion, depression.

Recognizing ANS states has great value in therapy and child care. By accurately identifying the state, the practitioner or parent can apply an appropriate strategy to re-establish ANS equilibrium, especially by supporting the Social Nervous System.

Very often human beings just need to hear a sound or song to enter into a certain state of being. Or at times we only need to read a few words to elevate or depress our mood. If our ANS is healthy and resilient, our mood, our state of being and our emotions can all be up regulated or down regulated according to what is most healthy for us. Being aware of these states and state changes in others helps us to communicate and support the other person.

We share ideas through words and music. We communicate to others what is going on inside of us through music and word. The following link is a brief youtube (6:32) with Stephen Porges giving two examples of popular culture conveying the ideas and experiences that the polyvagal theory expresses.

<https://youtu.be/CXezqZj-Jr4>

The first example is melodic and conveyed with a pure voice and very soothing. The second is less melodic and in a key and rhythm that feels very disturbing.

It's very clear that sound is a way that we communicate our states of being as well as effect a change in our or another's state of being. As noted in Porges' research we can identify the success or breakdown of ANS regulation, and we realize that there are interventions that can be made. As sound therapists we have the opportunity to assist others and ourselves to change states and facilitate nervous system regulation using sound and sound instruments. The effect could be creating a feeling of well-being, or invoking emotions that tend to stir things up. Both experiences are equally valid and valuable. It's important to know the context and timing of our offering and our intention as well as those with whom we are working. Some questions to consider before beginning a sound healing session.

- Are we working one on one or in a group? How are they feeling? What is their state of being?
- Is our intention to release, soothe, activate, calm, assist a healing process ...?

Through understanding the Polyvagal Theory and being able to recognize the various states of nervous system regulation within our clients/patients we can choose appropriate instruments, tones and rhythms. Recognizing our own state can help us make the same decisions to bring regulation to our own nervous system. As we work with ourselves and others in various degrees of arousal or shutdown to bring our systems into regulation, we create a resiliency in our system and provide that opportunity for others. This resiliency increases the health of the neurophysiology. It can and will support future interactions and situations.

Very often we know intuitively that a sound bath or sound session has created a change within our client/patient. My hope is that this brief explanation of the Polyvagal Theory provides a starting point or more clarification as to how the inner workings of the ANS are outwardly expressed. With this knowledge we are better able to recognize various states of neurophysiological regulation. We can assess the way a person looks, their affect, the way they talk and their facial movements. It's important to do this for ourselves as well. I hope that this paper has paired the neuroceptive knowing with the cognitive knowing in you.

References (for this particular writing)

The Polyvagal Theory, Stephen Porges

Triune Nervous System, John Chitty, poster-Colorado School of Energy Studies

Stephenporges.com

Sound Healing Certificate Program, Globe Institute

Definitions- nih.gov and ncbi.nih.gov

Youtube Hiding in Plain Sight, Stephen Porges

In the past 6 years for general knowledge of the Social Engagement System

The Pocket Polyvagal, Stephen Porges, audiobook

In an Unspoken Voice, Peter Levine, audiobook

Countless youtube videos by

Peter Levine, Bessel Van der Kolk, Irene Lyons, Deb Dana, Gabor Mate and many others who are using the polyvagal theory in treating stress, trauma and mental illness.