Clinical Applications of the Polyvagal Theory:
The Transformative Power of Feeling Safe

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Outline

1. Connectedness: A Biological Imperative (5-90)
2. Polyvagal Theory: The Adaptive Function of Evolutionary Changes in the Autonomic Nervous System (91-163)
3. The Social Engagement System in Promoting Connectedness, Trust, Play, and Intimacy (164-277)
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Session 1:
The Neurobiology of Connectedness

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Polyvagal Theory:
A Science of Connection, Trust, and Safety

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Connectedness
A Biological Imperative

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A Biological Imperative

What living organisms need to perpetuate their existence (*survival of the fittest).*

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Connectedness: A Biological Imperative

- 'the fittest may also be the gentlest, because survival often requires mutual help and cooperation'

Dobzhansky, T. (1962). ***Mankind evolving. New Haven, CT:*** Yale University Press.

Connectedness from an Evolution Perspective

- Nothing in Biology Makes Sense Except in the Light of Evolution
  - Behavior makes sense only in the light of evolution.

Dobzhansky, T. (1973). Nothing in Biology Makes Sense Except in the Light of Evolution. American Biology Teacher, 35 (3): 125–129.

Connectedness: A Biological Imperative

- The body's need to co-regulate biobehavioral state through engagement with others.
- Connectedness is the ability to mutually (synchronously, and reciprocally) regulate physiological and behavioral state.
- Connectedness provides the neurobiological mechanism to link social behavior and both mental and physical health.

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Building Blocks of Healthy Relationships

Social Engagement + Social Bonding

Safety → Proximity → Contact → Bonds

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Psychiatric/Behavioral/Educational Problems

Difficulties

- Feeling "safe" with others
- Being in physical proximity with others
- Being touched or touching others
- Establishing "trusting" social relationships

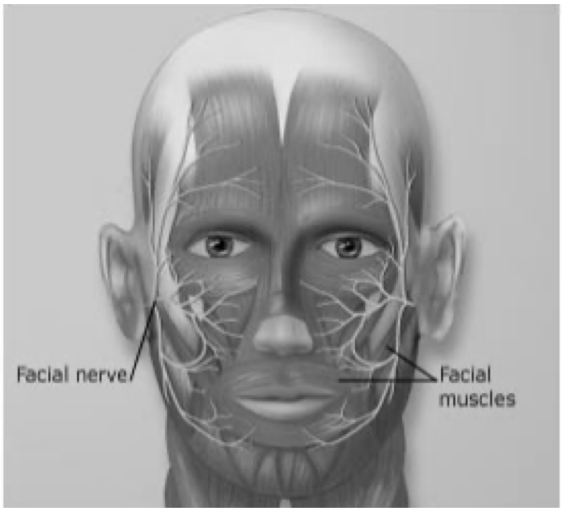
Safety → Proximity → Contact → Bonds

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Co-Regulation: Phase I
Social Engagement Behaviors

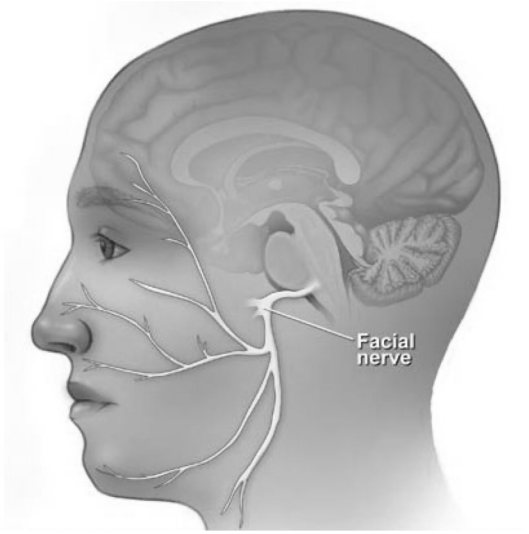
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Facial Nerve (cn VII)
Neural Pathways Regulating Facial Muscles

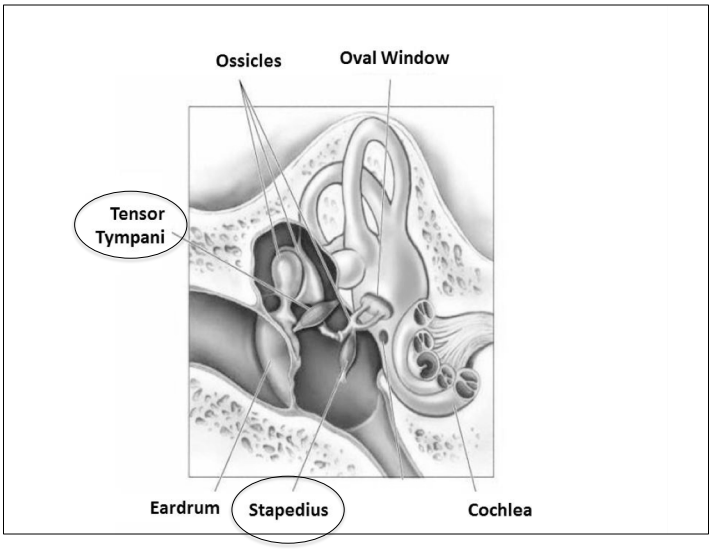


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Listening and Facial Expression



Structures of the Ear



Co-Regulation: Phase I
Social Engagement Behaviors

- Face-to-face behaviors (neural exercises)
  - Facial expressions
  - Gestures
  - Prosodic vocalizations
  - Listening
  - Reciprocity
- Applications in therapy?
- Applications in education?
- Applications in the workplace?

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Co-Regulation: Phase II
Physical Contact While Immobilizing Without Fear

- Maintains a physiological state that supports health, growth, and restoration.
- Optimizes the ability to rest, relax, sleep, digest, and perform bodily processes.
- Enables feelings of trust, safety, and love.
- Does not require face-to-face interactions.
- A challenge for mammals! (requires safety)
- Compromised following trauma

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Mammal-Reptile Interactions: Immobilization without fear

- Reciprocity is missing!
- Face-to-face interactions are missing!

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"Safety" Optimizes the Human Experience

- Safety is based on social connectedness providing a "neural" expectancy, which promotes both mental and physical health.
- True experiences of 'feeling' safe keep the autonomic nervous system out of states of defense
- Being safe is not the equivalent of removing threat

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Feature Detectors
Safety, Danger, and Life Threat

- The importance of face-to-face interactions, vocalizations, body posture, and gestures
  - Cues of safety or danger
  - Efficient strategy to co-regulate physiological state
- Neuroception (more later) is the neural process of evaluating risk without awareness

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Co-Regulation and Social Communication:
Neural Experiences

- Social behavior is a “neural exercise” that promotes neurophysiological states that support mental and physical health.
  - What factors enhance this link?
  - What factors distort this link?

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Disrupted Co-Regulation:
Lack of Social Engagement Behaviors

- Disconnect in face to face interactions disrupt opportunities for co-regulation and potentially trigger biobehavioral states of defense
- Acute Dis-Connectedness: Disrupts opportunities to co-regulation

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Trauma Disrupts Opportunities to Co-Regulate

- Trauma disrupts the Social Engagement System - Phase I of co-regulation.
- Polyvagal Theory is a hierarchical model
  - If Phase I of co-regulation is not available, then Phase II is not available
  - Trauma 'optimizes' biobehavioral states of defense

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Impact of Society and Culture

- Does our culture dampen access to our Social Engagement System?
- Do we have sufficient opportunities to exercise our social engagement system?
- What is the impact of email, texting, and other “virtual” social interactions on our “social engagement system?”

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Impact of Society and Culture

John, who is 18, likes to sit in front of several screens simultaneously: a work project, a YouTube clip, a video game. To shut it all down for a date or even a one-night stand seems like a waste.

“For an average date, you’re going to spend at least two hours, and in that two hours I won’t be doing something I enjoy,” he said.“

Helen Fisher

Trauma and Abuse Disrupt Co-regulation and Connectedness

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Trauma:
Chronic Disruption of Connectedness

- Shifts ANS state
- Distorts social awareness
- Displaces social engagement behaviors with defensive reactions
  - fight/flight
  - immobilization (dissociation)
- Interferes with healthful reciprocal “co-regulation” of state
- Disrupts neurophysiological regulation

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Connectedness
A Biological Imperative

- Social behaviors are "neural exercises" that promote neurophysiological states supporting mental and physical health (i.e., exercising the 'vagal brake' and the integrated Social Engagement System).
- Trauma and abuse lower the threshold to trigger the defensive behaviors (aggressor, victim) that disrupt connectedness and the ability to co-regulate.

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Session 2:
Polyvagal Theory:
The Adaptive Function of Evolutionary Changes in the Autonomic Nervous System

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Professor Psychiatry, University of North Carolina

Polyvagal Theory

- Provides a theoretical basis for a neuroscience of safety and responses to threat.
  - Social interactions recruit neural circuits that support health, growth and restoration
  - Cues of danger and life threat recruit neural circuits that disrupt bodily processes.

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Origins of the Polyvagal Theory

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The Vagal Paradox
Discovering a Lost Defense System

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The Vagal Paradox

- Bradycardia are mediated by the vagus and a risk index (potentially lethal)
- Heart rate variability is primarily mediated by the vagus and a protective factor

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Vagal Paradox

- Not all vagal pathways support social communication, down regulate stress, and enhance resilience.
- There are vagal pathways that can be recruited for defense and are potentially lethal.

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Answers in the NICU

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Is There a Neurophysiological Explanation?

Are “stress” models (e.g., Walter Cannon and Hans Seyle) useful in explaining responses to abuse and trauma?

Is there a defense system that is not part of fight-flight mechanisms?

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Ivan P. Pavlov (1927)
Conditioned Reflexes: An Investigation of the Physiology of the Cerebral Cortex

Trauma and Loss of Function
Safe Familiar Features Rehabilitate

- A large flood in Petrograd (9/23/1924) disrupted Pavlov's research and many of his "trained" dogs almost drowned.
- After experiencing the flood some dogs performed fine, while other dogs lost all their conditioned reflexes and this deficit persisted for several weeks.
- When the experimenter remained with the dog, all conditioned reflexes were immediately restored.
- When the experimenter left the dog alone, all deficits immediately returned.

Curt P. Richter (1957)
Phenomenon of Sudden Death in Animals and Man.
Psychosomatic Medicine, 19, 191-198

Walter B. Cannon (1942)
"Voodoo" Death, *American Anthropologist,* 44:169-176.
Insights into PTSD?

His cheeks blanch, and his eyes become glassy, and the expression of his face becomes horribly distorted. He attempts to shriek but usually the sound chokes in his throat, and all that one might see is froth at his mouth. His body begins to tremble and his muscles twitch involuntarily. He sways backward and falls to the ground, and after a short time he appears to be in a swoon. He finally composes himself, goes to his hut and there frets to death.

R. Herbert Basedow (1925**),** *The Australian Aboriginal*

Voodoo Death
Insights into PTSD

- Voodoo Death was defined as death due not disease or injury, but do to emotional stress.
- Cannon assumed that even this "immobilized" response would be associated with increased sympathetic nervous system excitation.
- "If in the future, however, any observer has opportunity to see an instance of voodoo death, it is to be hoped that he will conduct the simpler tests before the victim's last gasp."

Cannon, W.B. (1942) "Voodoo" death. Amer. Anthropol., 44: 169.

Hopelessness
Vagal or Sympathetic Mechanisms?

"...we believe that human victims, like our rats, may well die a parasympathetic rather than a sympathico-adrenal death, as Cannon postulated"

C.P. Richter (1957)

Immobilization with Fear

- How does this defensive system differ from "fight-flight"?
- What triggers this defense system?
- What are the dangers?
- How is it possible to recover?

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Immobilization with Fear

- A missing concept in psychology and psychiatry
- Not all stressors result in “fight/flight”
- Not all vagal (parasympathetic) influences are restorative

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Why Was This Missed?

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The Autonomic Nervous System Taught from a Paired Antagonism Perspective

- Gaskell (1916) The Involuntary Nervous System
- Langley (1921) The Autonomic Nervous System
- Meyer & Gottlieb (1926) Experimental Pharmacology as a basis for therapeutics.

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Polyvagal Theory Presents an Integrative Perspective of the Autonomic Nervous System

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Polyvagal Theory Presents an Integrative Perspective of the Autonomic Nervous System

- Emphasis on the features of a "system"
  - Bi-directional communication between brainstem and visceral organs
  - Involves
    - Efferents
    - Afferents
    - Central regulation
  - Source nuclei in the brainstem
- Relation with other cranial nerves
- Bi-directional Influences between visceral organs and the brain (i.e., embodiment)

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Walter Hess Nobel Prize (1949) The Central Control of the Activity of Internal Organs. An Integrative Perspective

"A recognized fact which goes back to the earliest times is that every living organism is not the sum of a multitude of unitary processes, but is, by virtue of interrelationships and of higher and lower levels of control, an unbroken unity."

http://nobelprize.org/nobel_prizes/medicine/laureates/1949/hess-lecture.html

Polyvagal Theory

- Provides a theoretical basis for a neuroscience of safety and explains how safety promotes spontaneous social engagement behaviors and health, growth, and restoration.
- Explains how autonomic state is optimized during safe social interactions and disrupted during states of defense.
- Explains how social interactions recruit neural circuits that support health, growth and restoration, while cues of danger and life threat recruit neural circuits that disrupt bodily processes.

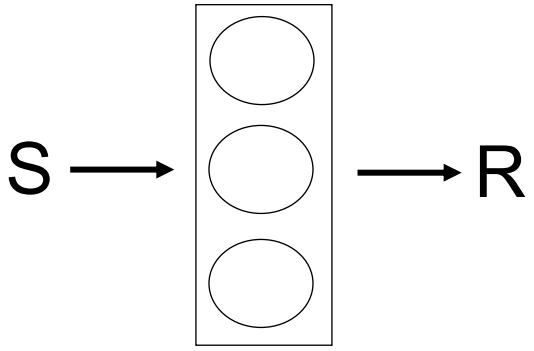
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Physiological State
An Intervening Variable

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Physiological State
An Intervening Variable Capable of Biasing Responses

- Behaviors



Physiological State

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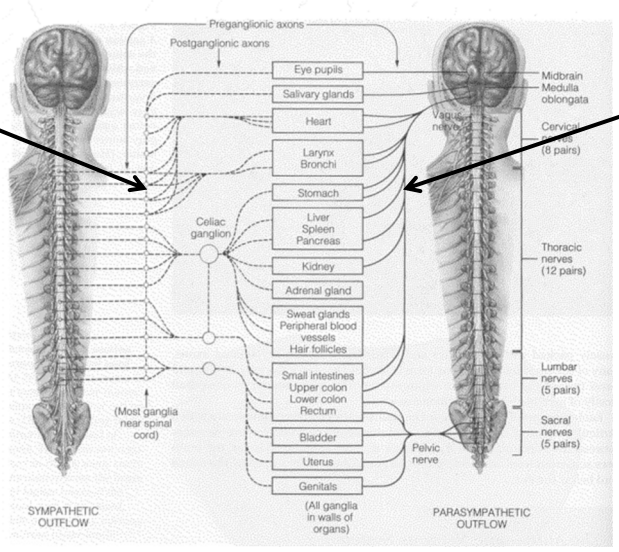
Polyvagal Theory

- Evolution provides an organizing principle to understand neural regulation of the human autonomic nervous system as an enabler of social behavior.
- Three neural circuits form a phylogenetically-ordered response hierarchy that regulate behavioral and physiological adaptation to safe, dangerous, and life threatening environments.
- "Neuroception" of danger or safety or life threat trigger these adaptive neural circuits.

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The Autonomic Nervous System:
A Paired Antagonism Perspective

Sympathetic Nervous System

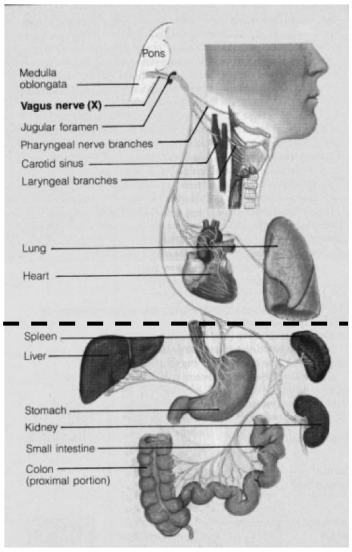


Vagus (Parasympathetic Nervous System)

Poly-Vagi

Supra-diaphragmatic vagus

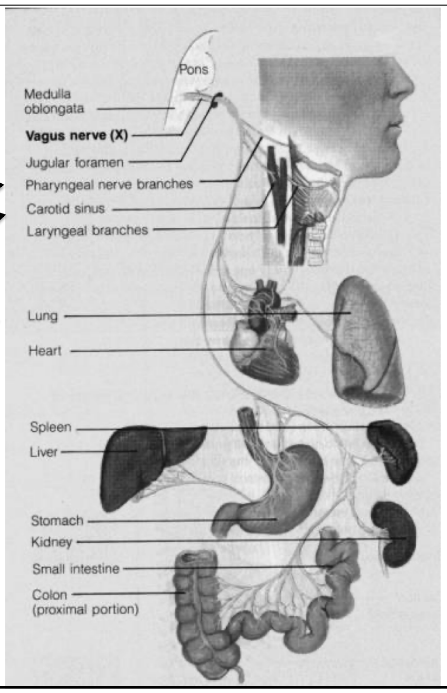
Sub-diaphragmatic vagus



Vocalizations

Posture

Breathing

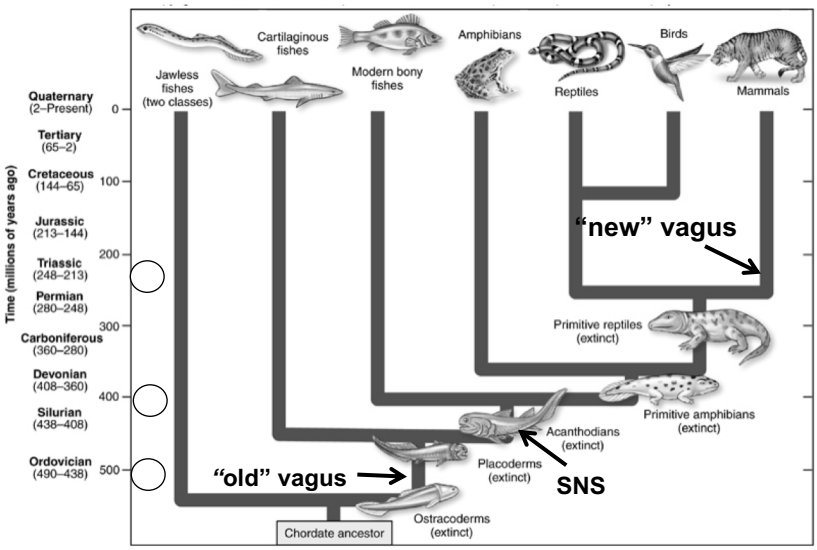


Immobilization with Fear

- Immobilization as a defense strategy is a missing concept in psychology and psychiatry, although forced immobilization (restraint) is a frequent feature of trauma and chronic abuse
- Not all stressors result in "fight/flight"
- Not all vagal (parasympathetic) influences are restorative

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Evolution as an Organizing Principle



Three Phylogenetic Stages of the ANS

Stage 1: Primitive unmyelinated vagus (DVC)

- Immobilization behaviors (i.e., fainting, shutdown, dissociation)

Stage 2: Sympathetic Nervous System (SNS)

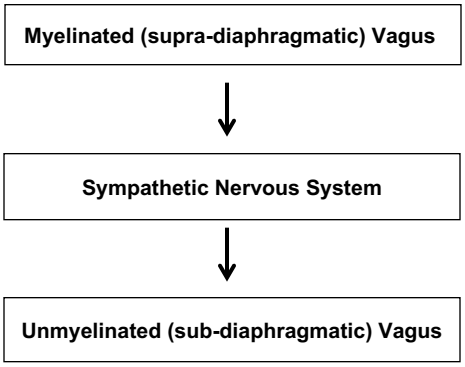
- "Fight-flight" behaviors

Stage 3: Myelinated mammalian vagus (VVC)

- Social communication (supports homeostasis)
- Enables social interactions to regulate physiology and promote health growth and restoration (balance between unmyelinated vagus and SNS)

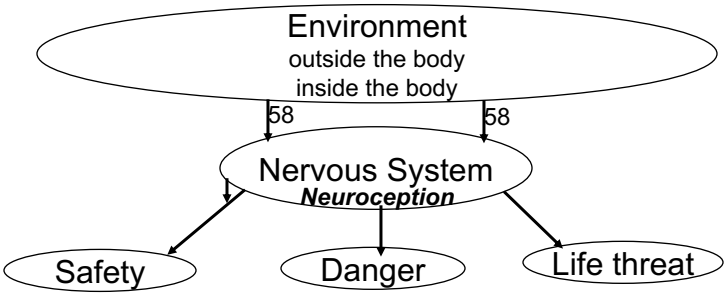
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Hierarchical Model of Autonomic State
Dissolution (Evolution in Reverse)



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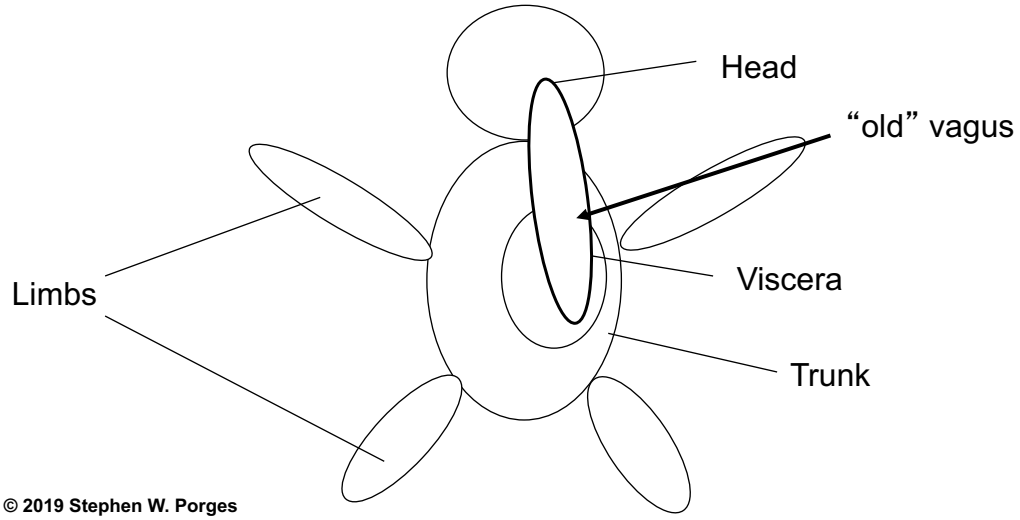
The Quest for Safety:
Emergent Properties of Physiological State



Spontaneously engages others eye contact, facial expression, prosody supports visceral homeostasis	Defensive strategies fight/flight behaviors (mobilization)	Defensive strategies death feigning/shutdown (immobilization)

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Phylogenetic Organization of the ANS:
The Polyvagal Theory



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Immobilization with Fear

… I read about the body immobilizing instead of fighting or fleeing. I am now 69 and when I was 18 I was nearly strangled and then sexually assaulted. Years later I was speaking with my daughter about this incident and she was disbelieving that I did what I did and that I froze. I felt so ashamed and judged. After reading your theory I cannot tell you how excited and vindicated I feel.. I am crying right now.

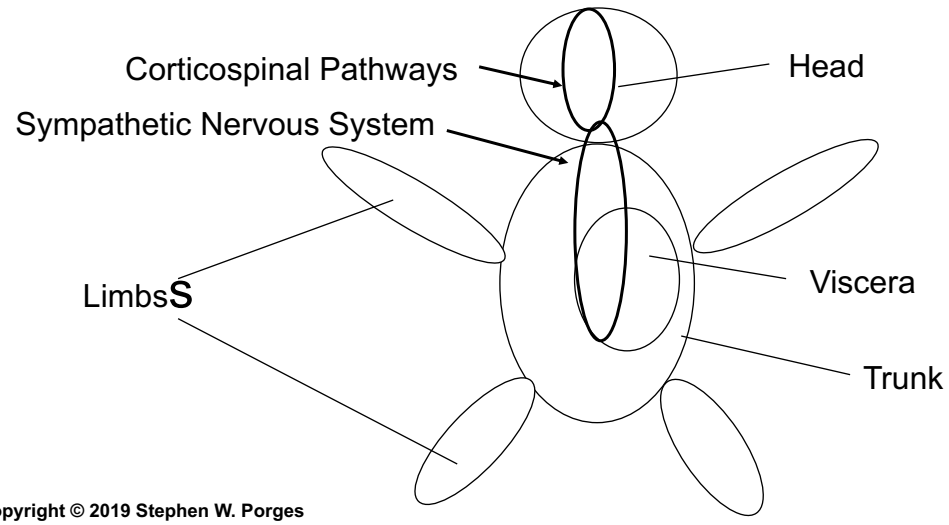
personal communication

Immobilization with Fear

- Immobilization as a defense strategy is a missing concept in psychology and psychiatry, although forced immobilization (restraint) is a frequent feature of trauma and chronic abuse
- Not all stressors result in "fight/flight"
- Not all vagal (parasympathetic) influences are restorative

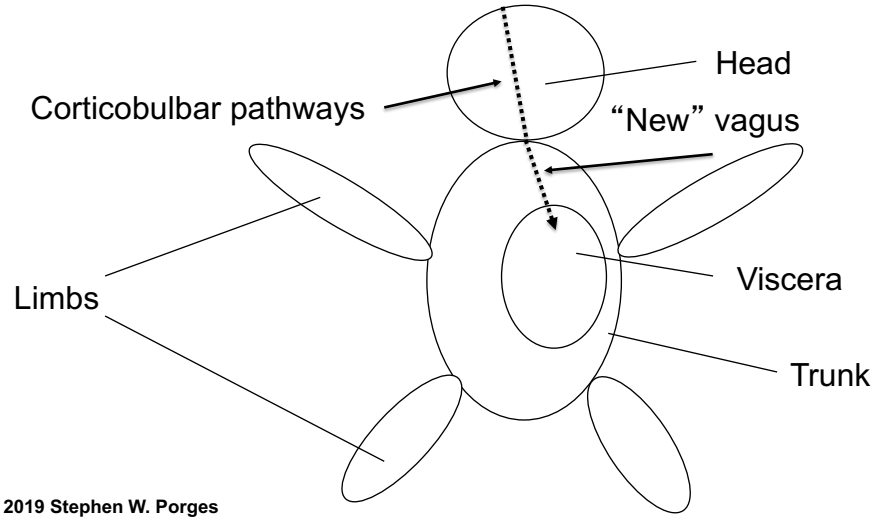
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Phylogenetic Organization of the ANS:
The Polyvagal Theory



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Phylogenetic Organization of the ANS:
The Polyvagal Theory



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The Face-Heart Connection:

- At birth mammals have bidirectional neural communication between the face and the heart (suck-swallow-breathe-vocalize), which forms the core of a Social Engagement System.
- Metabolic demands, perceived danger, life threat, and illness retract the Social Engagement System resulting in a face that is not "social" and a physiological state (removal of the vagal brake on the heart) that promotes defensive behaviors.
- The Social Engagement System functionally choreographs the SNS and DVC to support health, growth and restoration (i.e., homeostatic functions)
- The face reflects Polyvagal state.
- Polyvagal-informed therapies work by 'exercising' the bidirectional brain-body communication system involving the vagus (exercising the vagal brake) and contributing to enhanced regulation of bodily organs and the muscles of the face and head (e.g., facial expression, vocalizations).

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Health Consequence of ANS Disruption

- The ANS supports health, growth, and restoration ONLY when not recruited for defense.

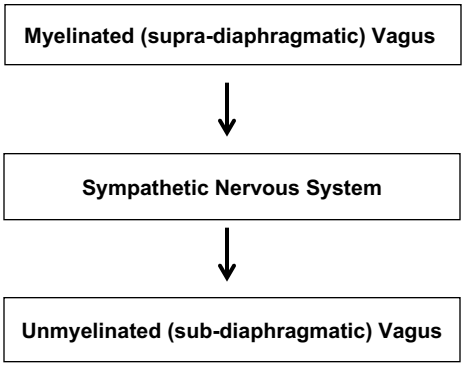
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Predictable Health Consequences of Disrupting ANS Function

- The ANS supports health, growth, and restoration ONLY when not recruited for defense.
- Loss of Social Engagement System including the 'protective' ventral vagal system results in a neurophysiological state that supports defensive behaviors and when chronic promotes mental and physical disorders.
- Medically Unexplained Symptom (MUS) including IBS and other ANS problems are frequent co-morbidities of trauma and chronic stress.

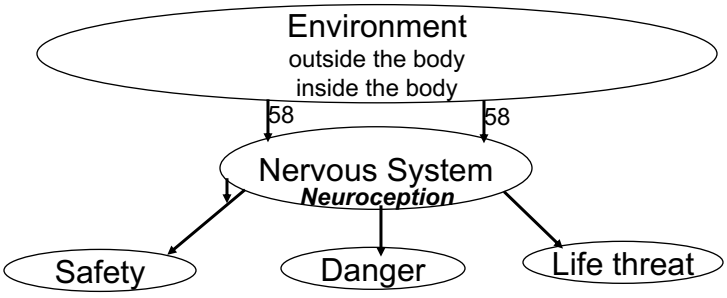
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Hierarchical Model of Autonomic State
Dissolution (Evolution in Reverse)



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The Quest for Safety:
Emergent Properties of Physiological State



Spontaneously engages others eye contact, facial expression, prosody supports visceral homeostasis	Defensive strategies fight/flight behaviors (mobilization)	Defensive strategies death feigning/shutdown (immobilization)

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Trauma Triggers Dissolution:
Evolution in Reverse

Structure	Function	VVC	SNS	DVC
Head	Communication	+		
Limbs	Mobilization		+	
Viscera	Immobilization			+

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Dissolution

- "The higher nervous arrangements inhibit (or control) the lower, and thus, when the higher are suddenly rendered functionless, the lower rise in activity" (Jackson, 1884)
- The ANS reacts to challenges in a phylogenetically ordered response hierarchy with newest components of the ANS responding first (Polyvagal Theory).
  - Removal of VVC Tone
  - Increase in Sympathetic Tone
  - Surge in DVC Tone

Jackson JH. The Croonian lectures on evolution and dissolution of the nervous system. BMJ. 1884 Apr 12;1(1215):703-707.

Dissolution: Polyvagal Theory

- The ANS reacts to challenges in a phylogenetically ordered response hierarchy with newest components of the ANS responding first.

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Social Engagement System

Observable Deficits in Several Psychopathologies

- Lack of prosody
- Poor eye contact and difficulties in social communication
- Blunted facial expressivity
- Difficulties in behavioral state regulation (hypervigilant, anxious, distractible, impulsive, tantrums, hypoarousal)
- Compromised vagal regulation (e.g., state regulation, digestion)
- Difficulties in listening, following verbal commands, speech-language delays
- Sound sensitivities
- Oral motor defensiveness (e.g., ingestive behaviors)

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Polyvagal Theory: Basic Principles

1. The 'neural' regulation of the autonomic nervous system (ANS) changed during evolution
2. The ANS functions in a hierarchical manner paralleling evolution
3. In response to challenges, the ANS shifts 'state' consistent with evolution in reverse or dissolution
4. Mammals have two defense systems
   - Fight/flight (sympathetic)
   - Immobilization/shutdown/dissociative (dorsal vagal

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Polyvagal Theory: Basic Principles

5. Neuroception – detection of risk/safety without awareness and triggers adaptive autonomic state
6. The Social Engagement System links regulation of the muscles of the face and head with vagal regulation of the heart
7. The Vagal Brake regulates physiological state(e.g., heart rate) through the (ventral) supra-diaphragmatic branch of the vagus that primarily influences organs located above the diaphragm.

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Insights from Polyvagal Theory:
Seeds for Polyvagal-Informed Therapies

- Evolution
  - During different stages of vertebrate evolution the structure and function of the ANS changed
  - Newer circuits inhibit older circuits
- Dissolution (Evolution in reverse)
  - Disease, damage, and adaptive reactions to survival demands sequential recruit more ancient circuits
- Autonomic regulation is the core process underlying behavioral/emotional regulation
- Autonomic state provides an intervening variable in how we respond to the world
- Autonomic state provides a window and target for intervention

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Insights from Polyvagal Theory
Embedded Optimism

- A world without state regulation disorders!
  - Emotional state regulation
  - Behavioral state regulation
  - Physiological state regulation
  - Autonomic state regulation (role of the vagal ‘brake’)

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Session 3:
Social Engagement System as a Portal of Co-regulation and Therapy: Harnessing a Neuroception of Safety in Clinical Treatment

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Founding Director, Traumatic Stress Research Consortium
Kinsey Institute, Indiana University
Professor Psychiatry, University of North Carolina

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- Metabolic demands, perceived danger, life threat, and illness retract the Social Engagement System resulting in a face that is not “social” and a physiological state (removal of the vagal brake on the heart) that promotes defensive behaviors.
- The face reflects Polyvagal state.
- Music works through the ‘face-heart’ connection.

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Social Engagement System

Observable Deficits in Several Psychopathologies

- Lack of prosody
- Poor eye contact and difficulties in social communication
- Blunted facial expressivity
- Difficulties in behavioral state regulation (hypervigilant, anxious, distractible, impulsive, tantrums, hypoarousal)
- Compromised vagal regulation (e.g., state regulation, digestion)
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- Oral motor defensiveness (e.g., ingestive behaviors)

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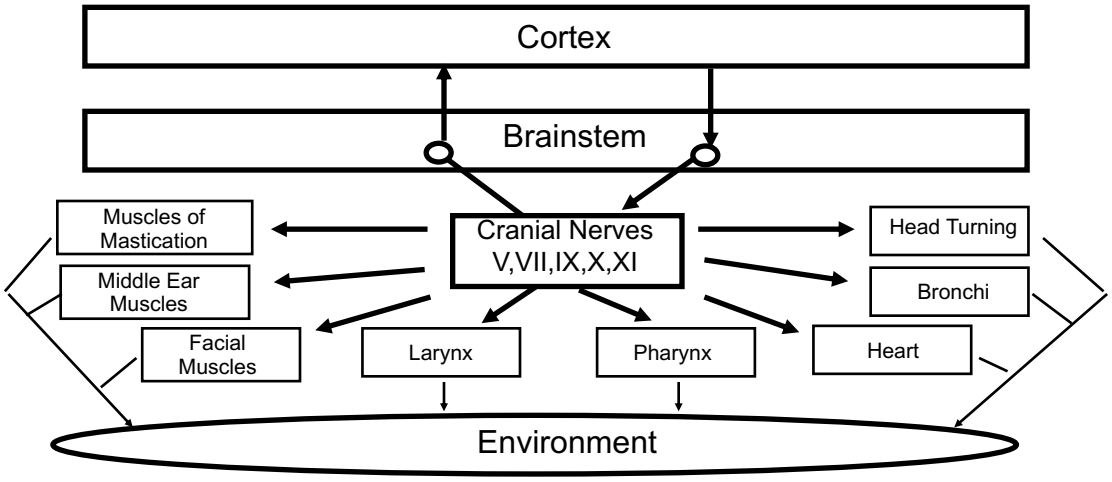
Deconstructing the "Mammalian" Social Engagement System

An Initial Focus on Efferent Pathways

- Visceromotor component
  - Supradiaphragmatic (myelinated) vagus originating in the nucleus ambiguus
- Somatomotor Component
  - Special visceral efferent pathways originating in source nuclei of cranial nerves V, VII, IX, X, & XI (branchiomotor, evolving from the ancient gill arches)

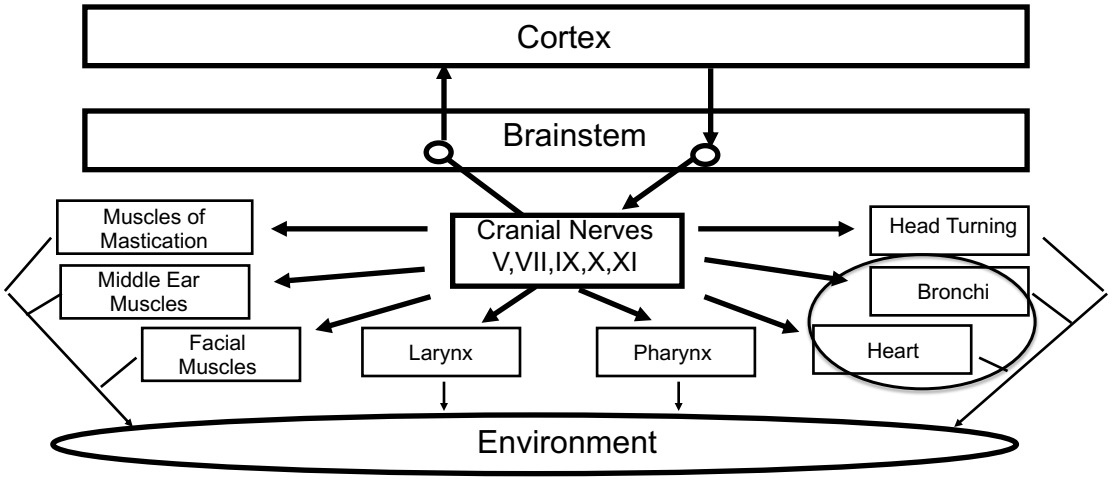
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Deconstructing the Social Engagement System



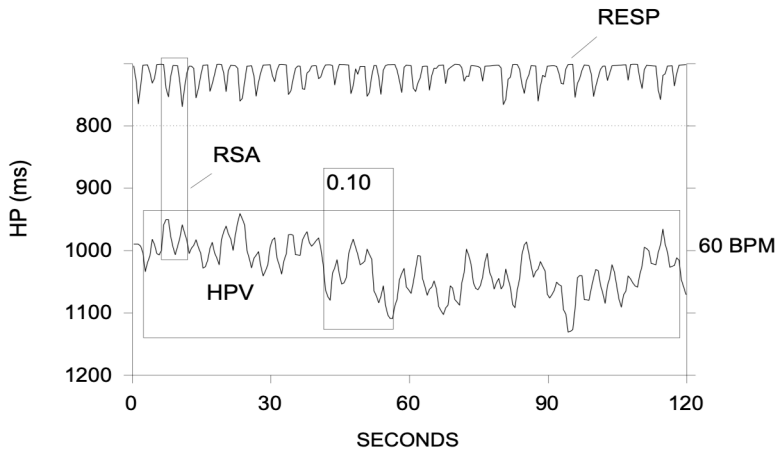
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Deconstructing the Social Engagement System



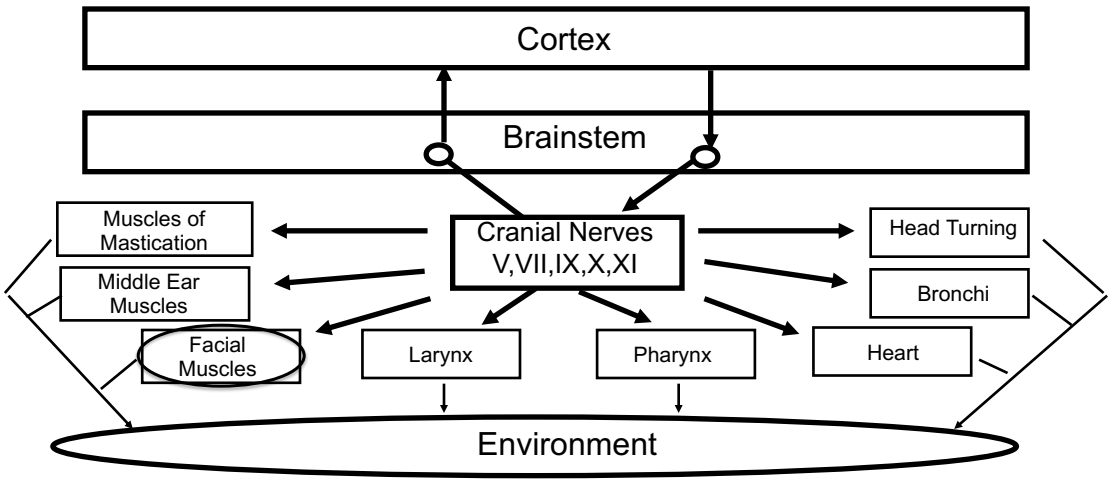
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Visceromotor
Vagal Influences Via Respiratory-Heart Rate Rhythms



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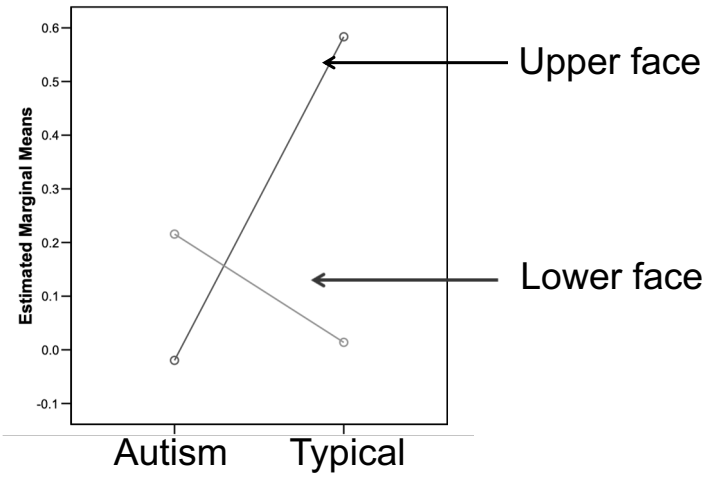
Deconstructing the Social Engagement System



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Facial Muscle Tone (EMG)

Autism



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Detached Middle Ear Bones

A Defining Feature of Mammals

- Detached middle ear bones are a defining feature of mammals.
- Living mammal species can be identified by the presence in females of mammary glands. Since mammary glands and other soft-tissue features are not visible in fossils, detached middle ear bones are used.
- Without “detached” middle ear bones, low amplitude sounds in higher frequencies would not be heard. Thus, enabling mammals to communicate in a frequency band that is difficult to hear for reptiles.

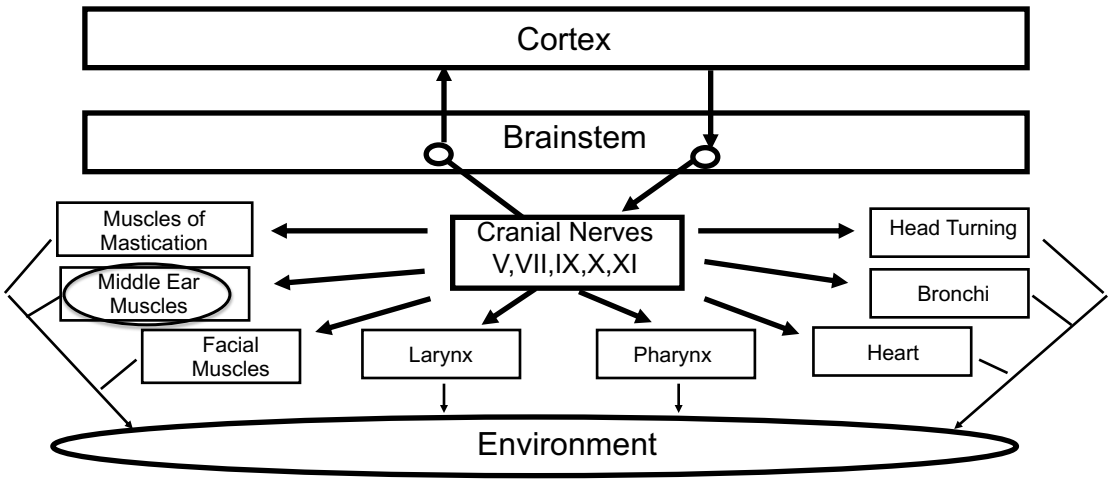
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The Role of the Middle Ear
Extracting Social Meaning from Vocalizations

- Evolution and middle ear bones
- Transfer function of the middle ear
- Frequency band of perceptual advantage

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Deconstructing the Social Engagement System



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Listening:
An Integrative Exercise of the Social Engagement System



Middle Ear Muscle Dysfunction

- Without functioning middle ear muscles, we are hypersensitive to the low frequencies sounds that trigger anticipation or presence of predator!

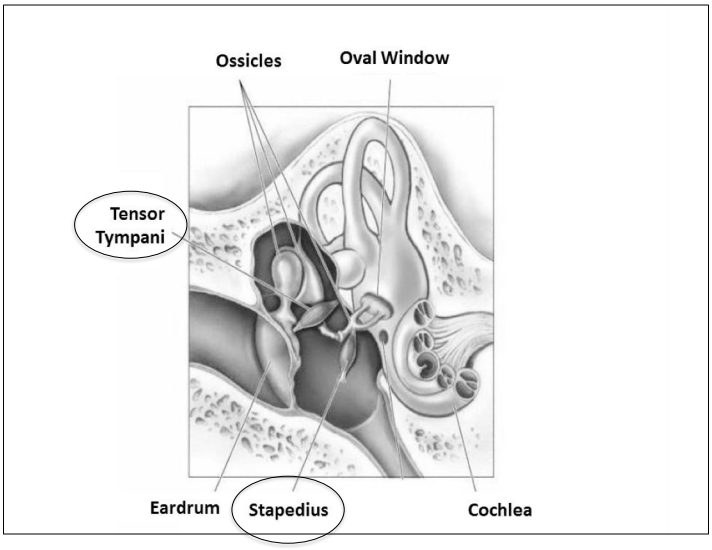
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Auditory Hypersensitivities
A Common Clinical Symptom?

- Without functioning middle ear muscles, we are hypersensitive to the low frequencies (background) sounds that trigger anticipation or presence of predator!
- Difficulties extracting human voice.
- Advantage in detecting low frequency predator and high frequency danger sounds.
- Evolutionary adaptive function of auditory hypersensitivity?
- Auditory hypersensitivities are associated with PTSD, trauma history, ADD, autism, and several mental disorders and behavioral problems.

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Structures of the Ear



- What symptoms occur with changes in neural tone to muscles regulated by the facial nerve?

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Bell's Palsy: A Natural Experiment

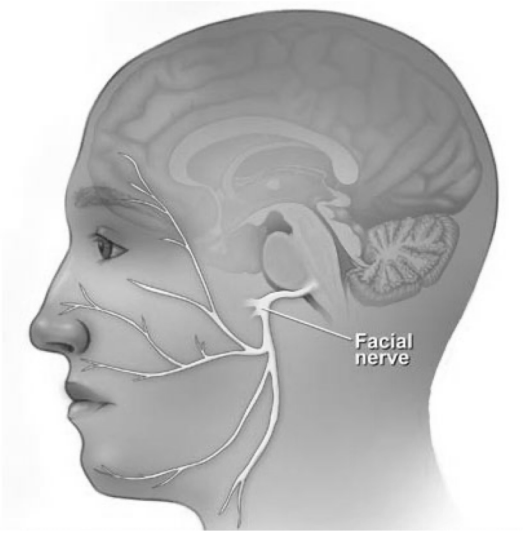
Consequences of Lateralized Paralysis of the Facial Nerve

- Impact on the social engagement system
  - Drooping of the muscles of the face
  - Inability to close the eyelid and to blink
  - Difficulty chewing
  - Hyperacusis

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Bell's Palsy

A Natural Experiment



http://www.famouspeoplearehuman.com/famous-people-bells-palsy.htm

HIV and the Social Engagement System

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HIV Disrupts the Social Engagement System

HIV disrupts the Social Engagement System resulting in a face that is not "social" and a physiological state (decreased vagal regulation of the heart) that promotes defensive behaviors.

Biological Psychology 94 (2013) 143–151

Contents lists available at SciVerse ScienceDirect

Biological Psychology

journal homepage: www.elsevier.com/locate/biopsycho

Atypical autonomic regulation, auditory processing, and affect recognition in women with HIV

K.J. Heilman[a], E.R. Harden[a], K.M. Weber[b], M. Cohen[b,c], S.W. Porges[a,d,*]

Prader Willi Syndrome

Prader Willi Syndrome Behavioral Phenotype

- State regulation problems
  - Impulsivity
  - Defensive (aggression, tantrums)
  - Difficulty with change in routine
- Poor socialization (difficulties in co-regulation)
- Ingestive behaviors
  - Difficulties at birth
  - Hyperphagia (abnormally increased appetite for food)
- Hypersensitivities?

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PWS: Atypical ANS Regulation

- … “patients with PWS have a detectable underlying autonomic dysfunction characterized principally by diminished parasympathetic nervous system activity.”

DiMario, F. J., Dunham, B., Burleson, J. A., Moskovitz, J., & Cassidy, S. B. (1994). An evaluation of autonomic nervous system function in patients with Prader-Willi syndrome. *Pediatrics*, 93(1), 76-81.

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Is there a neural circuit that links atypical autonomic regulation with many of the clinical features of PWS behavioral phenotype?

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The Social Engagement System

- The Social Engagement System links the parasympathetic nervous system with the muscles of the face and head.
- Dysfunction of the Social Engagement System accounts for many features of the PWS behavioral phenotype.

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PWS Disruptions in the Social Engagement System

- The Social Engagement System is disrupted in Prader-Willi Syndrome
  - Different facial cues
  - Differences in conforming when held
  - Different vocalizations (intonation)
  - Different sensory profile
  - Different neural regulation of the ANS
  - ‘He talking about my son’

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Connectedness (Co-Regulation)
A Biological Imperative

- PWS is associated with a compromised Social Engagement System, which limits the effectiveness of social behavior in regulating physiological and behavioral state.
- Impact of dysfunctional Social Engagement System on the biobehavioral state of caregivers and family.

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A New Paradigm to Study (Treat) PWS

- Are features of the PWS behavioral phenotype related to atypical regulation of the autonomic nervous system?
- Are the behavioral state regulation difficulties associated with PWS explained by a neural circuit (Social Engagement System) that links the regulation of muscles of the face with the autonomic nervous system?
- Can the behavior of individuals with PWS be optimized by strategies that support the regulation of autonomic state?

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PWS Following SSP

4 year old male (completed)

- Increased conversation (Transitioned from 2 to 3 words sentences during the SSP)
- Improved speech
- Increased motivation to complete activities
- Increased social engagement with mom and siblings
- Demonstrated improved ability to take turns with siblings during play

4 year old male (completed)

- Demonstrated pride after completing a puzzle (cheeks flushed immediately after the puzzle)
- Initiated social interactions with neighbors (Normally chooses to play by himself)
- Increased conversation
- Recalling lyrics from the songs throughout the day

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Neuroception

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Safety:
Neural and Cultural Definitions

- The social, cultural, and legal definitions and expectations of safety and risk often have little to do with how our nervous system reacts!

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Safety
A Misunderstood Construct

- Safety is not the removal of threat.
- Feeling safe is dependent on autonomic state.
- Definable cues trigger an autonomic state that supports feelings of safety or danger or life threat.
- Trauma disrupts safety and shifts autonomic state leading to mental and physical illness.

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Neuroception
Unconscious Evaluation and Detection of Risk

- The nervous system's detection of risk in others – *without awareness.*
- Can dampen defensive systems and facilitate social behavior (safety).
- Can promote defensive strategies of mobilization (fight/flight) or immobilization (shutdown, dissociation).
- Triggers of "defense" are often related to a history of physical restraint or social isolation.

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Trauma or Safety
How Does Our Body Define Safety?

- We are a traumatized species.
- Feeling safe or being traumatized is not solely determined by the stimuli or context.
- Physiological (autonomic) state (intervening variable) influences our responses to cues of safety and danger.

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Faulty Neuroception

Challenges may:

- Shift physiological and behavioral state
- Distort social awareness
- Displace 'appropriate' spontaneous social behaviors with asocial behavior or defensive reactions
- Or, maintain social behaviors in an environment in which defensive strategies would be more adaptive

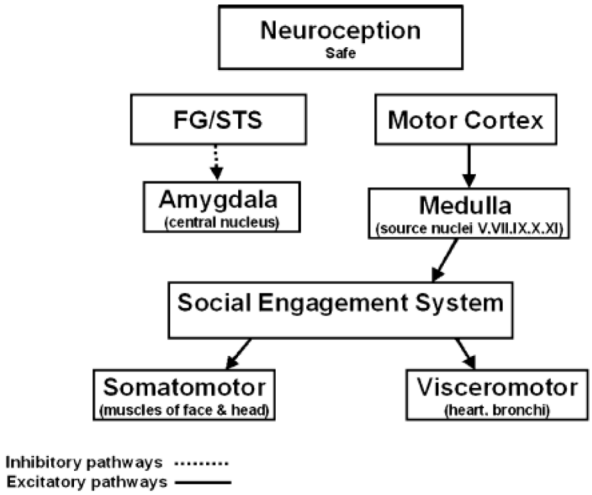
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Neuroception

- Where in the nervous system are the feature detectors that determine safety?

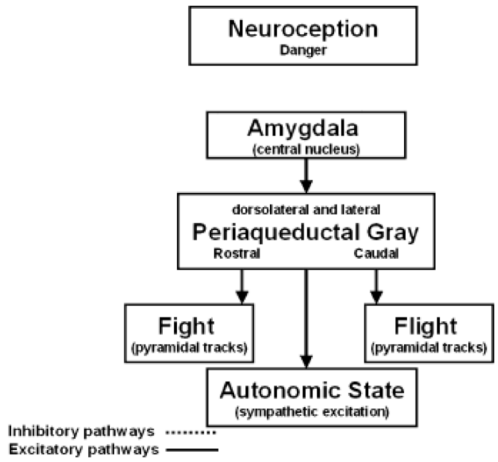
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Neuroception: Safety



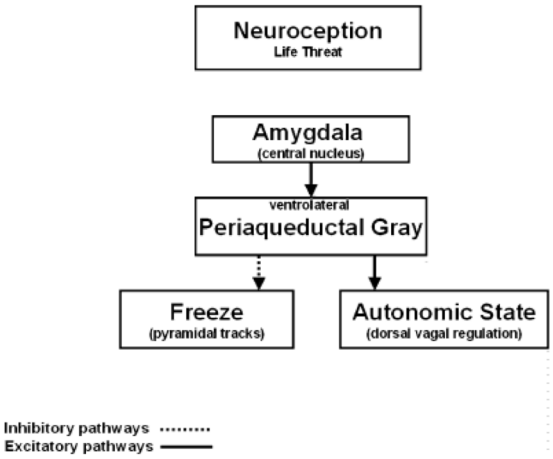
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Neuroception: Danger



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Neuroception: Life Threat



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Feature Detectors
Safety, Danger, and Life Threat

- The importance of face-to-face interactions, vocalizations, body posture, and gestures
  - Cues of safety or danger
  - Efficient strategy to co-regulate physiological state
- Cues of safey promote co-regulation (intersubjective regulation)

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Feature Detectors
The Role of Face-to-Face Interactions

- How do we “feel” when there is a violation of the face-to-face interactions?
- Does a violation displace spontaneous social engagement behaviors with defensive reactions?

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Violation of Face-to-Face Interactions
An Experimental Manipulation

The Face-to Face Still Face Procedure (Tronick, Als, Adamson, Wise, & Brazelton, 1978)

3 Phases:

- 2 minutes Social Play
- 2 minutes Still Face
- 2 minutes Reunion Play

A Biological Basis for Manners?

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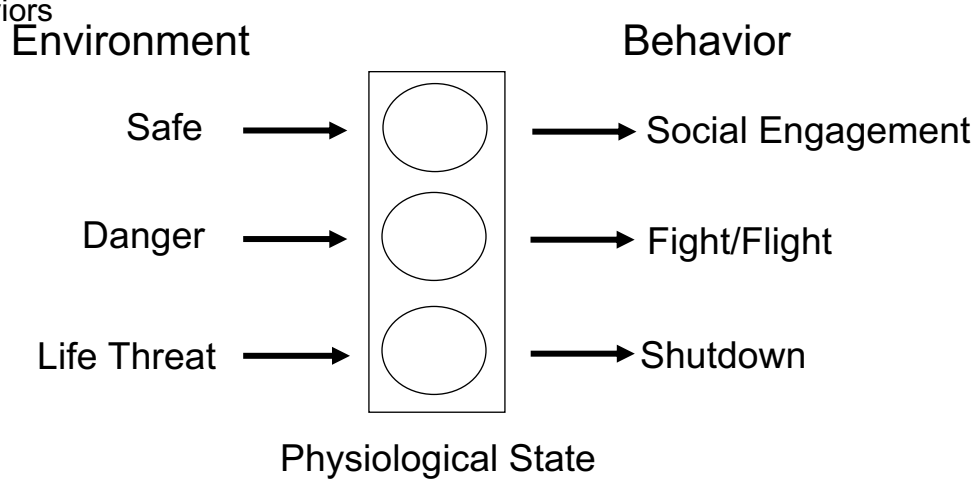
Biological Rudeness

- Violation of a “neural” expectancy
- Lack of reciprocity (poor attunement)
- Is this a feature of several psychiatric disorders?

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Neuroception

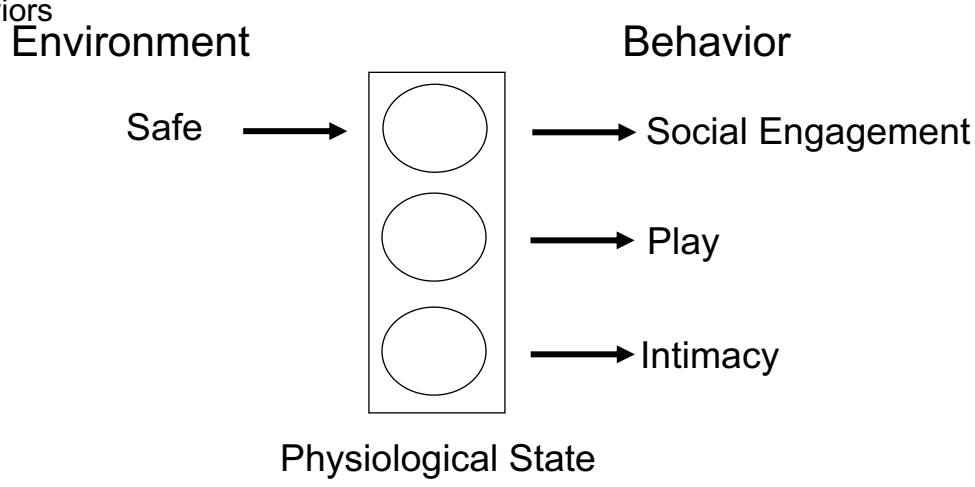
- Behaviors



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Neuroception

- Behaviors



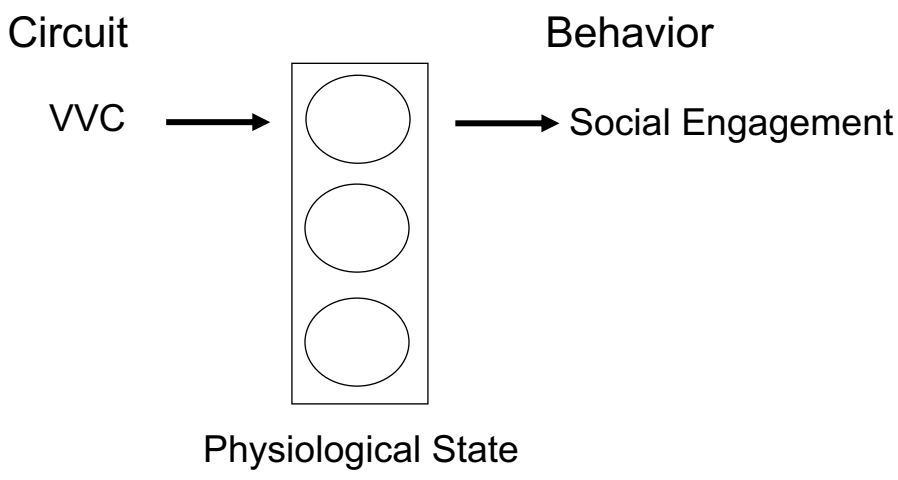
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Three Circuits, Five States

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Social Communication

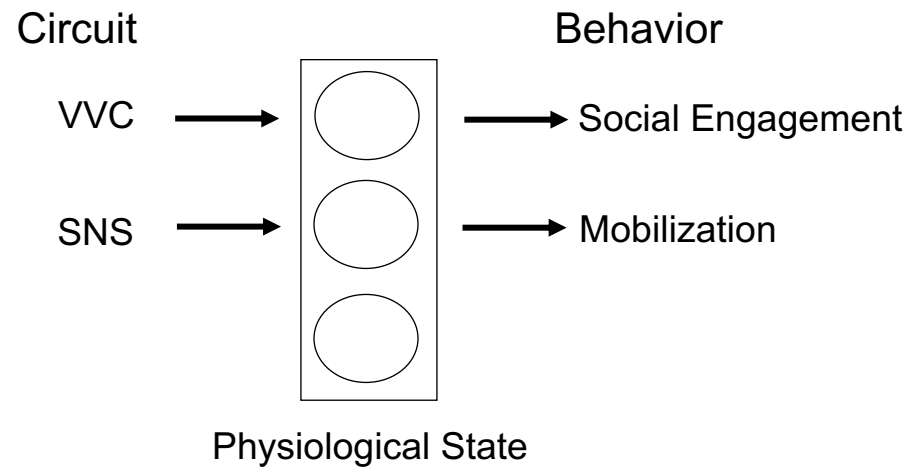
- Behaviors



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Play/Dance

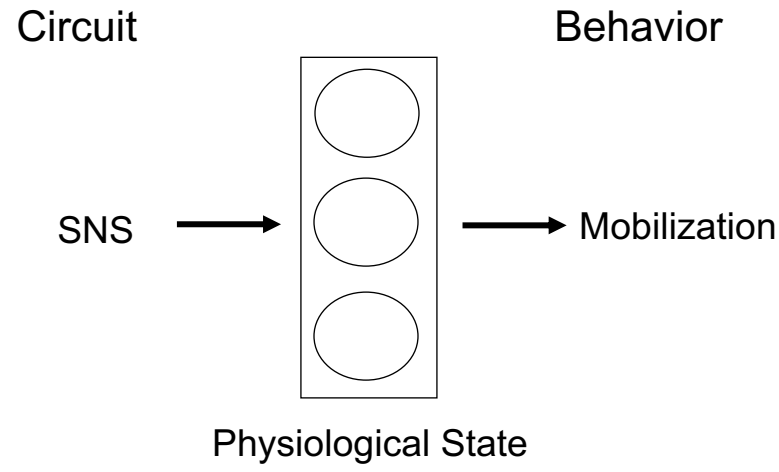
- Behaviors



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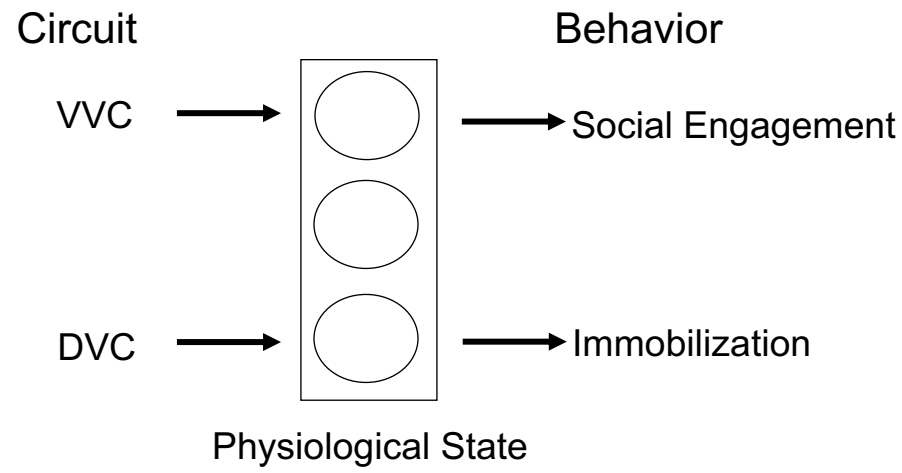
Fight/Flight

- Behaviors



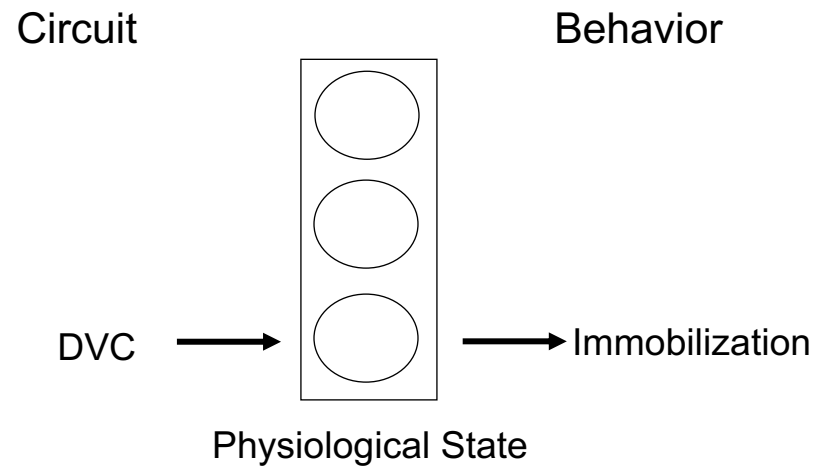
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Intimacy



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Shutdown/Dissociation



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Social Engagement System in Contemporary Lyrics

Safety: When You Say Nothing at All

- It's amazing how you can speak right to my heart
  Without saying a word you can light up the dark
  Try as I may I could never explain what I hear when you don't say a thing
- The smile on your face lets me know that you need me
  There's a truth in your eyes saying you'll never leave me
  A touch of your hand says you'll catch me if ever I fall
  Now you say it best when you say nothing at all
- All day long I can hear people talking out loud
  but when you hold me near you drown out the crowd
  Old Mister Webster could never define
  what's being said between your heart and mine



Donald Alan Schlitz / Paul Overstreet



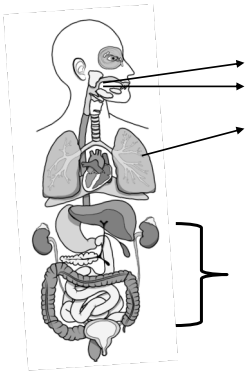
Polyvagal
A Song by Alice Minguez

- When you've lived with betrayal
- Starting right off from the cradle
- You find trust is the rarest thing to find
- Nobody can truly be your friend
- You might pretend but you don't really trust them
- 'Cause it's a real short trip from "got your back" to "backstabber"

- Alone and overwhelmed
- On high alert, I'm overcome
- I see myself from high above
- Nothing feels real,
- don't know what to do
- So tense I can't call out for help
- I'm mute and frozen;
- someone help me out!

Consequences of Autonomic Nervous System Retuning Following Trauma?

Body Perception Questionnaire (BPQ)



	Never	Occasionally	Sometimes	Usually	Always
37. I gag when I eat.	1	2	3	4	5
38. When I talk, I often feel I should cough or swallow the saliva in my mouth.	1	2	3	4	5
39. When I breathe, I feel like I cannot get enough oxygen.	1	2	3	4	5

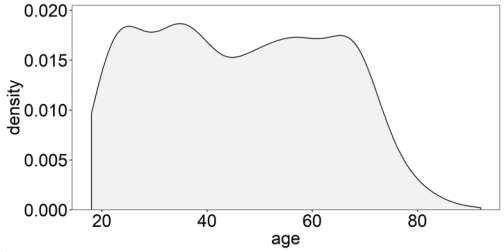
	Never	Occasionally	Sometimes	Usually	Always
42. I have "sour" stomach.	1	2	3	4	5
43. I am constipated.	1	2	3	4	5
44. I have indigestion.	1	2	3	4	5

Porges, S. (1993). Body perception questionnaire. *Laboratory of Developmental Assessment, University of Maryland.*
Cabrera, A., Kolacz, J., Pailhez, G., Bulbena-Cabre, A., Bulbena, A., & Porges, S. W. (2018). Assessing body awareness and autonomic reactivity: Factor structure and psychometric properties of the Body Perception Questionnaire-Short Form (BPQ-SF). *International journal of methods in psychiatric research*, *27*(2), e1596.

Loss of Purpose in Life:
A Consequence of ANS Retuning Following Trauma?

- Web-based design
- A nationally representative online sample of 2048 participants (Age range = 18 to 92 years, 51% female)
- Method:
  - Mediation analysis using structural equation modeling using bootstrapped confidence intervals. Models adjusted for age.



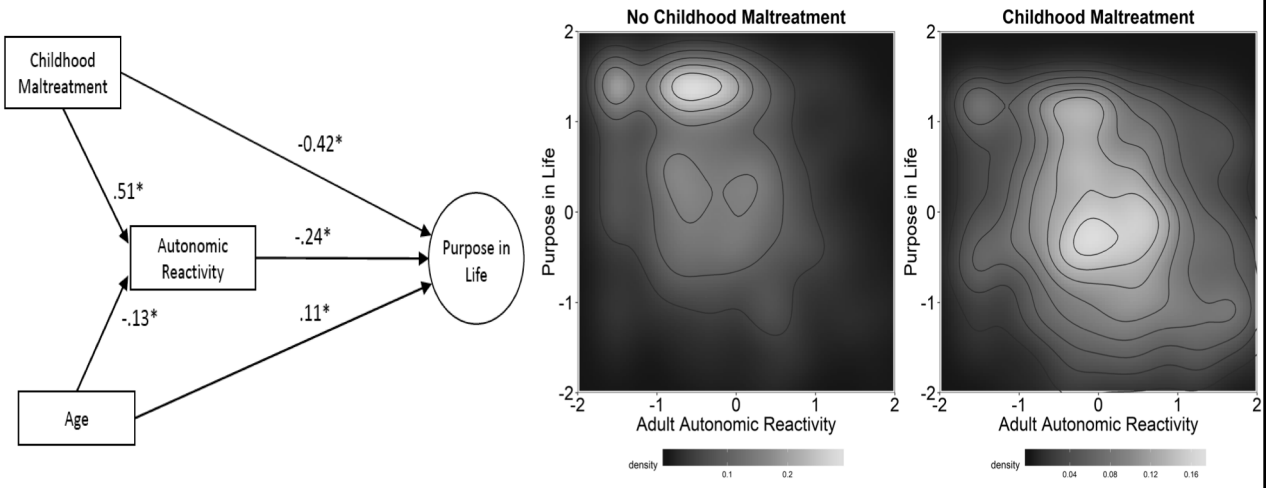


Childhood Trauma Questionnaire

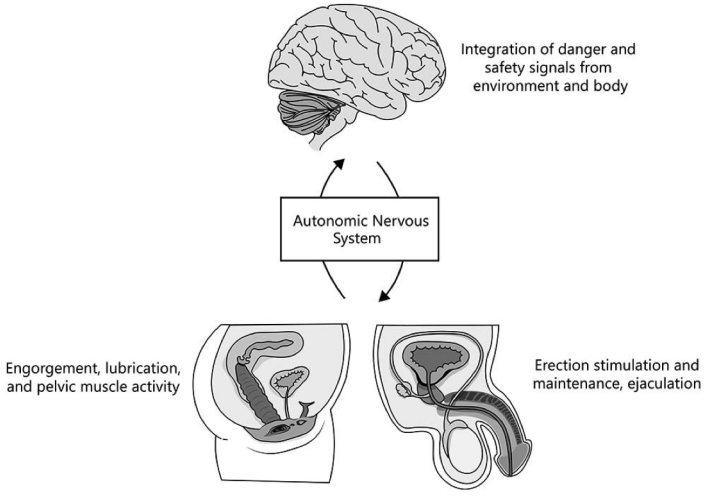


Childhood Trauma

Self-reported autonomic reactivity partially mediated the effect of childhood trauma on purpose in life:



Sexual Function in Adults With a Childhood Trauma:
Mediating Effects of Self-Reported Autonomic Reactivity



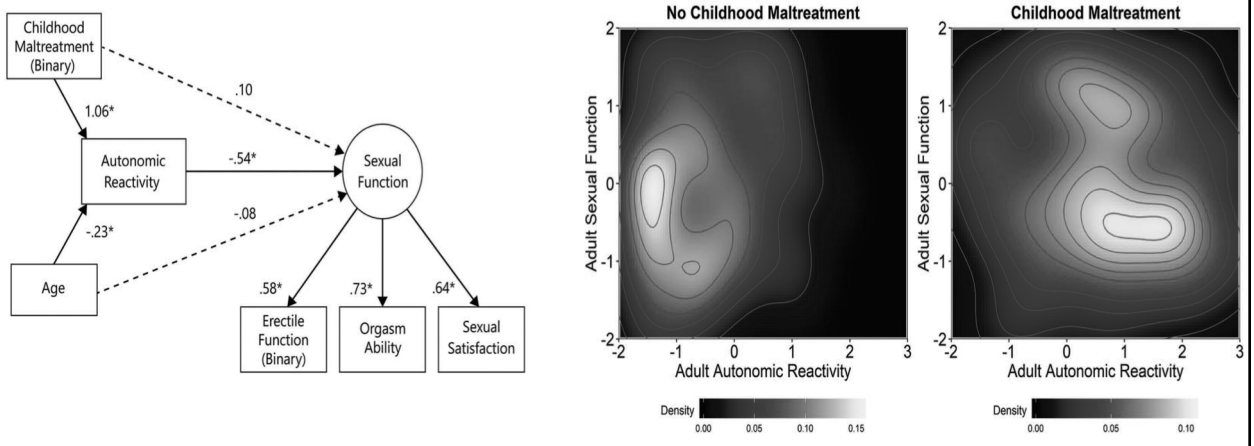
Kolacz, J., Hu, Y., Gesselman, A. N., Garcia, J. R., Lewis, G. F., & Porges, S. W. (2019). Sexual function in adults with a history of childhood maltreatment: Mediating effects of self-reported autonomic reactivity. *Psychological trauma: theory, research, practice, and policy*.

Sexual Function in Adults With a Childhood Trauma:
Mediating Effects of Self-Reported Autonomic Reactivity

- Data were collected in 2017 from a sample of U.S. residents age 18 years and older recruited through Amazon's Mechanical Turk (MTurk).
- 522 respondents (189 males; 333 females; 79.9% Caucasian, 7.1% Black or African American, 4.6% Asian, 2.7% Hispanic or Latino, 5.7% Multiracial or other). 68.9% of males and 80.8% of females were in a committed relationship or married.
- *Both males and females with a maltreatment history had elevated supradiaphragmatic reactivity, subdiaphragmatic reactivity, and combined reactivity scores (see Body Perception Questionnaire) compared to those without a maltreatment history.*

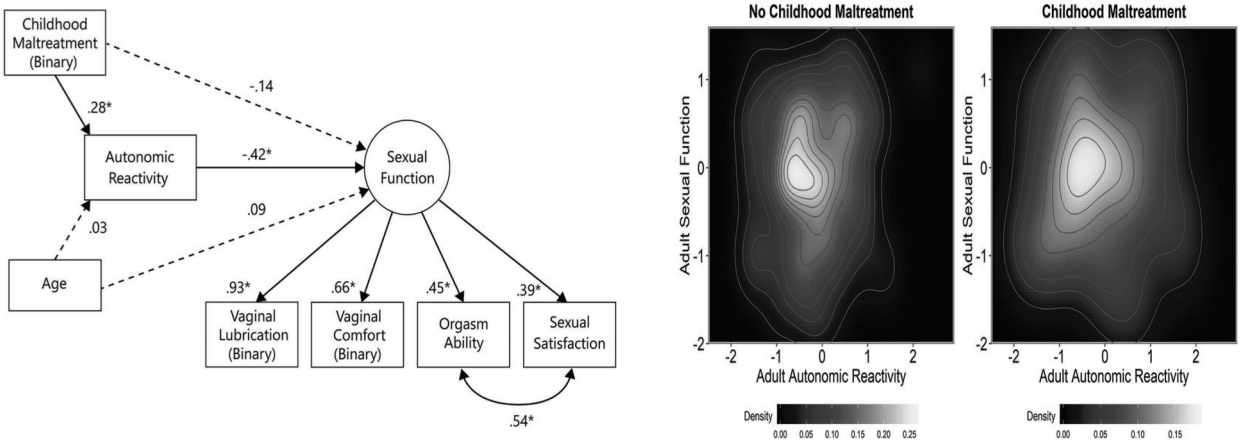
Kolacz, J., Hu, Y., Gesselman, A. N., Garcia, J. R., Lewis, G. F., & Porges, S. W. (2019). Sexual function in adults with a history of childhood maltreatment: Mediating effects of self-reported autonomic reactivity. *Psychological trauma: theory, research, practice, and policy*.

Impact on Male Sexual Function



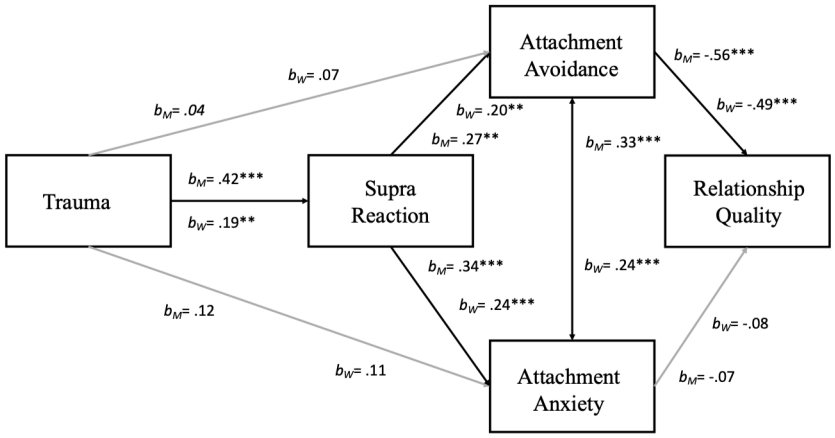
Kolacz, J., Hu, Y., Gesselman, A. N., Garcia, J. R., Lewis, G. F., & Porges, S. W. (2019). Sexual function in adults with a history of childhood maltreatment: Mediating effects of self-reported autonomic reactivity. *Psychological trauma: theory, research, practice, and policy*.

Impact on Female Sexual Function



Kolacz, J., Hu, Y., Gesselman, A. N., Garcia, J. R., Lewis, G. F., & Porges, S. W. (2019). Sexual function in adults with a history of childhood maltreatment: Mediating effects of self-reported autonomic reactivity. *Psychological trauma: theory, research, practice, and policy*.

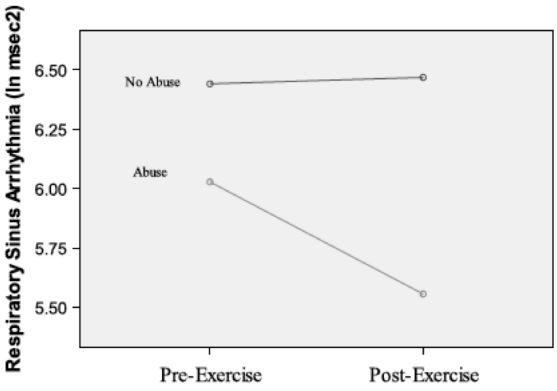
Impact of Trauma on Attachment and Relationships



400 individuals currently involved in a relationship
***p < .001; **p < .01; *p < .05.

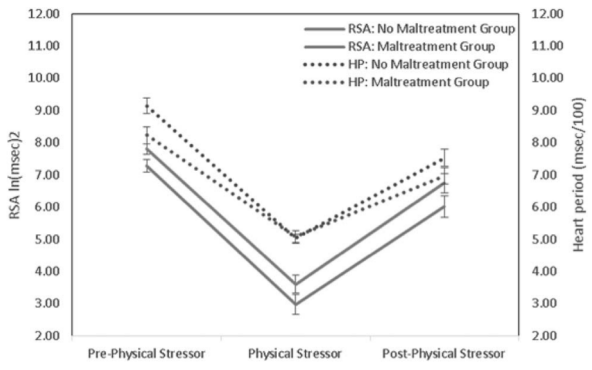
Uhlich, Kolacz, Gesselman, Garcia, & Porges (in preparation)

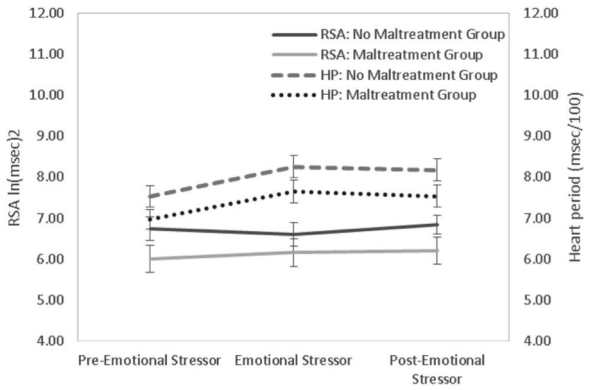
Abuse History Is Related to Autonomic Regulation (Vagal Brake) to Mild Exercise



Dale, L. P., Carroll, L. E., Galen, G., Hayes, J. A., Webb, K. W., & Porges, S. W. (2009). Abuse history is related to autonomic regulation to mild exercise and psychological wellbeing. *Applied psychophysiology and biofeedback*, *34*(4), 299.

Trauma History Influences ANS Regulation





Dale, L. P., Shaikh, S. K., Fasciano, L. C., Watorek, V. D., Heilman, K. J., & Porges, S. W. (2018). College females with maltreatment histories have atypical autonomic regulation and poor psychological wellbeing. *Psychological trauma: theory, research, practice, and policy*, *10*(4), 427.

Play

Neural Exercise
(2015)

Play as a neural exercise:
Insights from the Polyvagal Theory

Stephen W. Porges, PhD
Department of Psychiatry
University of North Carolina at Chapel Hill

Porges, S. W. (2015). ***The Power of Play for Mind Brain Health. Mindgains. org, GAINS*****, 3-7.**

Neural Exercise

- Exercising the Vagal Brake and the Social Engagement System
- Expectancy and violation of expectancy (peek-a-boo)
- Resilience (humor versus fear)

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Play

- Play is a “neural exercise” that enables the co-regulation of physiological state to promote neurophysiological states that support mental and physical health.
- Play as therapy.

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Principles to Establish Therapeutic Relationships are Similar to Play

- Reciprocity
- Movement and inhibition of movement
- Face-to-face interactions and/or prosodic vocalizations to dampen potential defensive reactions to movements, proximity, and touch
- Play (therapy) as a neural exercise

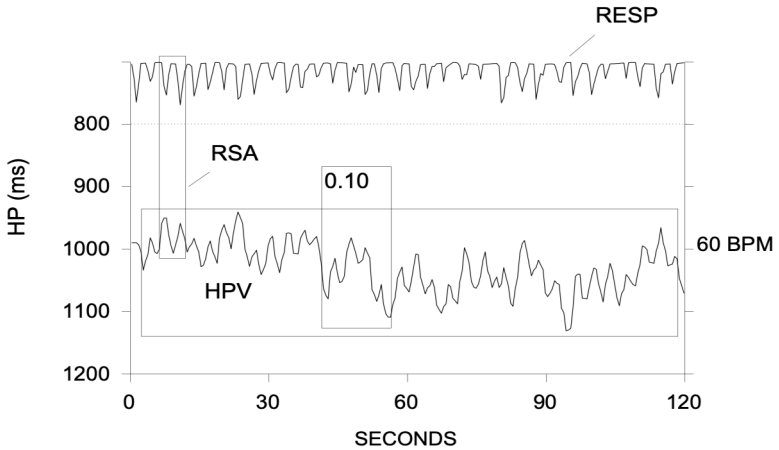
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Experiential: The Role of Breath

The Role of Breath

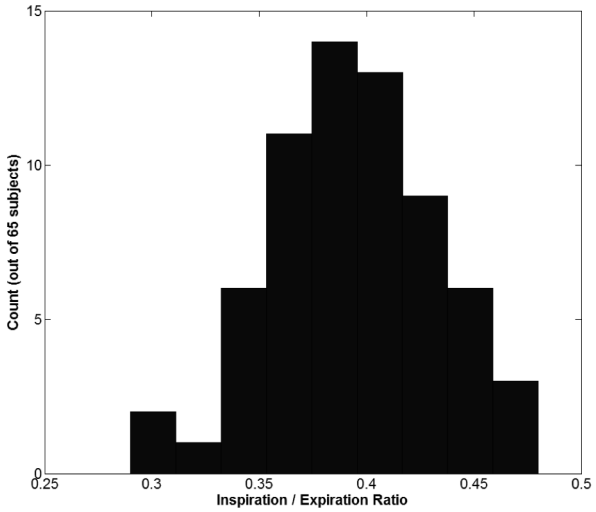
- Breathing modulates the “ventral” vagus
- Inhalation turns off the vagal brake (i.e., heart rate increases)
- Exhalation turns on the vagal brake (i.e., heart rate decreases)
- Breathing therapies exercise the vagal brake

Visceromotor
Vagal Influences Via Respiratory-Heart Rate Rhythms



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Breathing is Asymmetrical



Breathing Exercises: General Instructions

- Conducted in pairs identified as A and B. Best to work with someone you do not know well.
- The 'breather' and 'observer' will discuss what they have experienced ONLY after both participants have completed the entire breathing protocol.
- Goals:
  - Experience your bodily feelings and perception of others while manipulating your breathing.
  - Experience your bodily feelings and perception of others while they manipulate their breathing.

Slow Inhalation/Exhalation

- Slow inhalation breathing. Participant inhales slowly for about 7 seconds and exhales for about 3 seconds. Participant A completes 10 slow inhalation breaths, while Participant B observes.
- Slow exhalation breathing. Participant inhales for about 3 seconds and slowly exhales for about 7 seconds. Participant A completes 10 slow exhalation breaths, while Participant B observes.
- Reverse roles with B breathing and A observing.

Discussion Between A & B

- What did you notice in the face of the observer while breathing?
- What did the observer notice in the face of the breather during the controlled breathing?
- What feelings did you have while breathing and observing?
- How did you perceive each other during this task?

Other Breathing Exercises

- Rapid high chest breathing.
  - Participant inhales into their upper chest (like a gasp) for 2 seconds and exhales for 2 seconds.
  - Participant A completes 10 rapid high chest breaths, while Participant B observes.
- Slow exhalation 'abdominal' breathing.
  - Participant inhales for about 3 seconds pushing the abdomen while inhaling and then slowly exhales for about 7 seconds.
  - Participant A completes 10 slow exhalation 'abdominal' breaths, while Participant B observes.
- Reverse roles with B breathing and A observing.

Discussion II Between A & B

- What did you notice in the face of the observer while breathing?
- What did the observer notice in the face of the breather during the controlled breathing?
- What feelings did you have while breathing and observing?
- How did you perceive each other during this task?
- How did your experiences during the exercise relate clinical experiences?
- Did your experiences provide insight into the subjective experiences of your clients.

Session 4a:
Polyvagal-Informed Therapy

Stephen W. Porges, PhD
Distinguished University Scientist
Founding Director, Traumatic Stress Research Consortium
Kinsey Institute, Indiana University
Professor Psychiatry, University of North Carolina

In Search of an Intervening Variable

- Embodiment
- Bi-directional communication between brain and body
- Brainstem ready for therapy
- How to measure autonomic state
  - Observational
    - Intonation of voice
    - Facial expression
    - Gesture
    - Posture
    - Muscle tone
  - Autonomic measures
    - Heart rate
    - HRV (respiratory sinus arrhythmia)
    - Pulse amplitude/vascular tone
    - Sweat gland activity

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Polyvagal-Informed Therapy

- Can intervention strategies be designed to manipulate and support a physiological state (e.g., engaging and exercising feedback loops) that enhances the function of the social engagement system promotes spontaneous social behavior?

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Polyvagal-Informed Therapies
Principles

1. Acknowledge and respect client's physiological state
2. Exercise the Social Engagement System
   - Via bidirectional brain-body communication system involving the vagus (i.e., vagal brake)
   - Challenge and enhance the regulation of the heart (ventral vagal pathway) and the muscles of the face and head (e.g., facial expression, vocalizations).

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How Polyvagal-Informed Therapies Work

- Deficits in the Social Engagement System are potentially 'rehabilitated' through sensory portals communicating with brainstem structures regulating (i.e., central regulator) the Social Engagement System.
  - Sensory input stimulates a 'central regulator' that controls the motor outputs of the Social Engagement System (e.g., face, voice, gesture, vagal brake)
  - Bidirectionality of the system
    - Sensory input to the 'central regulator' – a system linking cortical detection with brainstem regulation of visceral state
    - The 'central regulator' is detecting specific sensory patterns
    - Specific sensory patterns, via neuroception, trigger different physiological states
    - Physiological states create a perceptual bias towards safety or defense
    - Moving between physiological states provides a neural exercise, primarily via imposing and releasing the 'vagal brake,' to optimize resilience

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The Emergence of Polyvagal Informed Therapies
Portals for Neural Exercise

- Face-to-face social interactions
- Singing
- Wind instruments
- Breathing exercises
- Posture shifts (e.g., baroreceptor stimulation)
- Listening
- Synchronous and reciprocal behaviors
  - Expectancies, predictability

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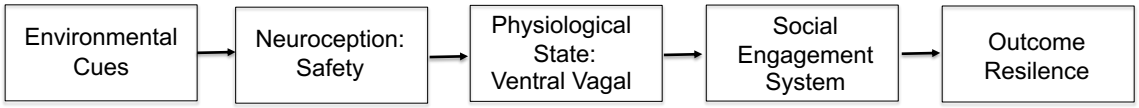
Reconnecting the Body with the Brain Through 'Neural' Exercises

- Social interactions
- Yoga
- Mindfulness
- Breathing exercises
- Singing/chanting
- Listening
- Playing
- Team sports

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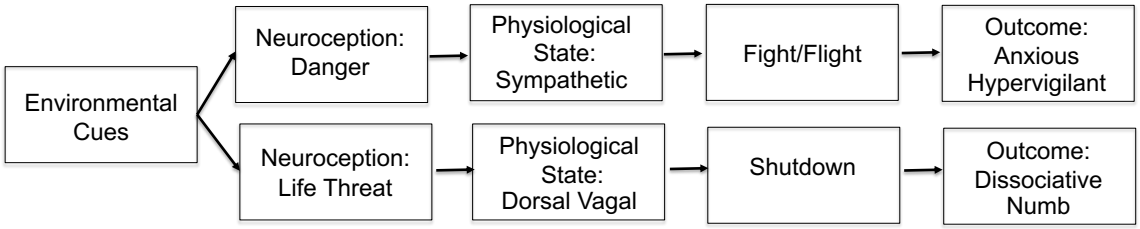
Polyvagal-Informed Therapy

Optimal Functioning



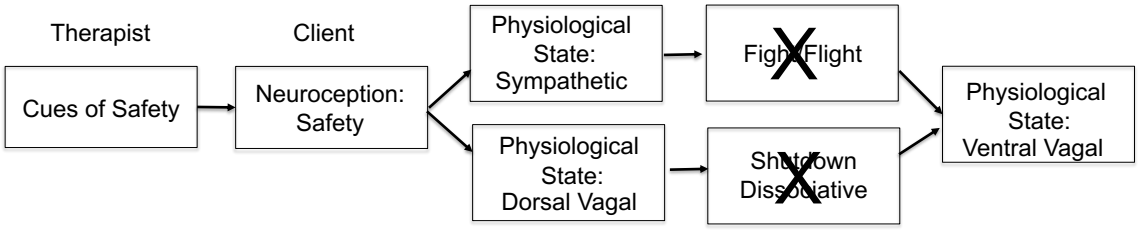
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Polyvagal-Informed Therapy
Rupture



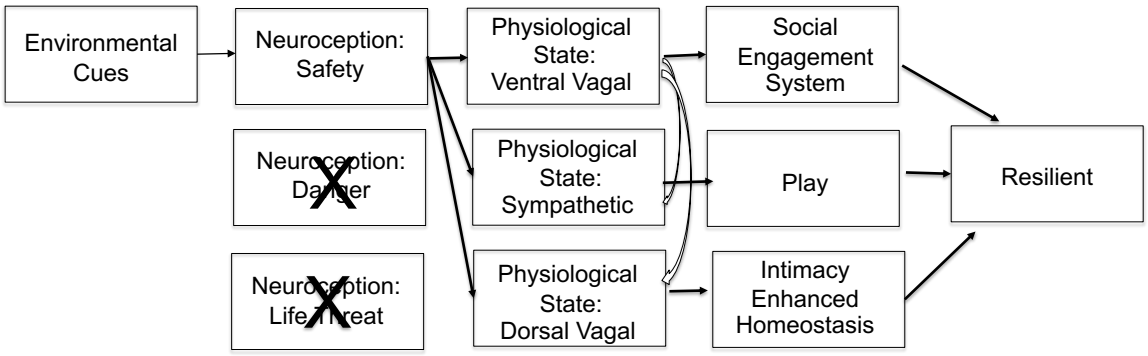
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Polyvagal-Informed Therapy
Repair



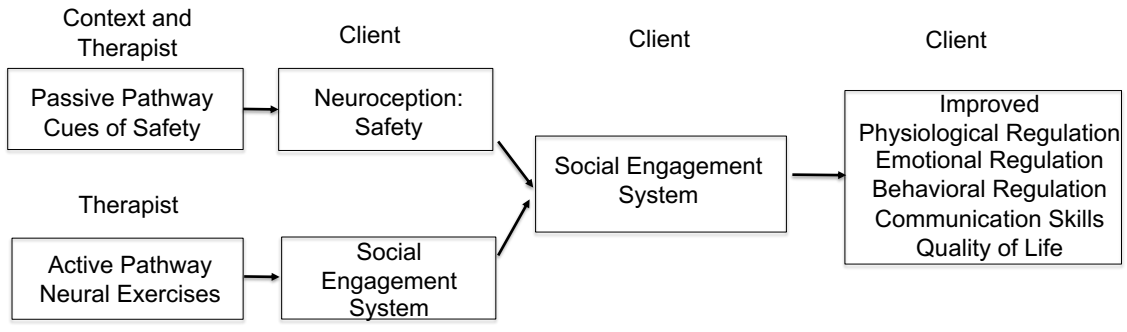
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Polyvagal-Informed Therapy
Neural Exercise



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Polyvagal-Informed Therapy



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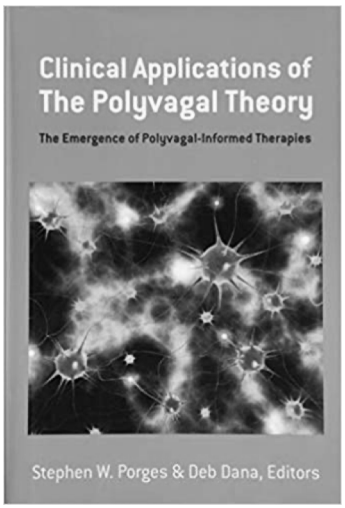
Polyvagal Processes in Therapy

Stage	Polyvagal Process
1. Experience therapy in safe context	• Neuroception of safety • Remove predator cues • Add acoustic cues of a loving mother (prosodic voice)
2. Perform 'neural' exercises moving between biobehavioral states	• Exercise 'vagal brake' to enhance autonomic flexibility and resilience
3. Become explicitly aware of subjective experiences associated with each biobehavioral states	• Mental exercises involving brain functions that are dependent on maintaining 'ventral' vagal state
4. Develop personal narrative and new 'neural expectancies" of safety while shifting biobehavioral states	• Emergent property of resilience, while moving between states of immobilization, mobilization, and safety ('ventral' vagal, social engagement).

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The Emergence of Polyvagal-Informed Therapies



Polyvagal-Informed Therapy
Authors and Disciplines

- Authors represent several disciplines including:
  - Psychology
  - Psychiatry
  - Family Therapy
  - Social Work
  - Nursing
  - Play Therapy
  - Dance movement therapy
  - Veterinary Medicine
  - Professional Counselors
  - Neonatology

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Polyvagal Theory

- A brain-body science of connection, trust, and safety
- Leading to optimized mental, social, and physical health

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Polyvagal Theory: Better Living Through Neurobiology

- Helps identify environmental features that foster feelings of safety.
- Explains how feeling safe “optimizes” behavior by turning off defense and increasing social behaviors.
- Explains the positive and negative feelings and behaviors of individuals (e.g., child and parent, partners, therapist and client) while interacting.

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What if Descartes Where Polyvagal-Informed?

- Je pense, donc je suis (I think therefore I am).
- Je ***me*** sens, donc je suis (I feel, therefore I am

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Session 4b
The Emergence of Polyvagal-Informed Therapy:
How Vocal Music and Voice Contribute to Healing Following Trauma

Stephen W. Porges, PhD
Distinguished University Scientist
Founding Director, Traumatic Stress Research Consortium
Kinsey Institute, Indiana University
Professor Psychiatry, University of North Carolina

Recovering Social Engagement System Function

- Can these deficits be 'rehabilitated' through portals to the social engagement system?
  - Stimulating the 'central regulator' in the brainstem of the Social Engagement System
- Can music be altered to efficiently stimulate the Social Engagement System?

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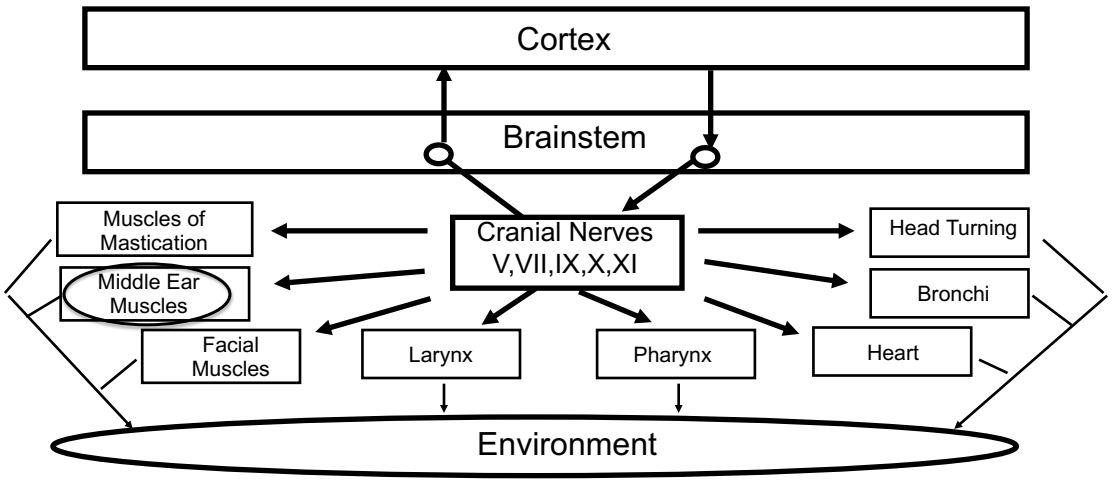
Regulation and Co-Regulation

The therapeutic impact of listening to prosodic vocalizations

- Vocalizations (vocal music and prosodic voices) can stimulate the Social Engagement System.
- Vocalizations (vocal music and prosodic voices) can support immobilization without fear and improve homeostatic processes.
- Vocalizations (vocal music and prosodic voices) enable feelings of trust that support health, growth, and restoration (e.g., mother's lullabies).

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Deconstructing the Social Engagement System



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Music and Prosodic Vocalizations
Common Features

- Vocal music shares features with human voice.
- Cues of trust and safety are convey by acoustic features in music and voice.
- Listening to music and/or human voice will facilitate access to the neural circuits that promote social behavior, emotional regulation, and health.

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Music and Human Speech
Common 'Neuroceptive' Features

- Vocal music shares features with human voice.
- Cues of trust and safety are convey by acoustic features in music and voice.
- Listening to music and/or human voice will facilitate access to the neural circuits that promote social behavior, emotional regulation, and health.
- Our nervous system processes music similar to prosody in human voice.
- Music may be more salient than voice to the neural "feature detectors" scanning the environment for risk and cues of safety.
- Vocal music (chants) might be very effective in triggering a neuroceptive state of safety and dampening defense (fight/flight/shutdown) systems.

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Synopsis
Polyvagal Theory Proposes

- Listening is dependent on and influences autonomic state
- Vocalizing (singing and talking) and listening provide opportunities to exercise neural circuits that support mental and physical health.
- Music evolved to support our biology of connectedness and our capacity to co-regulate
- Music has the capacity to efficiently convey cues of safety to our nervous system
- Cues of safety down regulate the metabolic costly mechanisms of defense and optimize homeostatic processes that support mental and physical health

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Safe and Sound Protocol
A Polyvagal-Informed Therapy

- Vocal music be modified to convey amplified cues of safety that change physiological state to support mental and physical health.
- Leveraging neuroception of safety to retune ANS state regulation
- Emergent social properties

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The Listening Project Protocol:

Triggering the Social Engagement System with auditory cues of safety

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The Safe and Sound Protocol™

A Portal to Social Engagement

iLS INTEGRATED LISTENING SYSTEMS

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Safe & Sound Protocol™



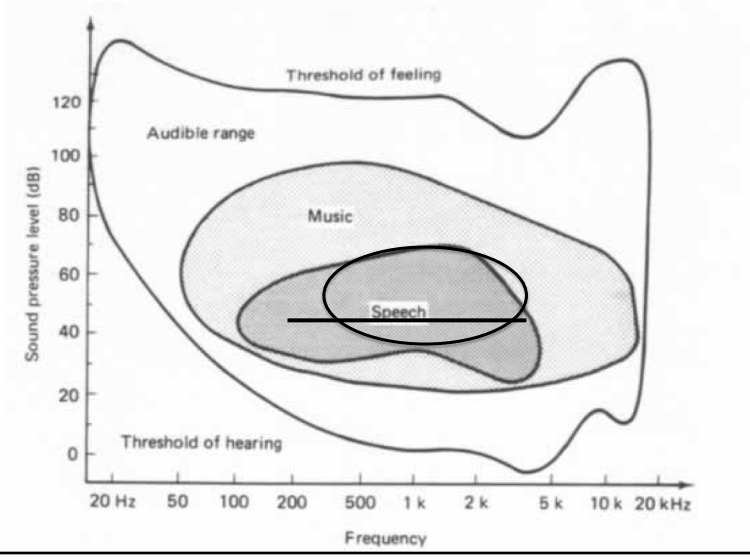


Safe & Sound Protocol (SSP): A Portal to Social Engagement

A five-day intervention to reduce stress and auditory sensitivity while enhancing social engagement and resilience.

Click Here > >

Safe and Sound Protocol™

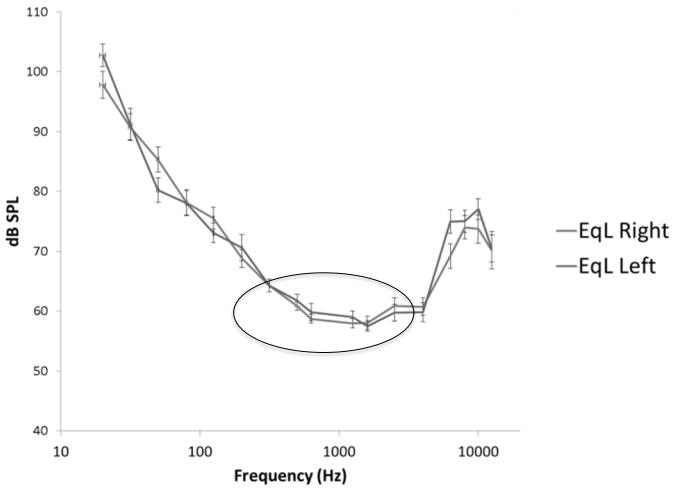


Auditory Anti-Masking Mechanisms
Extracting Speech (Vocal Music) from Background Sounds

- Function of the middle ear muscles (MEM)
  - Attenuates low frequency sounds
- Function of the medial olivary-cochlear systems (MOC)
  - Dampens high frequency sounds
- Consequences of MEM and/or MOC not functioning
- Relation of MEM to other physiological, neurological, psychological features
- Therapeutic “exercise” of MEM

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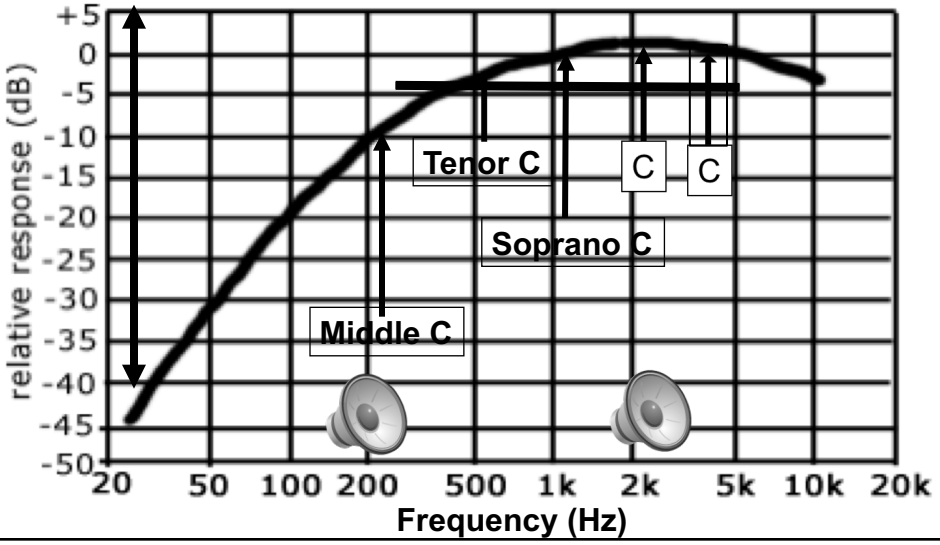
Equal Loudness Contours



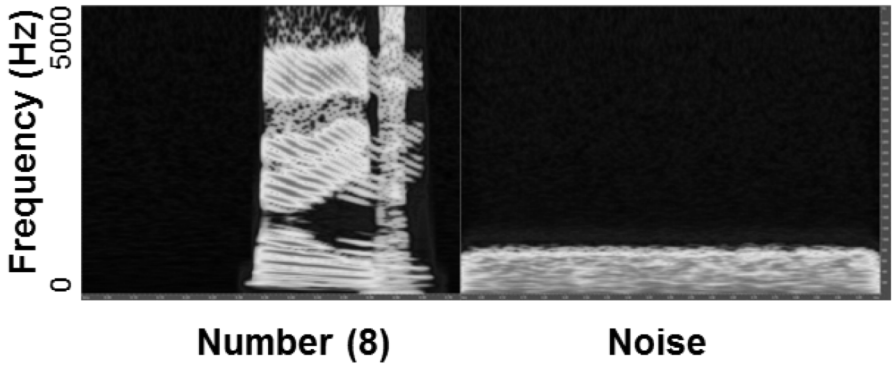
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Articulation Index:

Determining intelligibility of voice



Frequencies of Social Communication



Auditory Anti-Masking Mechanisms:

Extracting Speech (Music) From Background Sounds

- Function of the middle ear muscles (MEM)
  - Attenuates low frequency sounds
- Function of the medial olivary-cochlear systems (MOC)
  - Dampens high frequency sounds
- Consequences of MEM and/or MOC not functioning
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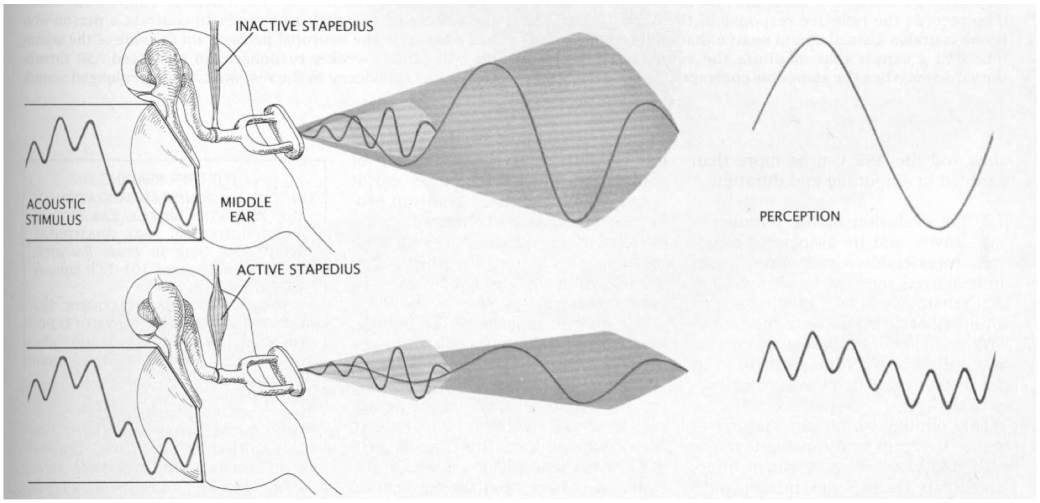
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Prosody

- Prosody describes the perception of feelings expressed in speech, and was recognized by Charles Darwin in The Descent of Man to predate the evolution of human language: "Even monkeys express strong feelings in different tones — anger and impatience by low, fear and pain by high notes."

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Middle Ear Muscles
Listening versus Hearing



Borg E, Counter SA.The middle-ear muscles. *SciAm* (1989) 261:74–80.

The Engineering of the Safe and Sound Protocol™

- Vocal music is modified to convey cues of safety that change physiological state to support mental and physical health.
- Acoustic cues of safety support the nervous system's capacity to optimize the regulation of visceral organs (i.e., promote homeostasis) and social behavior.

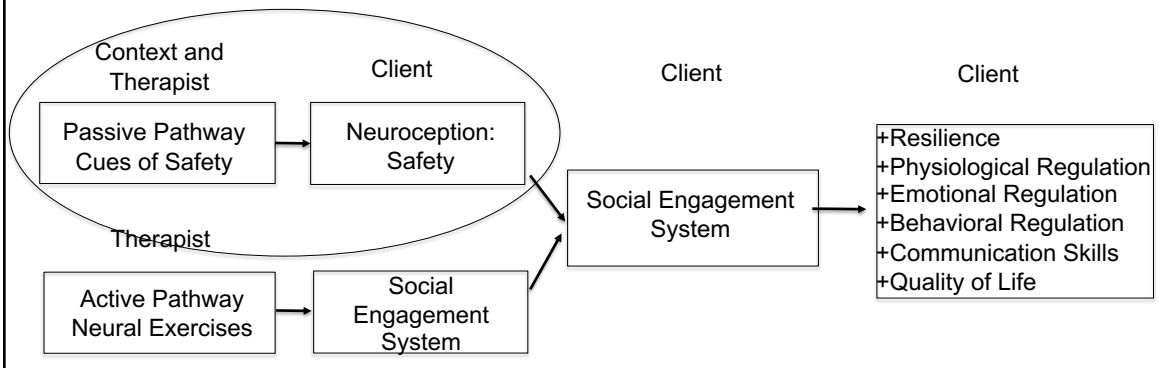
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Listening as a Polyvagal-Informed Therapy

- Listening is dependent on and influences autonomic state
- Vocalizing (singing and talking) and listening provide opportunities to exercise neural circuits that support mental and physical health.
- Music evolved to support our biology of connectedness and our capacity to co-regulate
- Music has the capacity to efficiently convey cues of safety to our nervous system
- Cues of safety down regulate the metabolic costly mechanisms of defense and optimize homeostatic processes that support mental and physical health

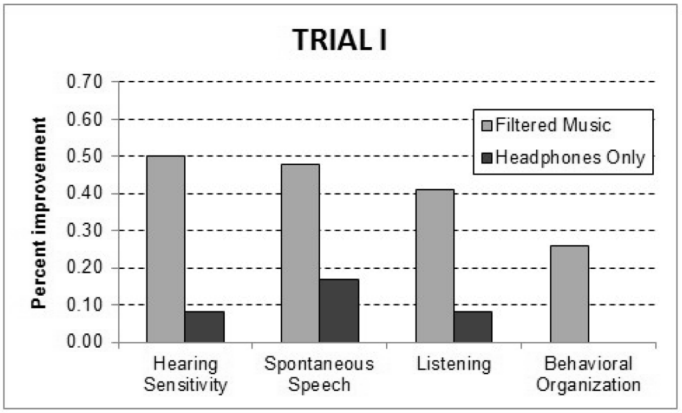
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Polyvagal-Informed Therapy
Safe and Sound Protocol



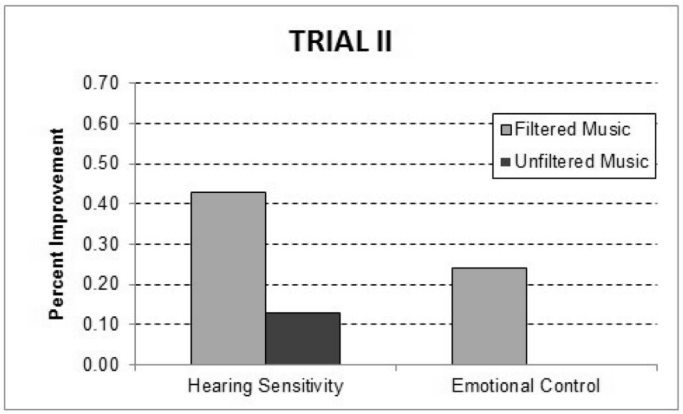
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Listening as Therapy



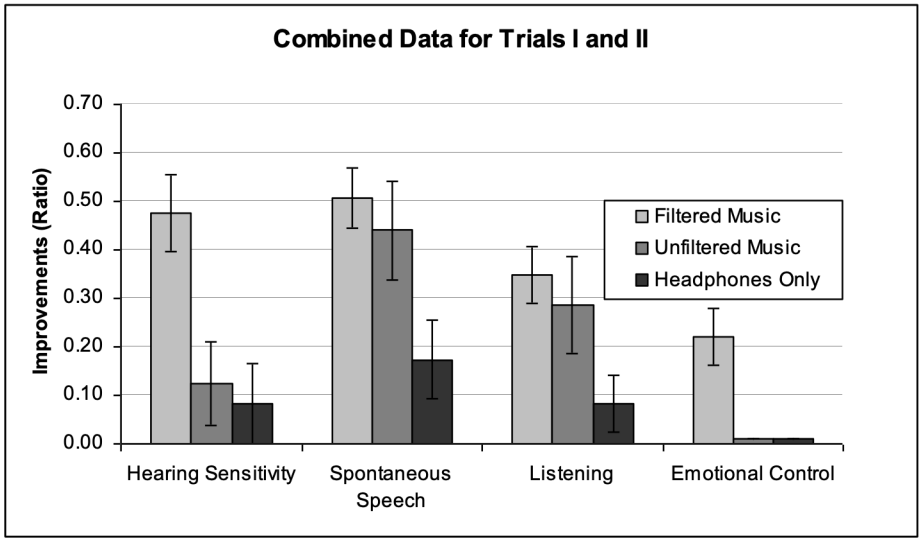
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Listening as Therapy



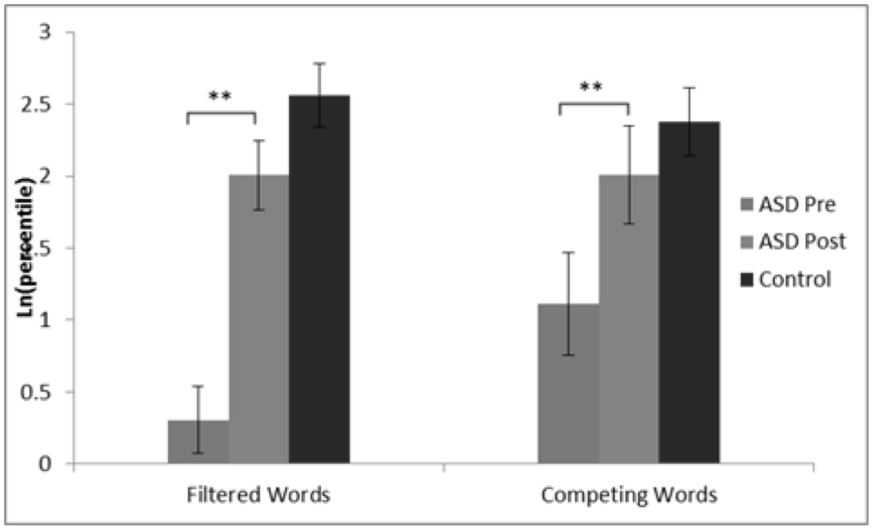
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Listening as Therapy



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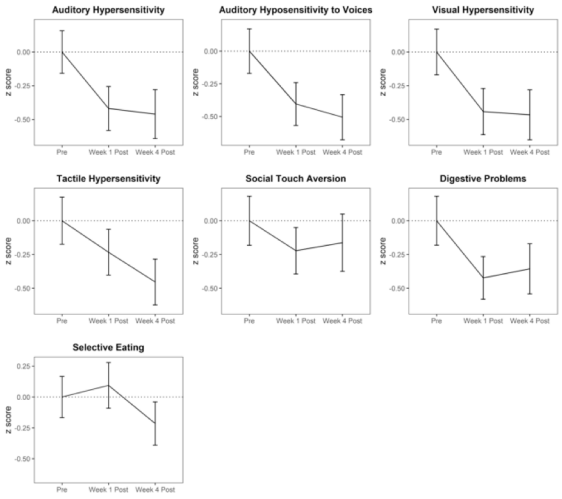
Listening as Therapy



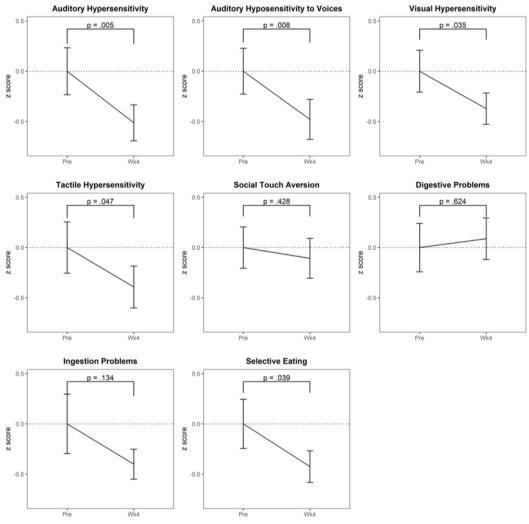
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Porges et al. (2013), International Journal of Psychophysiology.

SSP Improves Sensory Processing



SSP Improves Sensory Processing
Maltreated Children



“Filtered” Music

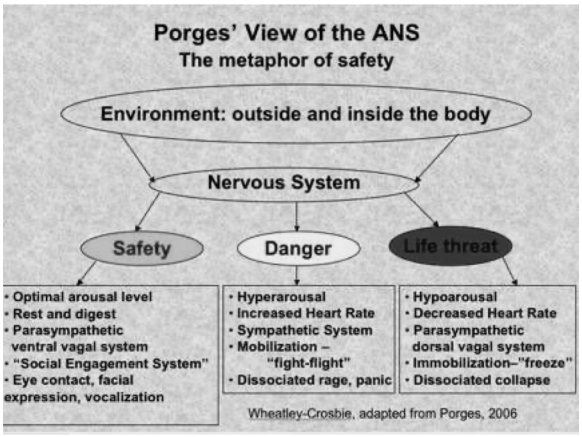


Our Nervous System is Waiting for Johnny Mathis

- The modulation of vocalizations in the filtered music signals safety to our nervous system.
- Cues of safety down regulate the metabolic costly mechanisms of defense and optimize homeostatic processes that support mental and physical health.
- In adult clients with severe trauma histories cues of safety may be triggers of violation of trust and abuse.

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Safe and Sound Protocol (SSP)
Facebook Parent Info. Forum



This is a group for parents that are interested in learning about experiences others have had with the Safe and Sound Protocol (SSP) which was created by Dr. Stephen Porges. My family is forever grateful to Dr. Porges for creating something that has been truly life changing for my son! Please feel free to share your own experiences, ask questions or read other's experiences with the protocol. **Members · 4,321**

Safe and Sound Protocol™
Role of 'Safe' in the Protocol

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A New Paradigm

- If social behaviors are not learned, are they emergent properties of specific neurophysiological states?
- Could intervention strategies be focused on manipulating or supporting the neurophysiological states (e.g., engaging and exercising feedback loops) from which social behavior would spontaneously occur?

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A New Paradigm

- If social behaviors are not learned, are they emergent properties of specific neurophysiological states?
- Could intervention strategies be focused on manipulating or supporting the neurophysiological states (e.g., engaging and exercising feedback loops) from which social behavior would spontaneously occur?
- Listening as acoustic vagal nerve stimulation.

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Safe and Sound Protocol™
Proposed Mechanisms

- Listening is dependent on and influences autonomic state.
- Listening provides opportunities to exercise neural circuits that support mental and physical health.
- Music evolved to support our biology of connectedness and our capacity to co-regulate.
- The altered music used in the SSP has the capacity to efficiently convey cues of safety to our nervous system and function as an acoustic vagal nerve stimulator.
- The acoustic cues of safety embedded in the SSP down regulate the metabolic costly mechanisms of defense and optimize homeostatic processes that support mental and physical health.
- The technology embedded in SSP have the potential to 'calm' nonhuman mammals.

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Our Nervous System is Waiting for Johnny Mathis

- The modulation of vocalizations in the filtered music signals safety to our nervous system.
- Cues of safety down regulate the metabolic costly mechanisms of defense and optimize homeostatic processes that support mental and physical health.
- Potential contraindications in adult clients with severe trauma histories.

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Safe and Sound Protocol™
A Polyvagal-Informed Therapy

- If social behaviors are not learned, are they emergent properties of specific physiological states?
- Can intervention strategies be designed to manipulate and support a physiological state (e.g., engaging and exercising feedback loops) that promotes spontaneous social behavior?
- Do cues of safety conveyed in music change physiological state to support mental and physical health?

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Synopsis
Polyvagal Theory Proposes

- Listening is dependent on and influences autonomic state
- Vocalizing (singing and talking) and listening provide opportunities to exercise neural circuits that support mental and physical health.
- Music evolved to support our biology of connectedness and our capacity to co-regulate
- Music has the capacity to efficiently convey cues of safety to our nervous system
- Cues of safety down regulate the metabolic costly mechanisms of defense and optimize homeostatic processes that support mental and physical health

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Summary

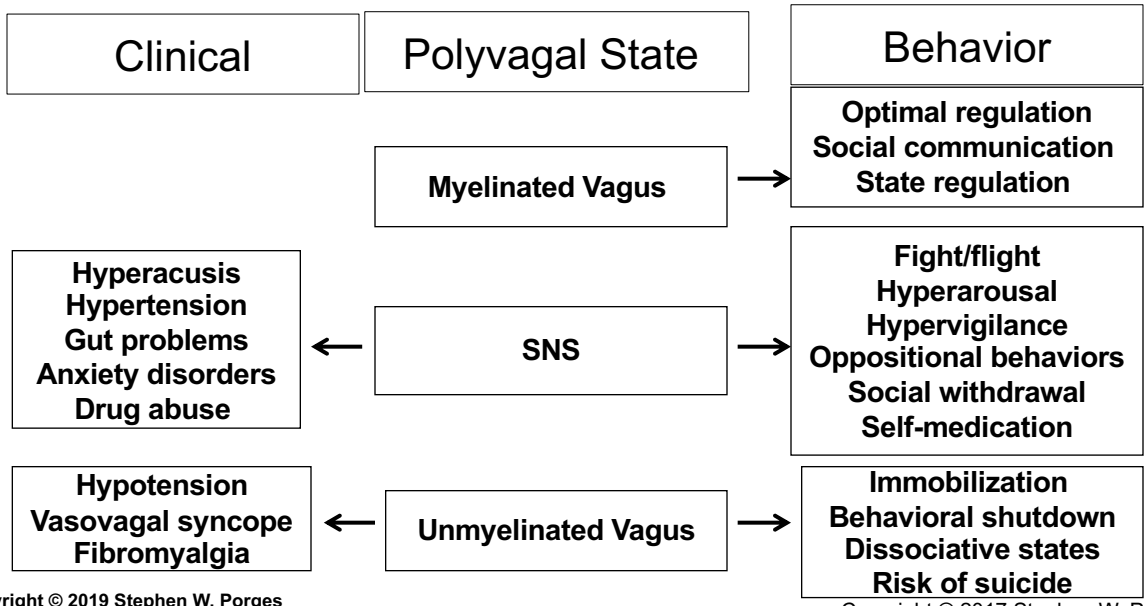
Stephen W. Porges, PhD
Distinguished University Scientist
Founding Director, Traumatic Stress Research Consortium
Kinsey Institute, Indiana University
Professor Psychiatry, University of North Carolina

New Paradigm

- Focuses on autonomic state as an intervening variable
- Shifts autonomic state through portal into the Social Engagement System
- Leverages the evolutionary dependence of our nervous system on cues of safety through neuroception

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New Model



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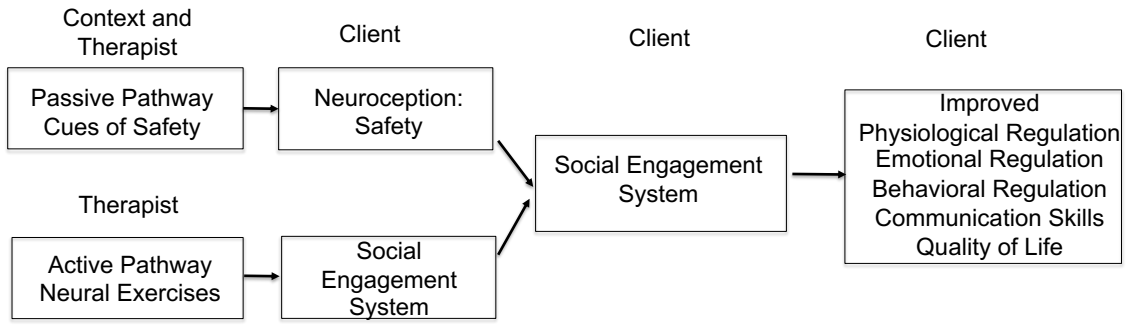
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Polyvagal Processes in Therapy

Stage	Polyvagal Process
1. Recruit ***passive*** pathway • Deliver therapy in a safe context • Witness and respect initial biobehavioral (physiological) state of client • Use social engagement to trigger a state of safety through neuroception	• ***Neuroception* of safety** • Remove predator cues • Express acoustic cues similar to a loving mother (prosodic voice) in voice and background music • Express positive facial expressions and gestures
2. Recruit ***active*** pathway • Synchronous reciprocal interaction (e.g., dance, movement) as a neural exercise (active pathway) • Develop resilience by expanding the window of tolerance	• **Exercise '*vagal brake*'** to enhance autonomic flexibility and emotional regulation. • Resilience emerges while moving between states of immobilization, mobilization, and safety.

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Polyvagal-Informed Therapy



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Polyvagal-Informed Therapies
Principles

1. Acknowledge and respect client's physiological state
2. Exercise the Social Engagement System
   - Via bidirectional brain-body communication system involving the vagus
   - Challenge and enhance the regulation of the heart (ventral vagal pathway via the vagal brake) and the muscles of the face and head (e.g., facial expression, vocalizations).

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Therapy Through the Lens of the Polyvagal Theory

- Witnessing and respecting initial biobehavioral (physiological) state of the client
- Using social engagement to trigger a state of safety through neuroception (passive pathway)
- Synchronous reciprocal interaction as a neural exercise (active pathway)
- Develop resilience by expanding the window of tolerance (range of autonomic state)
- Increase social flexibility and emotional regulation

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Social Engagement System

Observable Deficits in Several Psychopathologies

- Lack of prosody
- Poor eye contact and difficulties in social communication
- Blunted facial expressivity
- Difficulties in behavioral state regulation (hypervigilant, anxious, distractible, impulsive, tantrums, hypoarousal)
- Compromised vagal regulation (e.g., state regulation, digestion)
- Difficulties in listening, following verbal commands, speech-language delays
- Sound sensitivities
- Oral motor defensiveness (e.g., ingestive behaviors)

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Trauma:
Chronic disruption of connectedness

- Shifts ANS state
- Distorts social awareness
- Displaces social engagement behaviors with defensive reactions
  - fight/flight
  - immobilization (dissociation)
- Interferes with healthful reciprocal “co-regulation” of state

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Portals of Treatment
Opportunities to Retune Autonomic Regulation

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Reconnecting the Body with the Brain Through 'Neural' Exercises

- Yoga
- Mindfulness
- Breathing exercises
- Singing/chanting
- Listening
- Playing
- Team sports

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The 'Magical' Gifts of the Social Engagement System

Connecting Brain and Body

- Yoga
- Mindfulness
- Breathing exercises
- Singing/chanting
- Listening
- Playing
- Team sports

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The ‘Magical’ Gifts of the Social Engagement System

Connecting Individuals

- Yoga
- Mindfulness
- Breathing exercises
- Singing/chanting
- Listening
- Playing
- Team sports

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Polyvagal Syndrome: Symptoms

- Lack of prosody
- Poor face-to-face gaze
- Flat affect (facial expressivity)
- Sound hypersensitivities
- Inappropriate posture during social engagement
- Poor mood and affect
- Atypical state regulation
- Low threshold to become fight/flight
- Low threshold to be dissociative
- Lower gut problems
- Fibromyalgia

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Polyvagal Syndrome: Neural Mechanisms

- Special visceral efferents
  - Lack of prosody (IX,X)
  - Poor face-to-face gaze (VII)
  - Flat facial expressivity (VII)
  - Sound hypersensitivities (V, VII)
  - Inappropriate posture during social engagement (XI)
- Vagal regulation
  - Poor mood and affect
  - Atypical state regulation
  - Low threshold to become fight/flight
  - Low threshold to be dissociative
  - Lower gut problems
  - Fibromyalgia

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Polyvagal Syndrome: Stages

- Stage I (dampened Social Engagement System)
  - Blunted affect
  - Lack of prosody
  - Poor face-to-face gaze
  - Flat facial expressivity – especially upper face
  - Sound hypersensitivities
  - Inappropriate posture during social engagement
  - Poor mood and affect
  - Atypical state regulation (difficulties self-regulating and co-regulating)
- Stage II (highly mobilized and reactive)
  - Low threshold to fight/flight
  - Atypical state regulation (varies between apparently calm and reactive)

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Polyvagal Syndrome: Stages

- Stage III (vulnerable to shutdown and dissociation)
  - Atypical state regulation (varies between highly mobilized and shutdown)
  - Low threshold to immobilize and become dissociative
  - Lower gut problems
  - Fibromyalgia
- Stage IV (chronic shutdown and dissociative)

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Summary

- Life threat triggers a very ancient neural circuit that severely limits social engagement behaviors and may distort neuroception resulting in a detection of risk when there is no apparent risk.
- Attempts to socially engage a traumatized individual, rather than calming, may result in defensive strategies of rage and anger.
- Treatment of trauma may require a new model distinct from the traditional strategies of face-to-face dialog.

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Trauma or Safety
How Does Our Body Define Safety?

- We are a traumatized species.
- Feeling safe or being traumatized is not solely determined by the stimuli or context.
- Physiological (autonomic) state (intervening variable) influences our responses to cues of safety and danger.

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Safety
A Misunderstood Construct

- Safety is not the removal of threat.
- Feeling safe is dependent on autonomic state.
- Definable cues trigger an autonomic state that supports feelings of safety or danger or life threat.
- Trauma disrupts safety and shifts autonomic state leading to mental and physical illness.

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Rules to Treat Our Bodies

- Mental and physical health require the turning off of ANS defenses
- Mental and physical health are dependent on understanding and appreciating (i.e., self-compassion) the cues that our nervous system 'requires' to feel safe.
- Feeling safe provides the setting conditions for optimizing physical and mental heath, healing, and promoting social behavior.

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Clinical Impact of Polyvagal Theory

- The theory transforms the client's narrative from a documentary (emphasizing events and objects) to a pragmatic quest for safety with an implicit bodily drive to survive (emphasizing feelings).

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Polyvagal Theory:
Basic Principles

1. Evolution
2. Hierarchical
3. Dissolution
4. Defense systems
   - Fight/flight (sympathetic)
   - Immobilization/shutdown/dissociative (dorsal vagal)
5. Neuroception
6. Social Engagement System
7. Vagal brake

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Polyvagal Theory
New Insights into the ANS

- Current models of health are not consistent with the functional "rules" of the ANS
  - Feedback
  - Hierarchical
- "Organ" defined specialties assume dysfunction originates in a specific organ and not in neural regulation (ANS).
- Sexual abuse and other trauma disrupt the ANS.
- Separation of mental and physical illness is inconsistent with neurobiology.

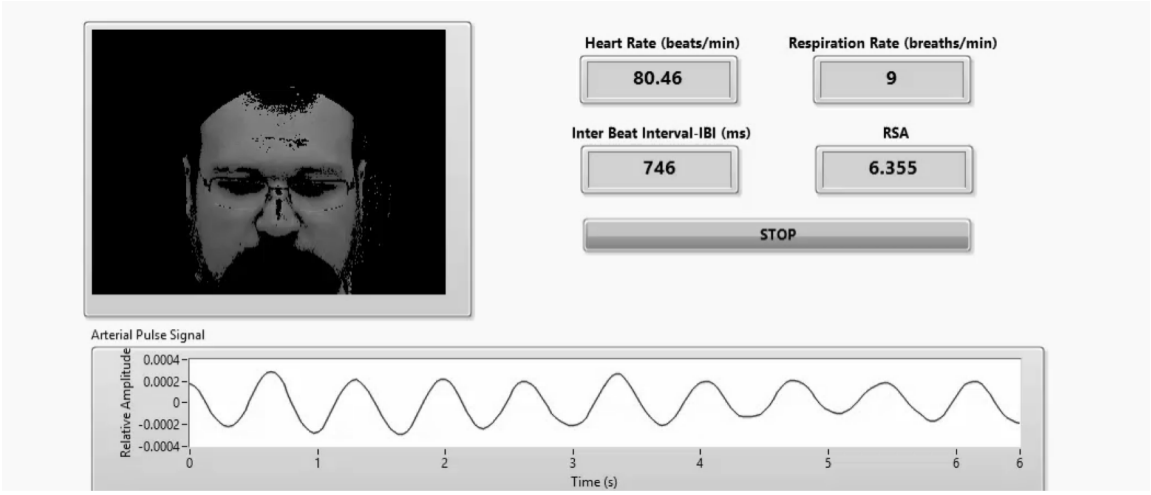
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New Directions

New Technology: PhysioCam



New Technology: PhysioCam



Kinsey Institute
INDIANA UNIVERSITY

Traumatic Stress Research Consortium

Studying the impact of traumatic stress on health, relationships, & sexuality

To become an affiliate: trauma@Indiana.edu

Trauma: Therapies and Perceived Benefits



213 TSRC Therapists

1 = never useful

4 = always useful

The Look of Love:
Inferring Polyvagal State from the Face

The look of love is in your eyes

The look your smile can't disguise

The look of love is saying so much more

Than just the words could ever say

And what my heart has heard

well it takes my breath away

I can hardly wait to hold you

Feel my arms around you



Burt Bacharach & Hal David

The Look of Love:
Inferring Polyvagal State from the Face

The look of love is in your eyes

gaze- orbicularis oculi

The look your smile can't disguise

facial muscles

The look of love is saying so much more

facial, neck, lip muscles

Than just the words could ever say

prosody

Burt Bacharach & Hal David

The Look of Love:
Inferring Polyvagal State from the Face

And what my heart has heard

vagal regulation of the heart, middle ear muscles, face-heart connection

well it takes my breath away

vagal regulation of the bronchi

I can hardly wait to hold you

Feel my arms around you

intimacy (immobilization without fear and not restraint)

Burt Bacharach & Hal David

Polyvagal Blues

Music and Lyrics	Dr. Robert Schwarz
Guitar and Vocals	Dr. Robert Schwarz
Vocals	Dr. Michael Reddy

Additional Information

- Stephenporges.com