

**Polyvagal Theory:
Foundation for a Neurobiological Model of Trauma Treatment**

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**Trauma and Contemplative Practice:
Exploring the Territory**

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Trauma

**Produces severe disruptions of healthy functioning
Individuals, families, groups, nations**

“Complex” trauma magnifies these disruptions

Multiple & repetitive traumatic events

Physical & sexual violence, emotional abuse & neglect

Social injustice, racial trauma, forced migration, war

Intergenerational transmission of complex trauma

Magnifies disruptions exponentially

**Humanity’s “Chain of Pain” disrupts multiple dimensions
of self (Kass, 2007, 2014):**

**Behavioral: Dysregulation of threat appraisal systems;
Hyper-reactivity, dissociative behaviors, numbing**

Cognitive: Distorted Schema - Self, Others, Life

Social-Emotional: Insecure & Disorganized Attachment

**Socio-Cultural: Rejection/fragmentation of identity ;
Loss of voice; Internalized oppression**

Existential-Spiritual: Loss of Coherence, Despair

Result:

Severe Disruptions of Healthy Functioning

Polyvagal Theory

Neurobiological foundation for understanding
how/why

trauma disrupts healthy functioning so severely

role of contemplative practice and mind-body therapies
in trauma treatment

Stephen Porges (2011)

**The Polyvagal Theory – Neurophysiological Foundations of
Emotions, Attachment, Communication, Self-Regulation**

Book spans his distinguished research career:

Measurement of Heart Rate Variability: 1985-1990

Clinical Significance

Vagal Brake

Heart Rate Variability: 1990-2000

Polyvagal Model of Stress Coping: 2000-2010

Explanation of Polyvagal Theory for
Early-Career Clinicians & Counseling Students:

**Kass & Trantham (2014) Perspectives from Clinical Neuroscience:
Mindfulness and Therapeutic Use of the Arts.**

in L. Rappaport (Ed.) **Mindfulness and the Arts Therapies:
Theory and Practice**

Vagal Brake

Heart Rate

Heart tissue contracts naturally

Pacemaker of heart: Sinoatrial node (SA) (100-120 bpm)

Faster than “healthy normal rate”

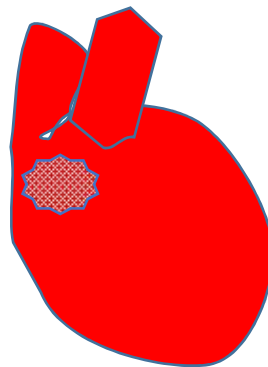
Sinoatrial Node:

Heart muscle

(in wall of right atrium)

Highest degree of rhythmicity

Pacemaker



Heart

Vagus Nerve (PNS) plays a key regulatory function:

Slows heart to healthy rate (60-80bpm): “Vagal brake”

Autonomic Nervous System: Regulates essential organs

Traditional emphasis (Cannon, adrenaline)

Sympathetic Nervous System (SNS): Activation

Parasympathetic Nervous System (PNS): Relaxation

Benson: Intentional interruption of SNS (1975)

Polyvagal Theory: PNS - Foundation for resilient stress coping

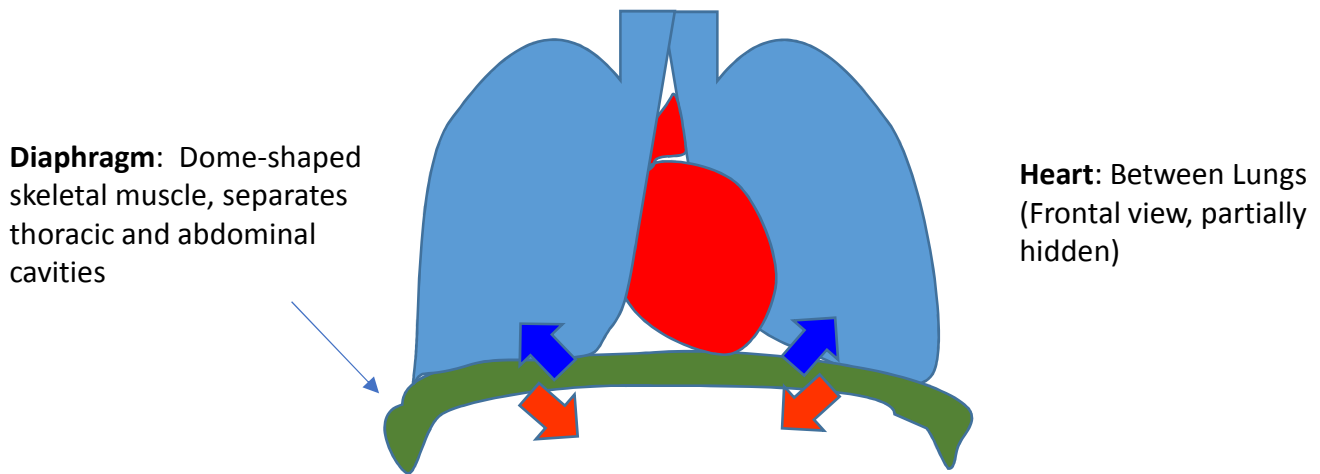
Vagal Brake Release: Heart Rate increases (w/o SNS activation)

Renews: Heart Rate decreases

Capacity for rapid changes in metabolic activation w/o Fight-Flight

Potential for flexible, resilient coping

Heart Rate Variability: Resource for Resilient Coping



Inhalation

Diaphragm contracts centrally & downward
Lungs expand vertically
(Abdominal cavity expands, allowing expansion of lungs)

Exhalation

Diaphragm relaxes, returning to dome shape
Lungs deflate vertically
(Abdominal cavity shrinks, supporting exhalation)

Relationship Between Breathing & Heart Rate:

Inhalation: Heart Rate Increases

Exhalation: Heart Rate Decreases

Respiratory Sinus Arrhythmia (RSA)

Heart Rate Variability (HRV)

Deep Breathing = High Vagal Tone = High HRV

High HRV = Healthy Heart & Increased Resilience

Positive Coping Skills

Polyvagal Theory:

Hierarchical Model of Stress Coping: Three Modes

1-Resilient Coping

High Vagal Tone = Activation & Relaxation w/o SNS

“Internal Composure” vs Fight-Flight (Kass & Trantham, 2014)

Reflective & Accurate Stress Appraisal

Social Engagement (Social Support = Not Alone)

Primary Brain Area: Pre-frontal cortex (humans)

2-Fight-Flight

Vagal Brake releases, enabling SNS activation

High activation necessary during danger/physical challenge

Stress appraisal is reactive, not always accurate

Reduced capacity for social engagement when tense

Primary Brain Area: Limbic system/Amygdala (mammals)

3-Freeze

Danger is overwhelming; perceived helplessness

“Ancient” PNS protective system takes over

Dramatic shift in metabolic & psychological processes

Body freezes

Physical & psychological numbing

Social engagement: minimal, isolated, chaotic

Memory: dissociative & implicit (right brain/somatized)

Dissociative mental and physical processes

SNS activation often persists (high adrenaline/ high anxiety)

Disorganized, ineffective activity

Primary Brain Area: Brain Stem (reptiles)

Core Concept in “Polyvagal” Theory

Vagus Nerve

Primary circuit of Parasympathetic Nervous System (PNS)

Originates in Brain Stem (Cranial Nerve # 10)

Connected to Reticular Activating System

Consciousness, Attention, Sleep

Somatic & Visceral Motor Functions (Heart, lungs)

Two Sub-Circuits

Dorsal Vagal Complex (DVC):

Ancient “Reptilian” Vagal Circuit

Activates freeze / immobilization behaviors

Reptiles (cold-blooded): Need to conserve energy

Dorsal Motor Nucleus, Brain Stem (Medulla)

Relatively slow signal transmission (Fiber C)

On / Off

Not capable of subtle gradations

Not responsive to “nuances” of environment

Ventral Vagal Complex (VVC):

More recent “Mammalian” Vagal Circuit

Regulates HRV: Integrated responsivity of heart & lungs

Mammals (warm-blooded): High energy management

Nucleus Ambiguus, Brain Stem (Medulla)

Fast signal transmission (Fiber B: myelinated sheathing)

Subtle gradations & rapid response to environment

Approach and Withdrawal

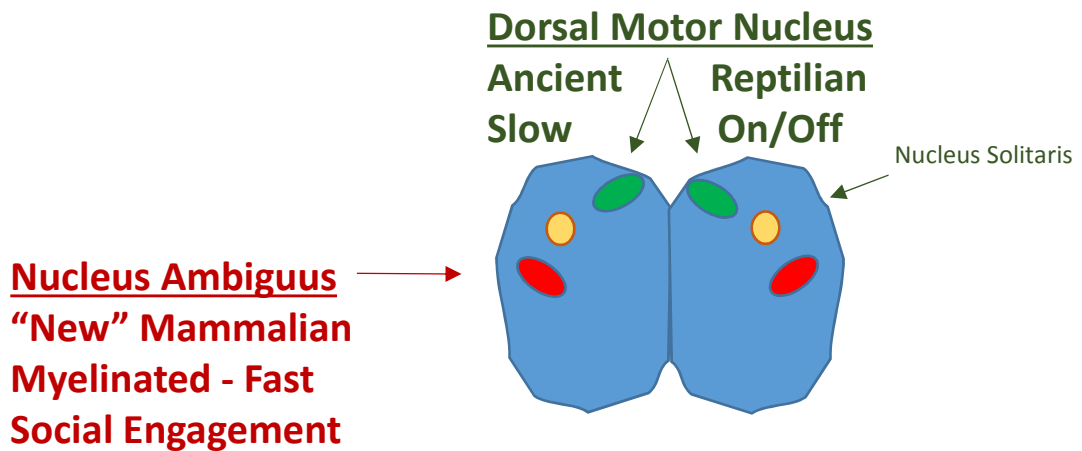
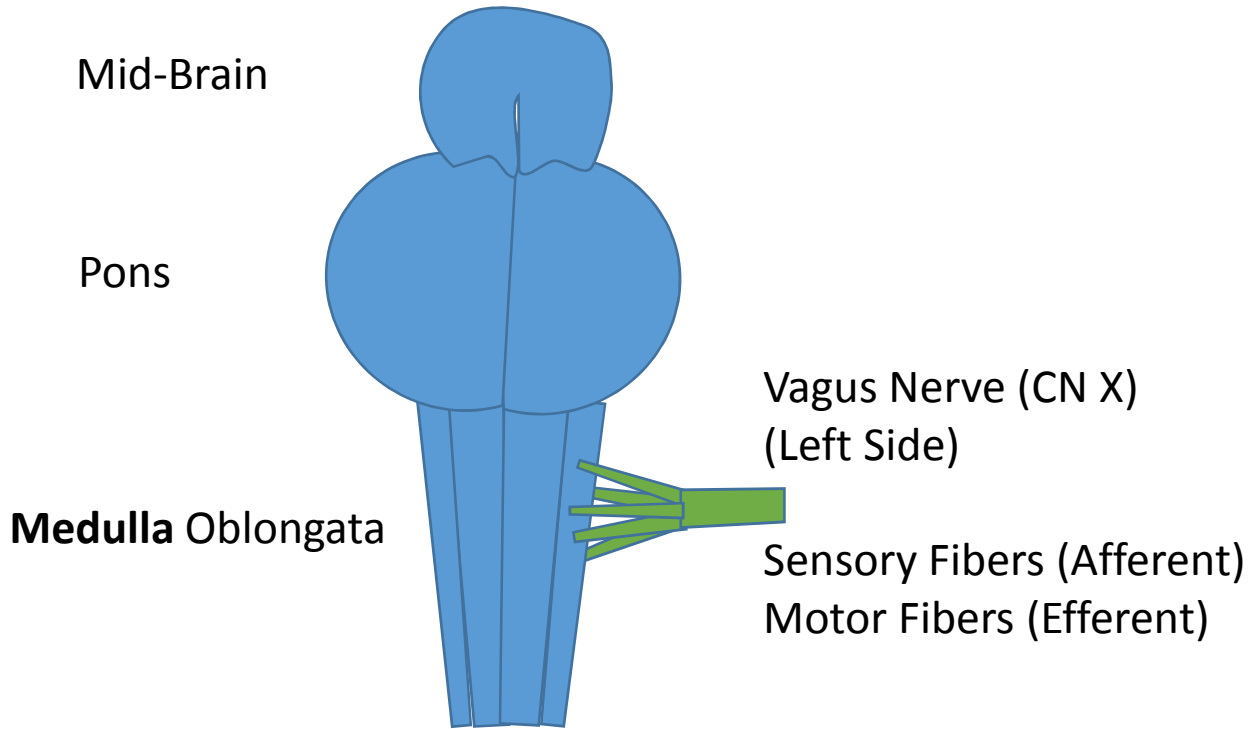
Connections to heart & lungs (regulates HRV)

Connections to cranial nerves for facial expression & voice

Cardio-vascular system ↔ Social engagement system

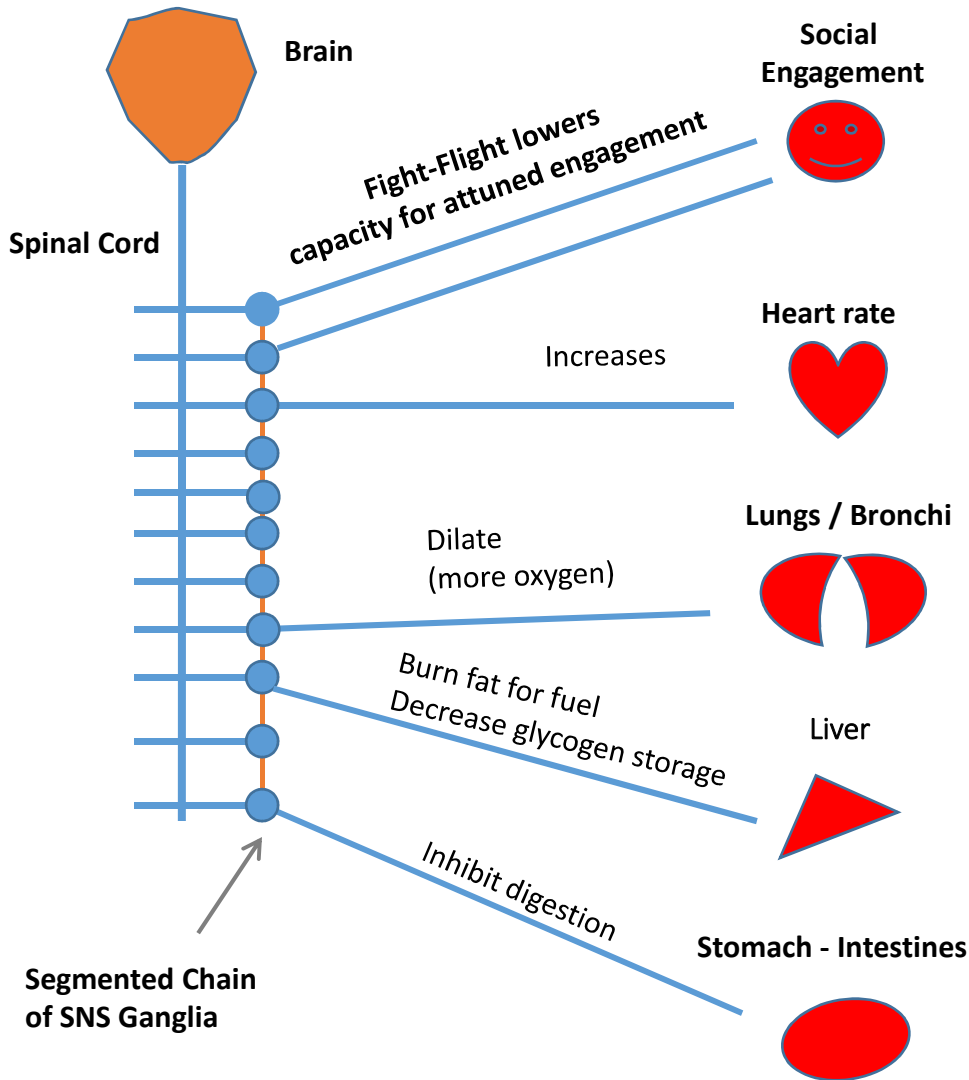
Vagus Nerve

Brainstem - Ventral View



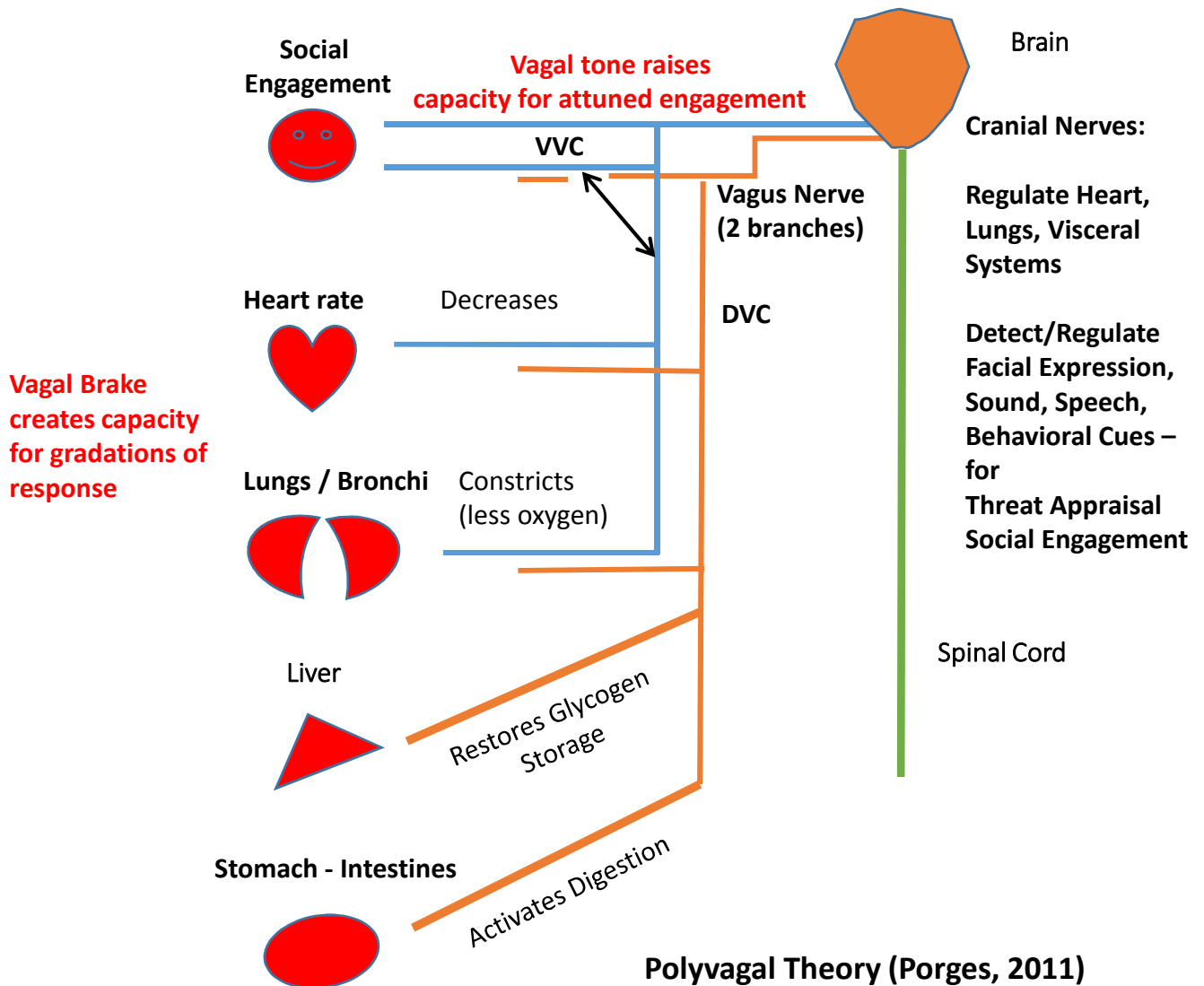
Cross Section of Medulla Area of Vagus Nerve (Middle of Inferior Olivary Complex)

Sympathetic Nervous System (SNS)



SNS: Second Tier of Stress Coping
Triggers fight - flight arousal when danger is perceived
After release of vagal brake

Parasympathetic Nervous System (PNS)



Ventral Vagal Complex (VVC):

Mammalian, myelinated vagus

Regulates vagal tone / HRV

Tier 1: Resilient Coping

Dorsal Vagal Complex (DVC):

Reptilian vagus

Tier 3: When fight-flight fails

Activates freeze / immobilization

Central Principles:

Sensorimotor, Bio-Energetic & Gestalt Therapies (With Mindfulness Practice and Hatha Yoga)

Traumatic Stress = Hyper-Arousal = Fight – Flight – Freeze

Psychophysiological Hyper-Reactivity and/or Numbing
Chronic Tension in Musculature

Protective Suppression of Core Emotions:

Neuromuscular Defense Mechanisms
Chronic Contraction of “Transverse” Muscle Systems (Reich)

Protective Repression of Traumatic Memories:

Implicit Memory (Lack of “Narrative” memory)
Somatic, Intrusive, Fragmentary, Dissociative
Suspended in Limbic System, Right Brain, & Body
Transverse Neuromuscular Defense Mechanisms (Reich)

Primary Therapeutic Methods:

Create Safety

Empathic Attunement; Therapeutic Alliance
Increase HRV; Stress-Coping Skills (CBT; EMDR)

Awareness and Release of Neuromuscular Tension

Range: Gentle Breath Work
Subtle Movement Work
Vigorous Muscular Work
Sculpt/Enact Emotions - Integrate “Parts”

Releases suppressed emotions

Restores repressed memories

Facilitates free flow of emotional energy

Increased capacity for healthy contact and withdrawal