

Social Connectedness as a Biological Imperative: Implications of Polyvagal Theory in the Classroom

Stephen W. Porges, PhD

Distinguished University Scientist, Kinsey Institute, Indiana University

Professor Psychiatry, University of North Carolina

Polyvagal Theory

- A brain-body science of connection, trust, and safety
- Leading to optimized mental and physical health and social behavior.
- Can the principles of Polyvagal Theory be applied in the classroom?

Polyvagal Theory: Better Living Through Neurobiology

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

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Better Education Through an Understanding of Neurobiology

- How does neurobiology relate to education?
 - Improve learning
 - Optimize social behavior within the classroom
- The traditional training does not prepare teachers for the problems they face in the classroom.
 - Teacher education focuses on learning and cognitive processes
 - The most relevant problems in the classroom are related to behavior and the underlying physiological state
- How would educators embrace a classroom of students (independent of age) who were able to relate their behavioral state?

Visualize a Polyvagal-Informed Classroom

- Are the prevalent models of education appropriate?
 - Education is steeped behavioral learning theory (S-R models).
 - Polyvagal Theory individualizes and dynamically expands the model from S-R to S-O-R. Where the 'O' is the physiological state of the student.

Visualize a Polyvagal-Informed Classroom

- Do feelings of safety and trust facilitate learning, while feelings of fear and danger interfere with learning?
- Do teaching environments facilitate learning, creativity, social behavior, and feelings of safety and trust?

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

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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.

A Biological Imperative

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

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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.

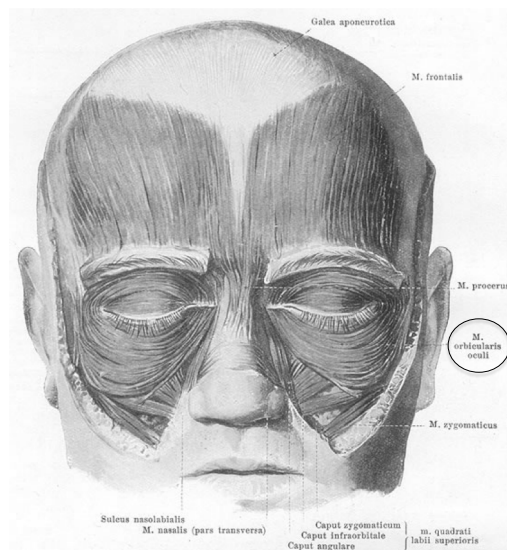
Dobzhansky, T. (1973). Nothing in Biology Makes Sense Except in the Light of Evolution. *American Biology Teacher*, 35 (3): 125–129.

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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Muscles of the Upper Face Signal Safety and Trust



Co-regulation: Phase I Face-to-Face Behaviors

- Facial expressions
- Gestures
- Prosodic vocalizations

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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 moments of intimacy with feelings of trust, safety, and love
- Does not require face-to-face interactions
- A challenge for mammals! (requires safety)

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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

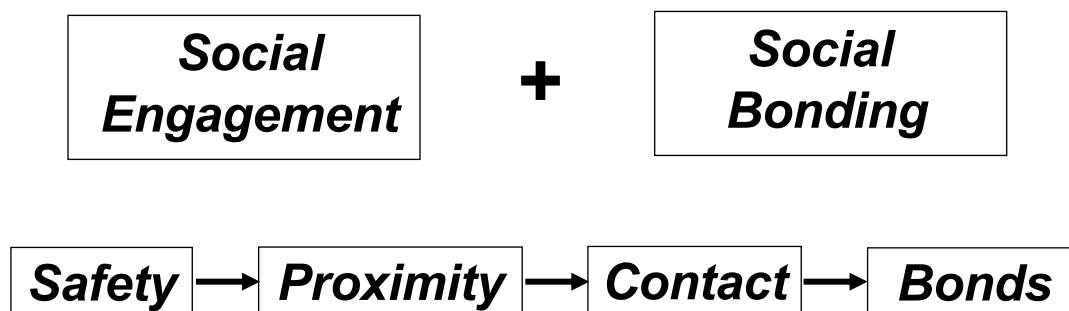
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Connectedness and Social Communication

- 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?
- Would feeling connected and safe lead to better learning?

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Building “Blocks” of Healthy Relationships

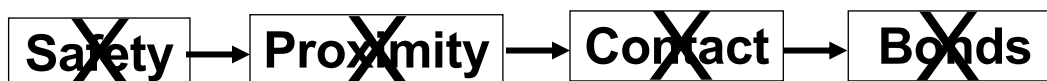


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Trauma Disrupts Connectedness

- Difficulties in feeling “safe” with others
- Difficulties in being in physical proximity with others
- Difficulties being touched or touching others
- Difficulties establishing “trusting” social relationships



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Trauma Disrupts Co-regulation and Fosters Defense

- Disconnect in face-to-face interactions disrupts opportunities to co-regulate
- Lowers thresholds to trigger biobehavioral states of defense
- Lowers thresholds to express disruptive classroom behaviors

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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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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
- Lowers threshold to express disruptive behaviors in the classroom

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Polyvagal Theory

- Provides a theoretical basis for a neuroscience of safety and responses to threat.
- 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.

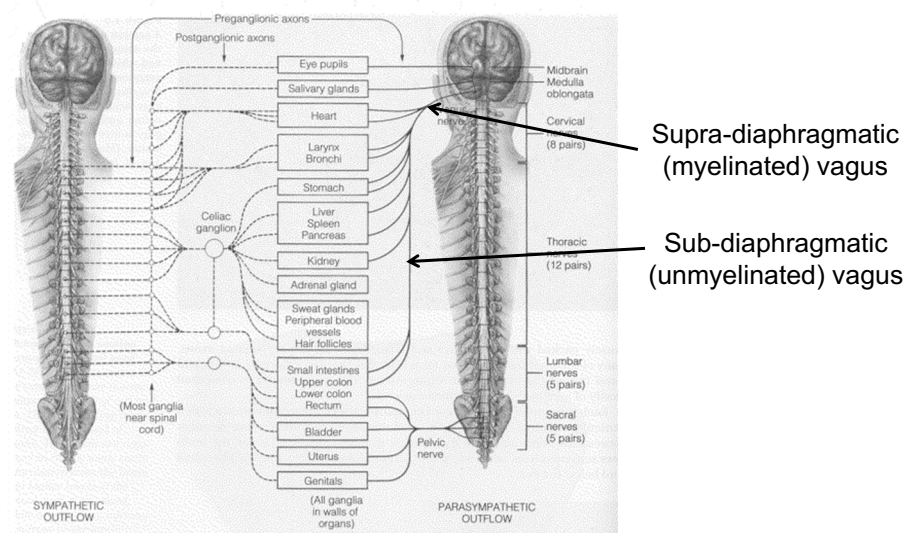
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Polyvagal Theory

- 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

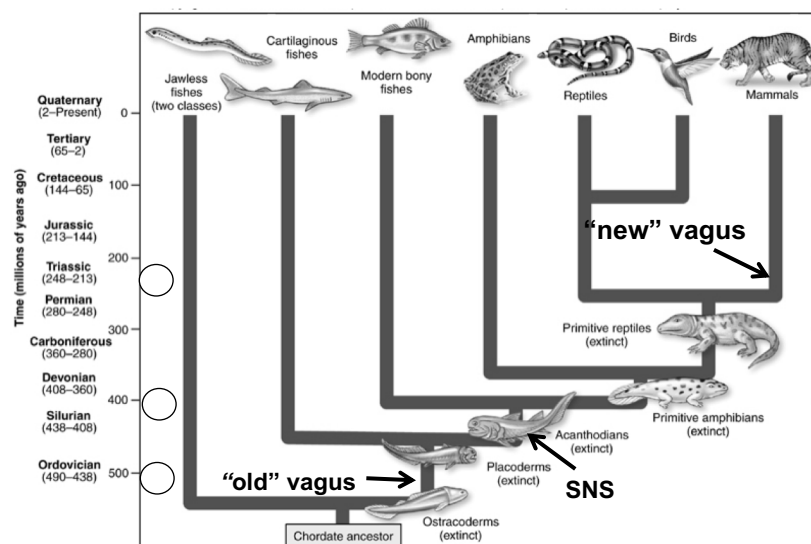


Immobilization with Fear

- Immobilization as a defense strategy
 - A missing concept in psychology and psychiatry
 - 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)

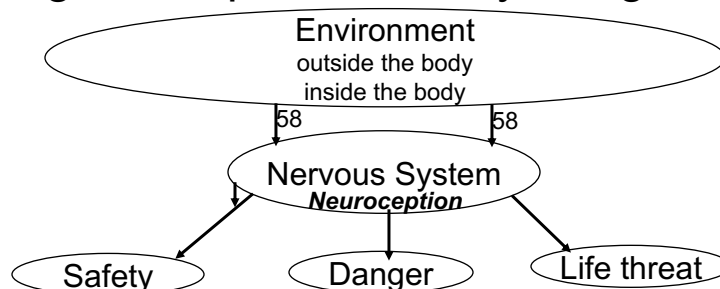
- “Fight-flight” behaviors

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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The Quest for Safety: Emergent Properties of Physiological State



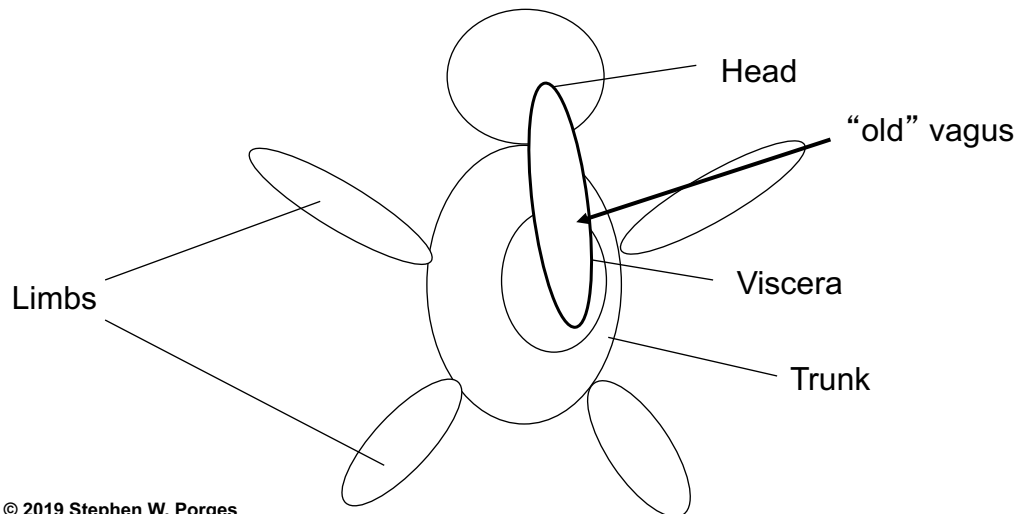
Spontaneously engages others
eye contact, facial expression, prosody
supports visceral homeostasis

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.

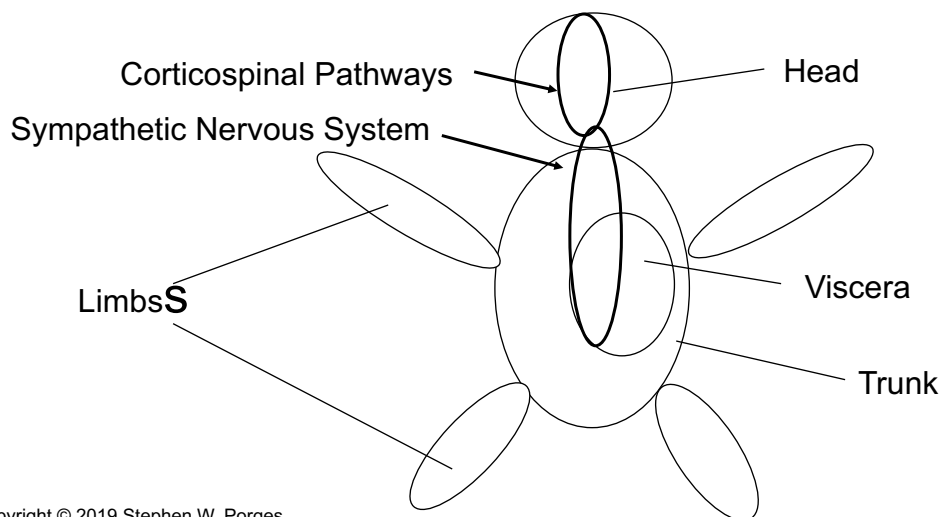
personal communication

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

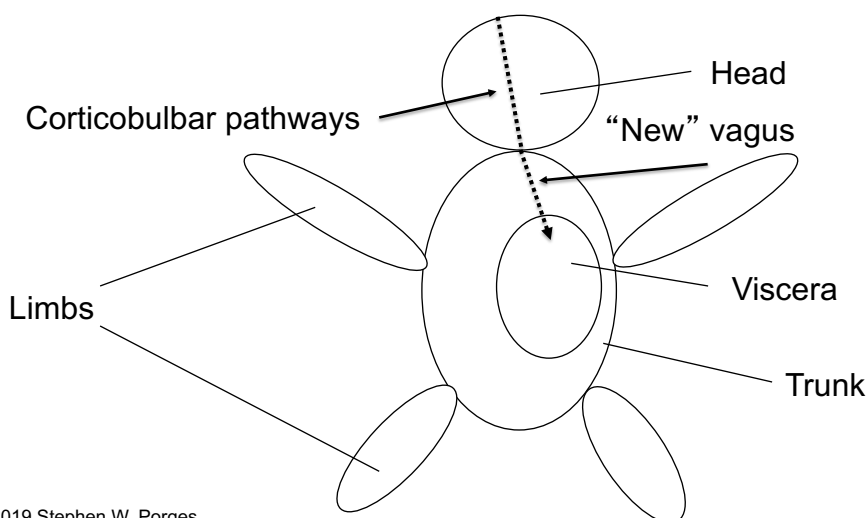
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Phylogenetic Organization of the ANS: The Polyvagal Theory



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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 face reflects Polyvagal state.

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Health Consequences of Disrupting ANS Function

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

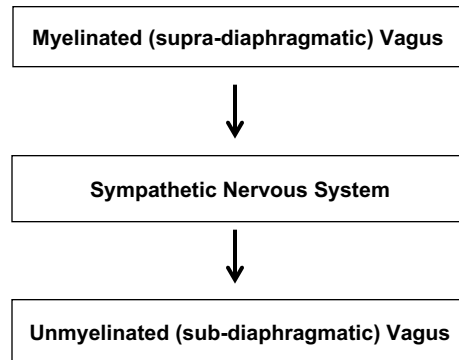
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Dissolution

- “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.

Hierarchical Model of Autonomic State Dissolution (Evolution in Reverse)



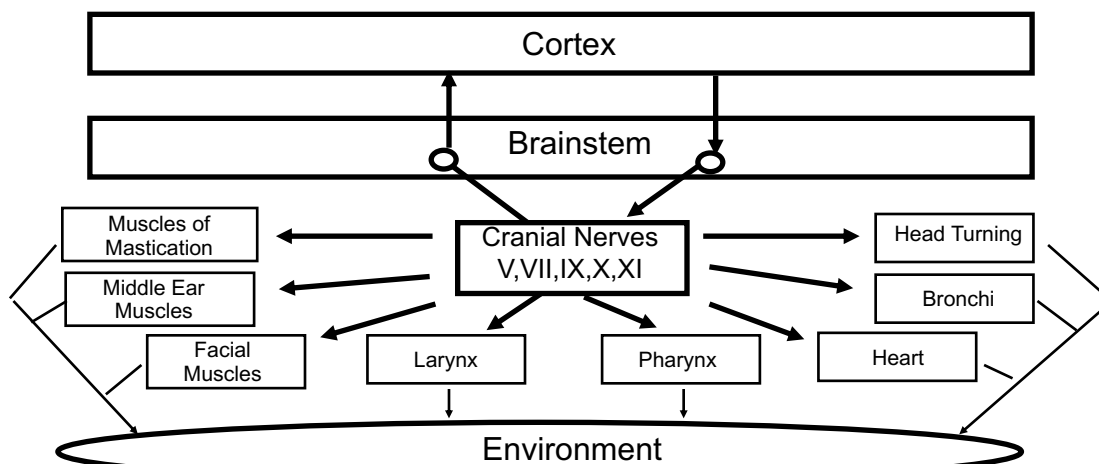
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Dissolution

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

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Deconstructing the Social Engagement System



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Social Engagement System

Observable Deficits in Educational Environments?

- Lack of prosody (intonation in voice)
- 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 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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Detecting Safety: Neuroception

- 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).

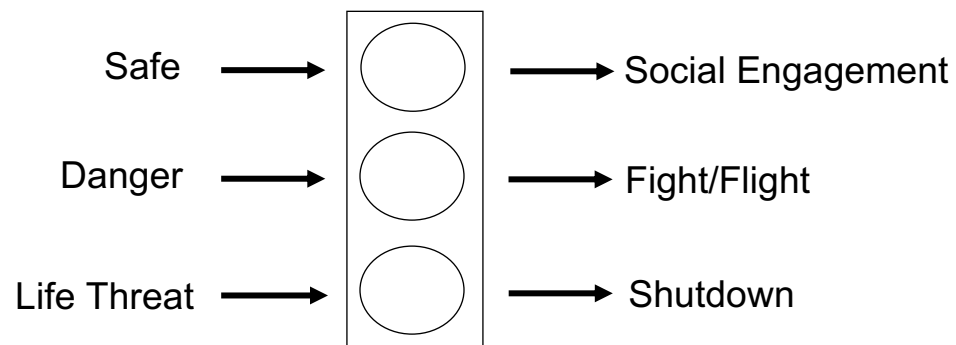
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Neuroception

- Behaviors

Environment

Behavior



Physiological State

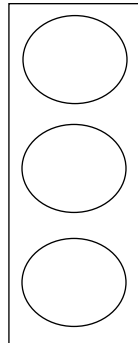
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Neuroception

- Behaviors

Environment

Safe



Behavior



Social Engagement



Play



Intimacy

Physiological State

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Three Circuits, Five States

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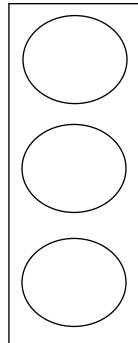
Social Communication

- Behaviors

Circuit

Behavior

VVC



Social Engagement

Physiological State

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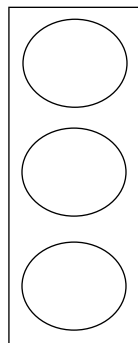
Play/Dance

- Behaviors

Circuit

Behavior

VVC



Social Engagement

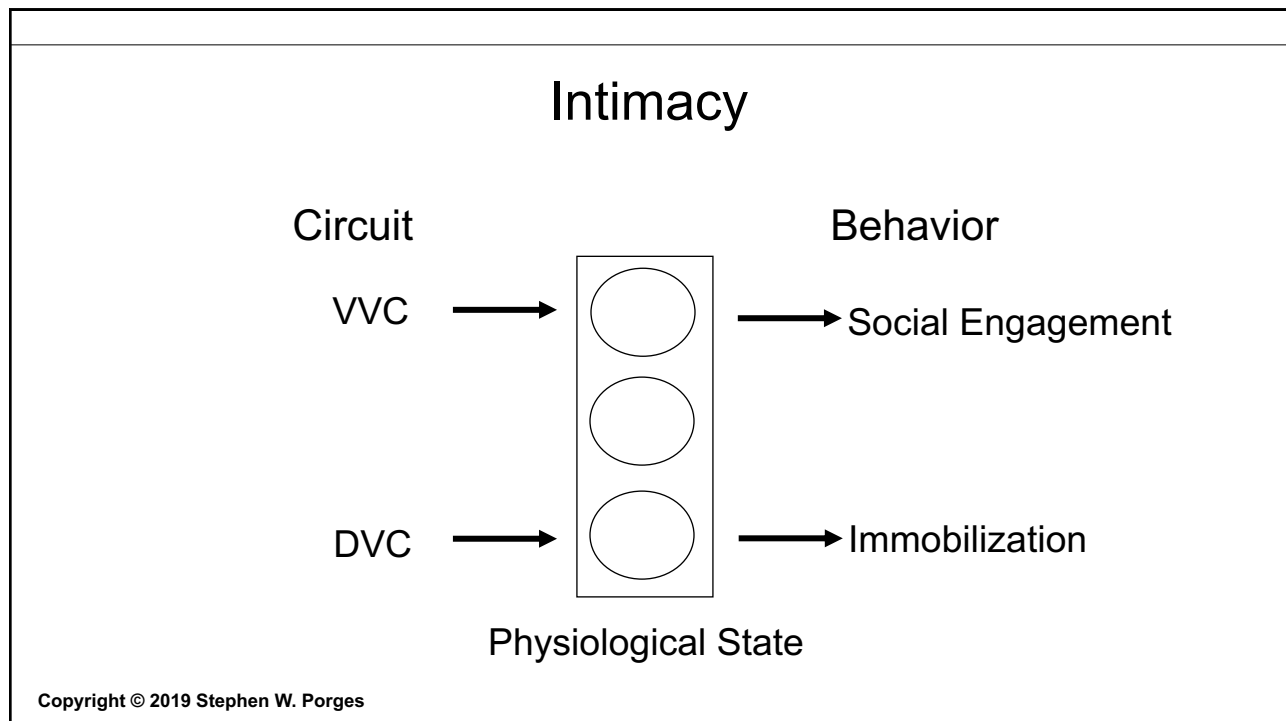
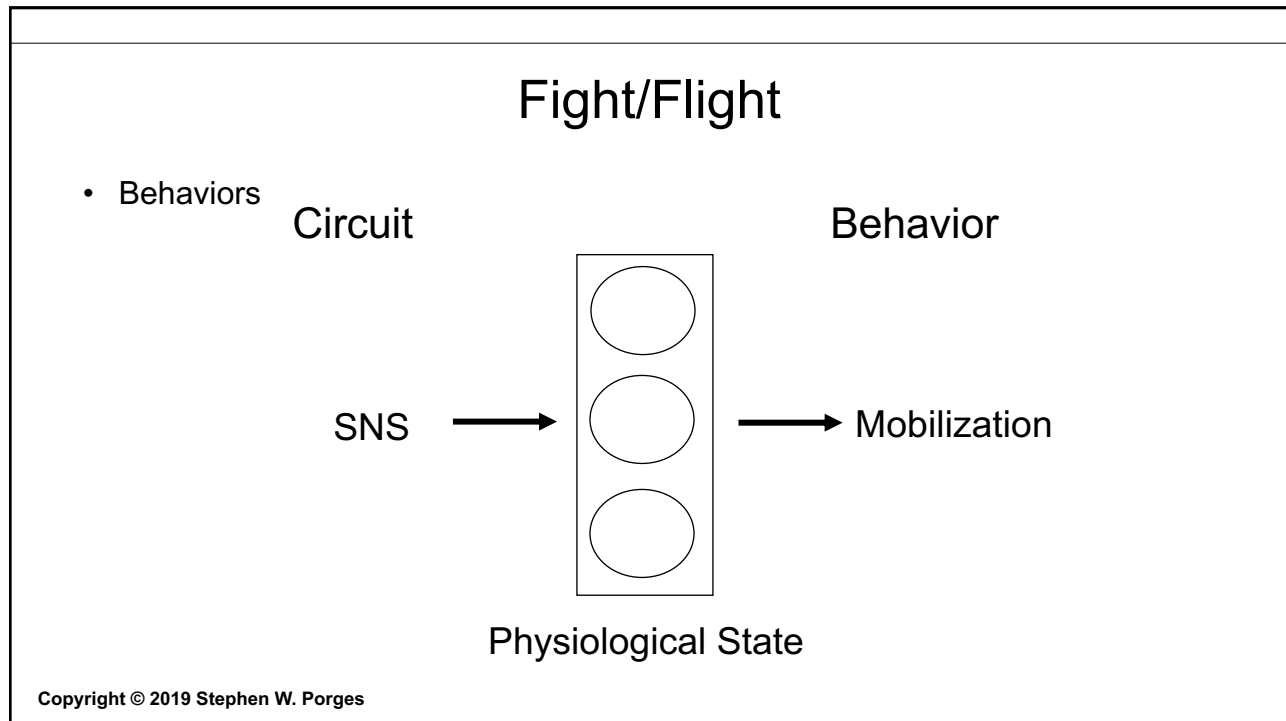
SNS



Mobilization

Physiological State

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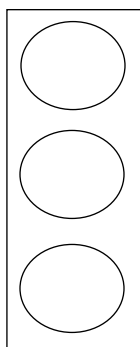


Shutdown/Dissociation

Circuit

Behavior

DVC



Immobilization

Physiological State

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Principles of Therapy, Teaching, and Play are Similar

- 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, teaching, and therapy are neural exercises

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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 health, healing, and promoting social behavior.
- Feeling safe provides the setting conditions for optimizing learning!

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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

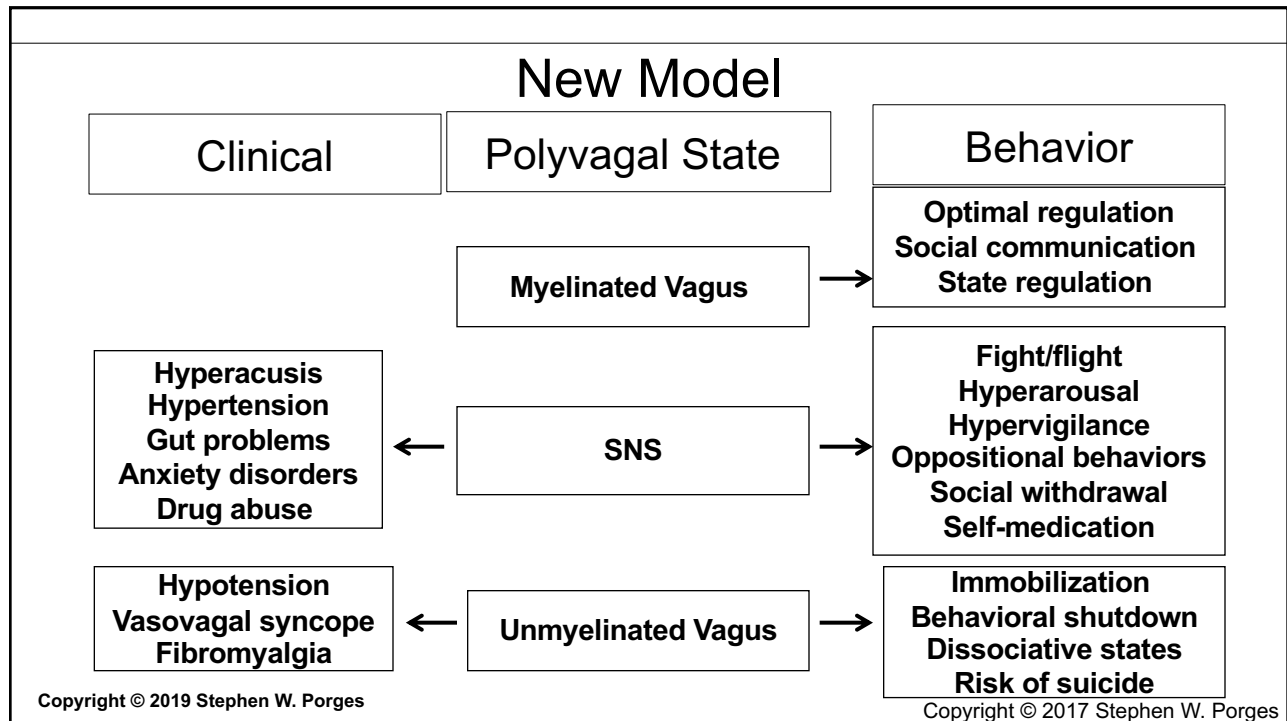
- When you've lived with betrayal
- Starting right off from the cradle
- You find trust is the rarest thing to find
- Nobody can truly be your friend
- You might pretend but you don't really trust them
- 'Cause it's a real short trip from "got your back" to "backstabber"
- Strung up so high I'm off the meter
- Something between nerves and being eager
- Wound up too tight, I can't come down
- Way too high
- Head spinning 'round and 'round

Polyvagal: A Song by Alice Minguez

- 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!

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



Polyvagal Syndrome?

- 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?

- 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?

- 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 dissociation)

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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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Impact of Polyvagal Theory on Clinical Sciences

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

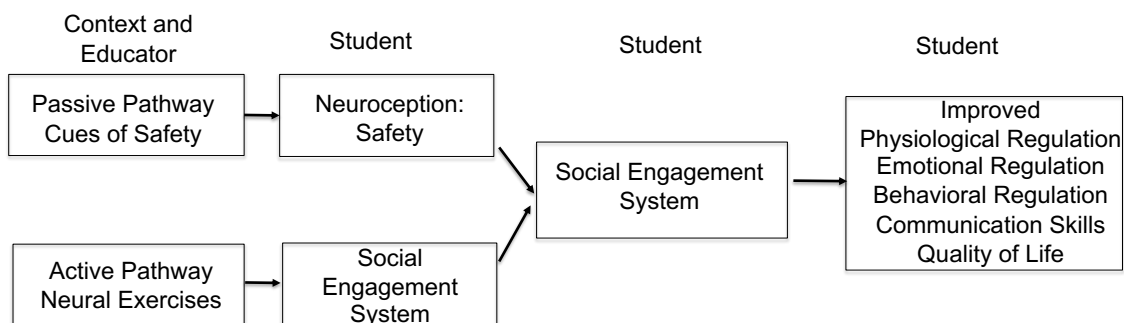
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Reconnecting the Body with the Brain Through 'Neural' Exercises

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

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Polyvagal-Informed Education



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Polyvagal Processes in Education

Stage	Polyvagal Process
1. Recruit passive pathway <ul style="list-style-type: none"> • Deliver information in a safe context • Witness and respect initial biobehavioral (physiological) state of student • Use social engagement to trigger a state of safety through neuroception 	<ul style="list-style-type: none"> • Neuroception of safety <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Synchronous reciprocal interaction (e.g., dialog, movement) as a neural exercise (active pathway) • Develop resilience by expanding the window of tolerance 	<ul style="list-style-type: none"> • 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 Processes in Education

Stage	Polyvagal Process
1. Experience teaching and learning in safe context	<ul style="list-style-type: none"> • Neuroception of safety <ul style="list-style-type: none"> • Remove predator cues • Use prosodic voice (e.g., mother's lullaby)
2. Perform 'neural' exercises with students moving between biobehavioral states	<ul style="list-style-type: none"> • Exercise 'vagal brake' to enhance autonomic flexibility and resilience
3. Become explicitly aware of subjective experiences associated with each yours and your student's biobehavioral states	<ul style="list-style-type: none"> • Mental exercises involving brain functions that are dependent on maintaining 'ventral' vagal state
4. Develop personal narratives with students that 'contain' reactivity via new 'neural expectancies' of safety while shifting biobehavioral states	<ul style="list-style-type: none"> • Emergent property of resilience, while moving between states of immobilization, mobilization, and safety ('ventral' vagal, social engagement).

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Education Through the Lens of the Polyvagal Theory

- Witness and respect biobehavioral (physiological) state of the student
- Using social engagement to trigger a state of safety through neuroception (passive pathway)
- Synchronous reciprocal interaction as a neural exercise (active pathway)
- Exercise the student's (and your own) Social Engagement System
 - Via bidirectional brain-body communication system involving the vagus and striated muscles of the face and head
 - Challenge and enhance the regulation of the physiological state (i.e., ventral vagal pathway slowing heart rate via the vagal brake) and the muscles of the face and head (e.g., facial expression, prosodic vocalizations).
- 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 the Classroom

- 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-Informed Education

Rules to Treat Our Bodies

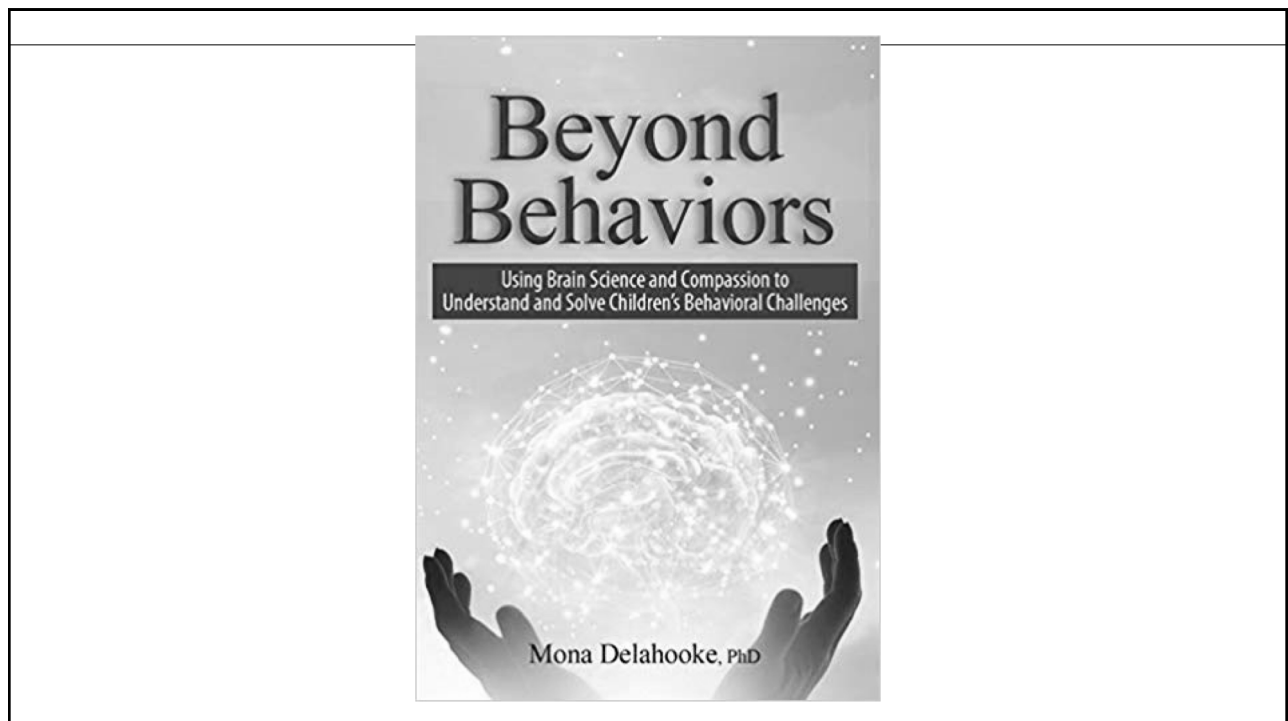
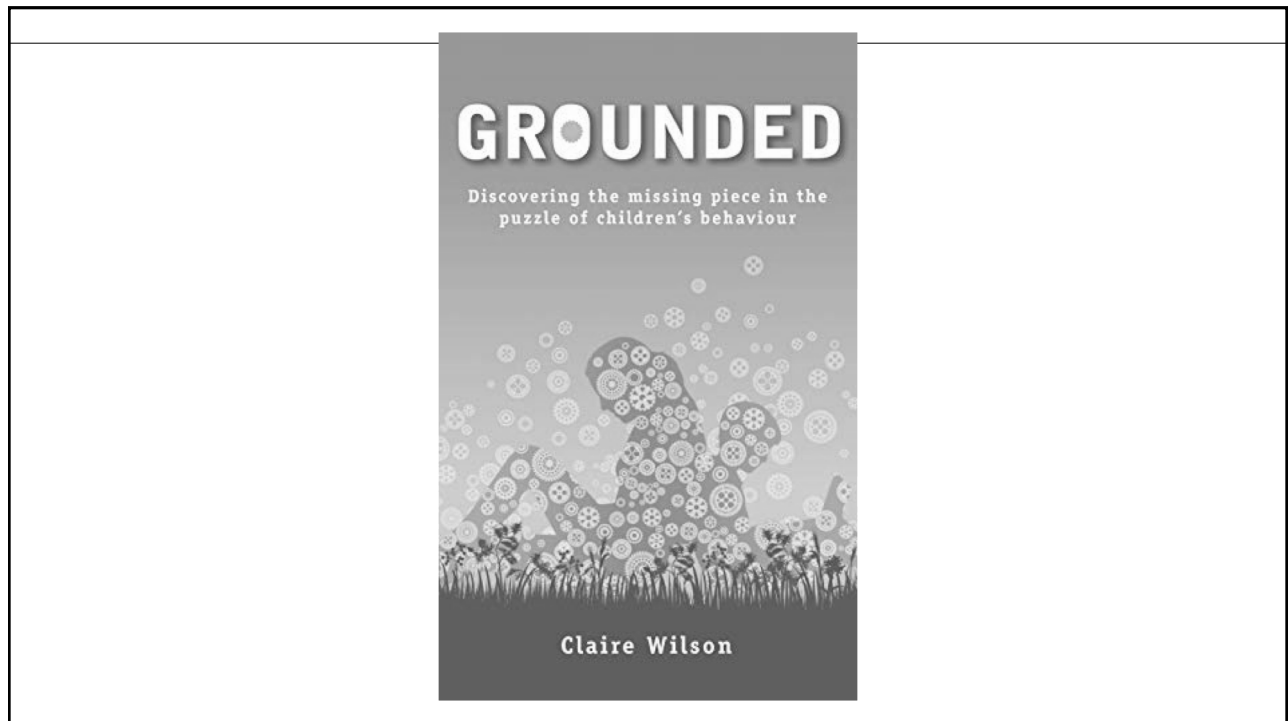
- Optimal learning and social behavior require the turning off of ANS defenses
- Optimal academic success is dependent on educators understanding and appreciating the cues that their nervous system and the nervous system of their students 'require' to feel safe.
- Feeling safe provides the setting conditions for optimizing physical and mental health, healing, and promoting efficient learning and positive social behavior.

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Education Through the Lens of the Polyvagal Theory

- Witness and respect the student's biobehavioral (physiological) state
- Use social engagement to trigger a state of safety through neuroception (passive pathway)
- Use synchronous reciprocal interactions 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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Summary

- Life threat triggers a very ancient neural circuit that severely limits social engagement behaviors, the ability to learn, 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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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.
- The important role of educator as an observer of student biobehavioral state in the classroom

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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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Traumatic Stress Research Consortium

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

To become an affiliate: trauma@Indiana.edu

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

Additional Information

- Stephenporges.com