



The Polyvagal Theory and the Face-Heart Connection: Neural Mechanisms Mediating Social Behaviour and Health

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Neuroception

- The nervous system's detection of risk in others – *without awareness*.
- Can dampen defensive systems and facilitate social behavior.
- Can promote defensive strategies of mobilization (fight/flight) or immobilization (shutdown, dissociation).

Faulty Neuroception

Challenges may:

1. Shift physiological and behavioral state
2. Distort social awareness
3. Displace spontaneous social behaviors with defensive reactions

A Neural Love Code: The Body's Need to Engage and Bond

- A biological quest for “safety” in proximity of another
- A major mediator of mental and physical health
- Explains the health benefits of social support

Feature Detectors:

The importance of face-to-face interactions

A Neural Love Code: Phase I

The importance of face-to-face interactions

A Neural Love Code: Phase II

The importance of physical contact while immobilizing without fear

The Neural Love Code

*Social
Engagement*

+

*Social
Bonding*

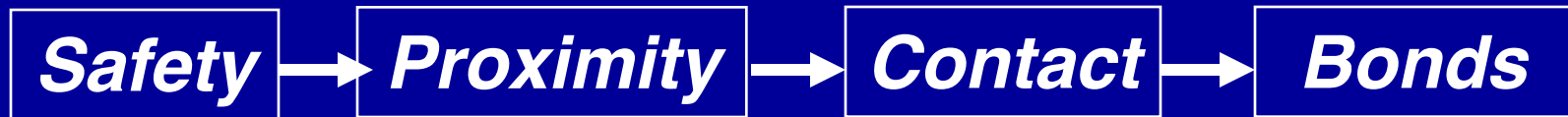
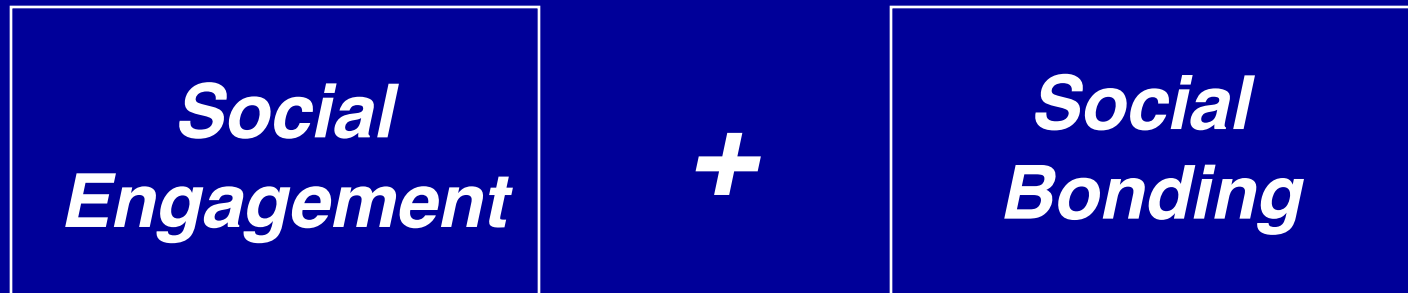
Safety

Proximity

Contact

Bonds

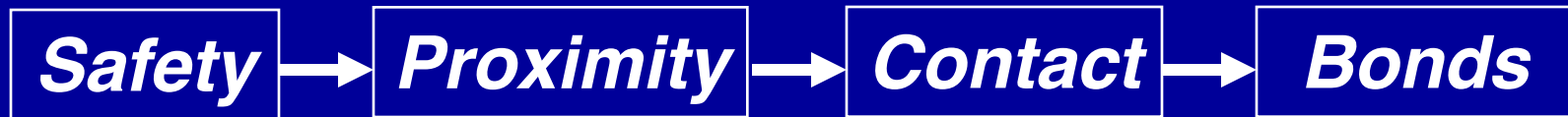
Building “Blocks” of Healthy Relationships



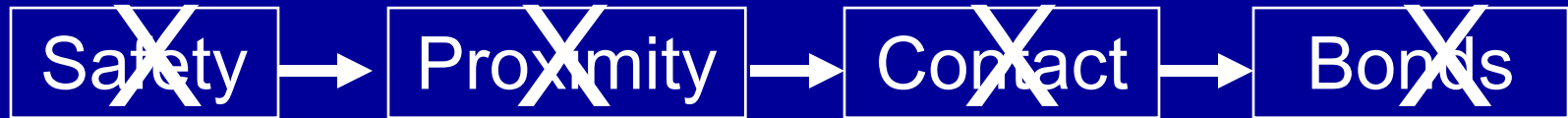
Features of Mental Health Problems

Difficulties

1. Feeling “safe” with others
2. Being in physical proximity with others
3. Being touched or touching others
4. Establishing “trusting” social relationships



Features of Mental Health Problems



What physiological mechanisms mediate social engagement and immobilization without fear?

Polyvagal Theory: Clinical Applications

- Proposes that therapeutic strategies should focus on turning off defenses
- Identifies the mechanisms for turning on and off defenses.
- Provides insights into clinical strategies to dampen defensive reactions

The Polyvagal Theory

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

The Quest for Safety:

Emergent Properties of Physiological State

Environment
outside the body
inside the body

Nervous System
Neuroception

Safety

Danger

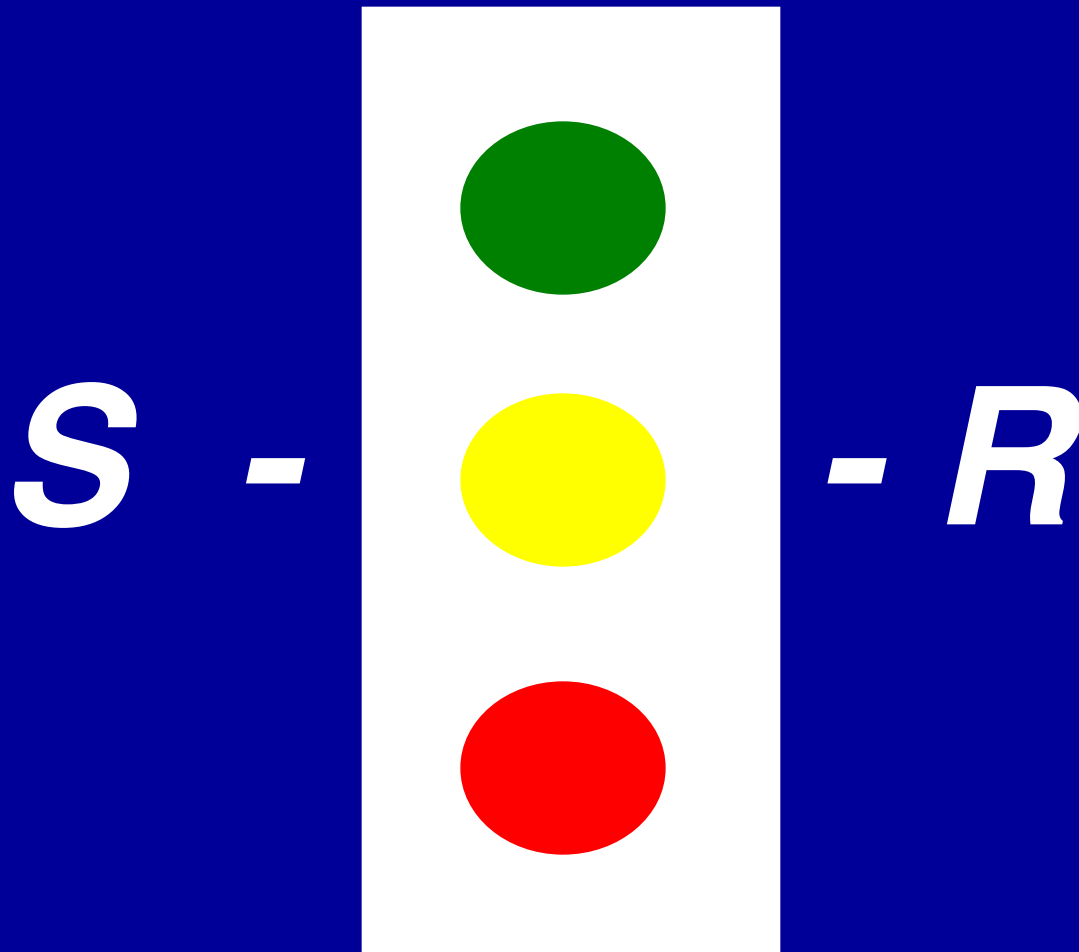
Life threat

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

Defensive strategies
death feigning/shutdown (immobilization)

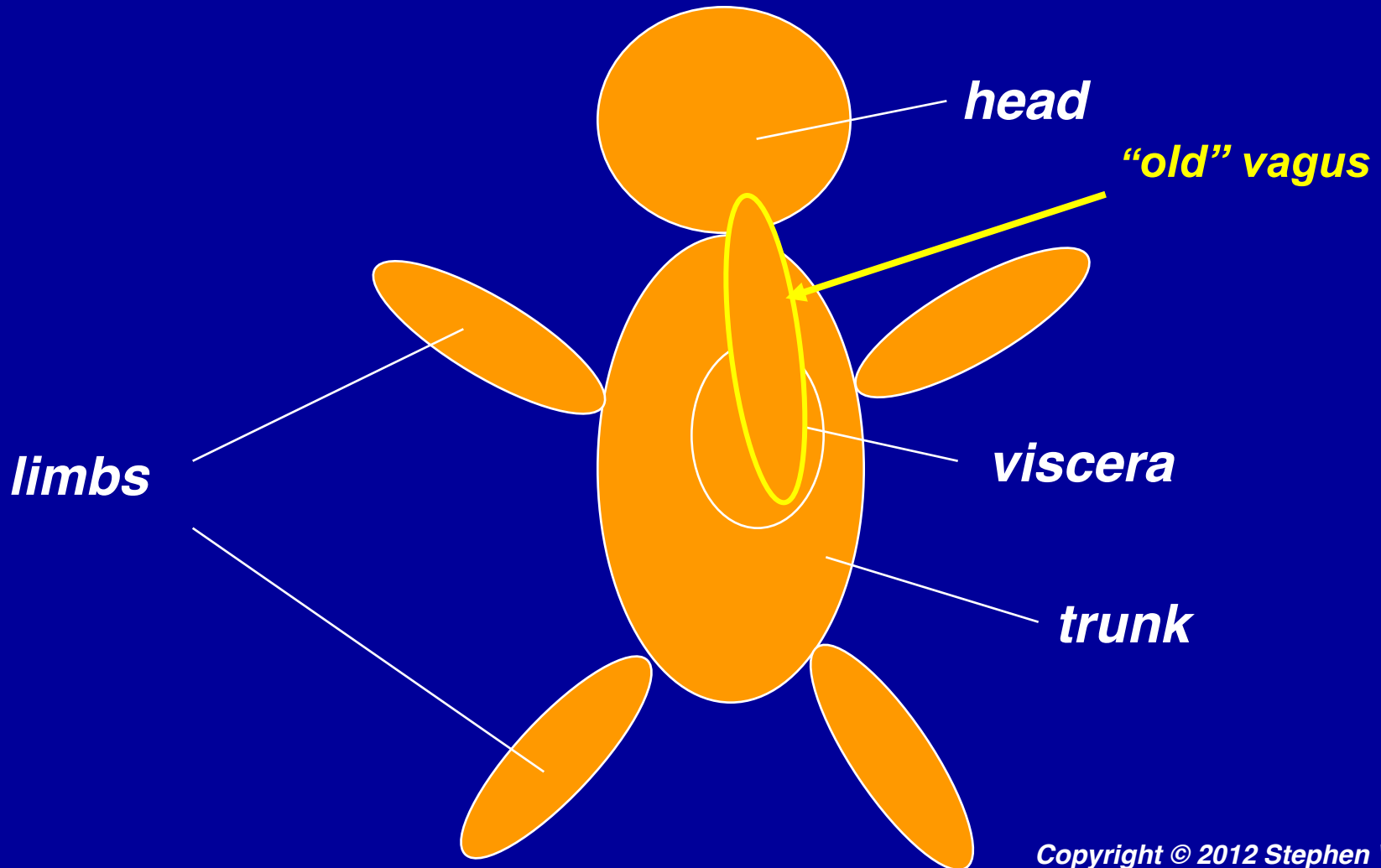
Defensive strategies
fight/flight behaviors (mobilization)

Physiological State Colors our Perception

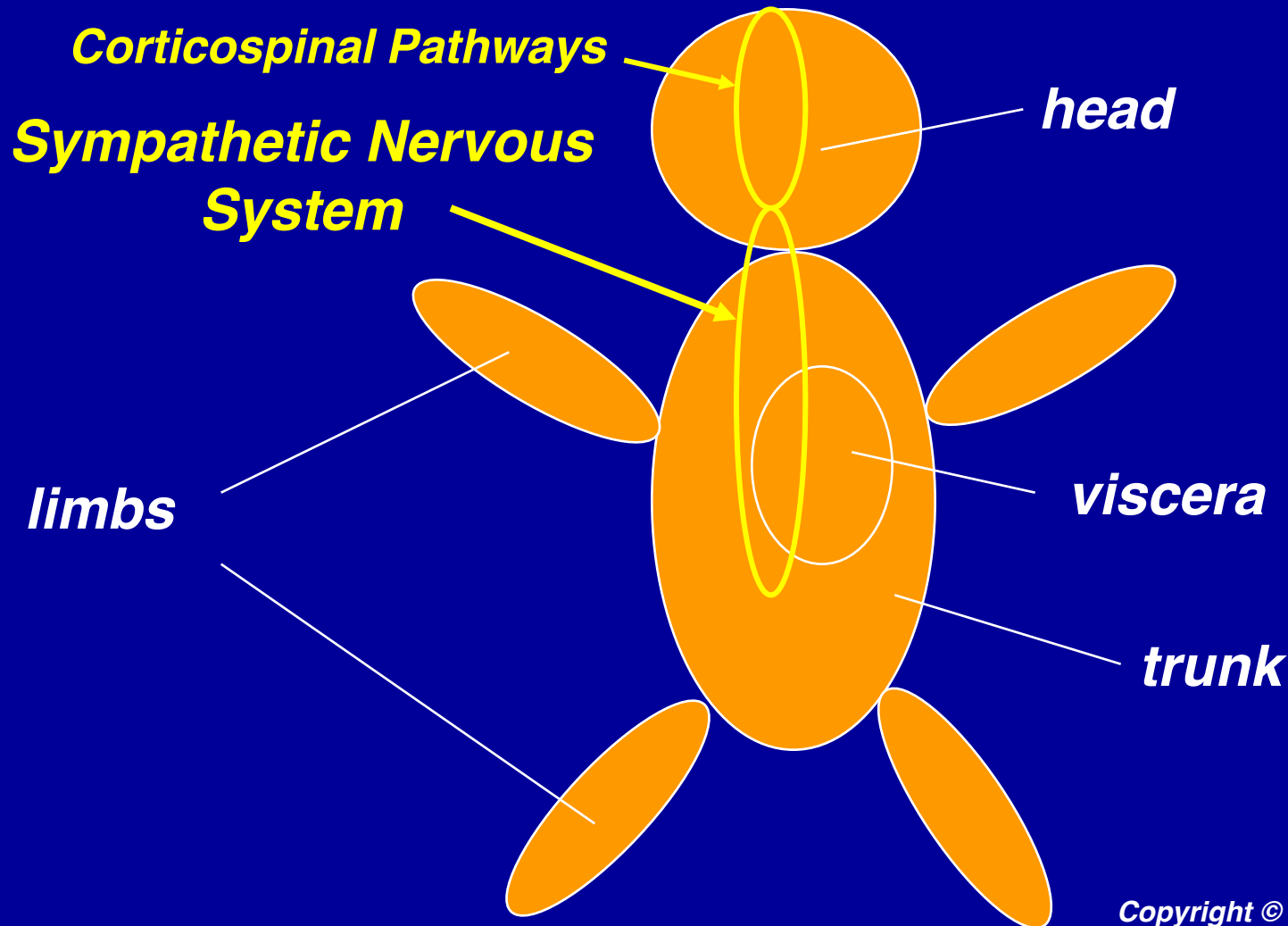


Physiological State

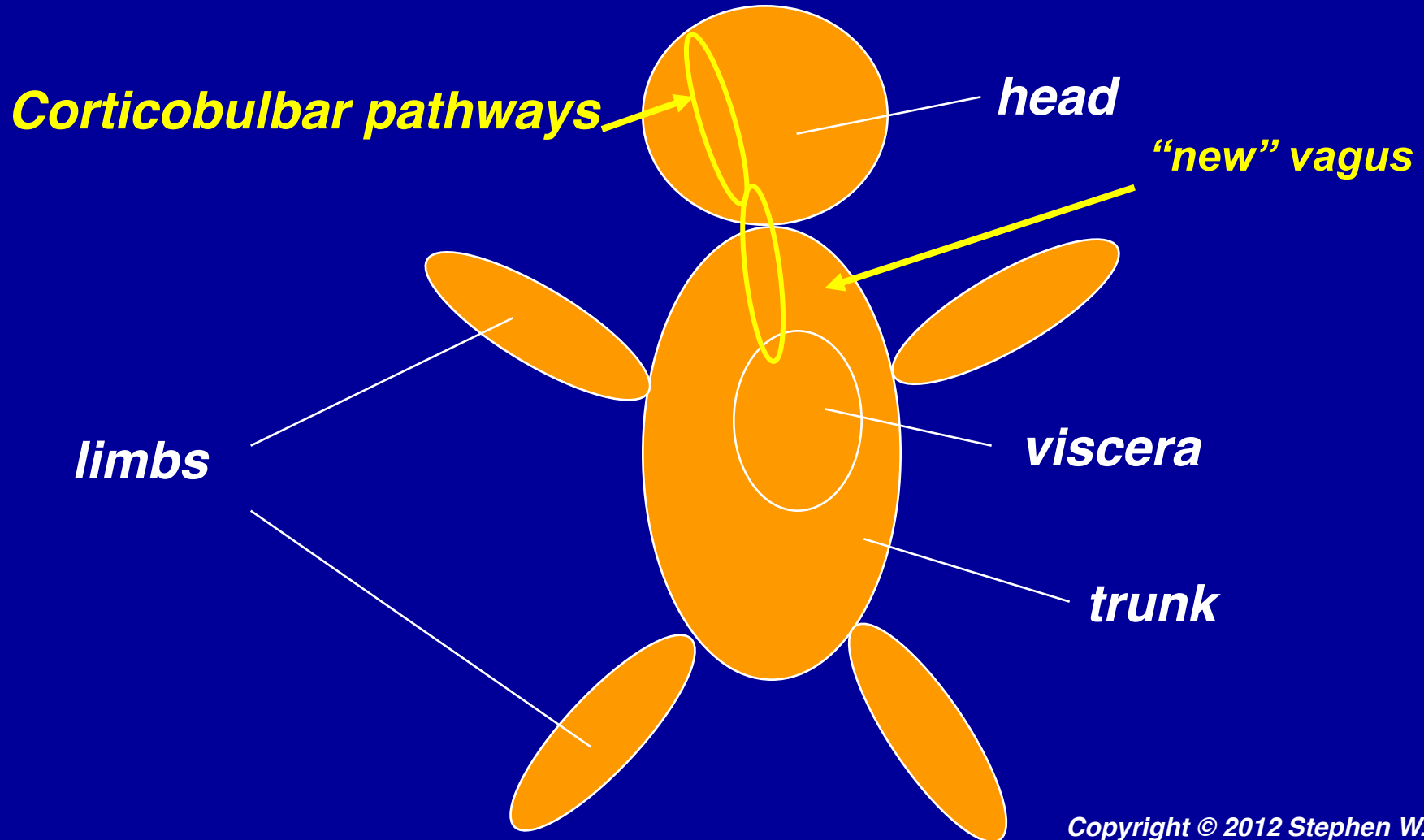
Phylogenetic Organization of the ANS: The Polyvagal Theory



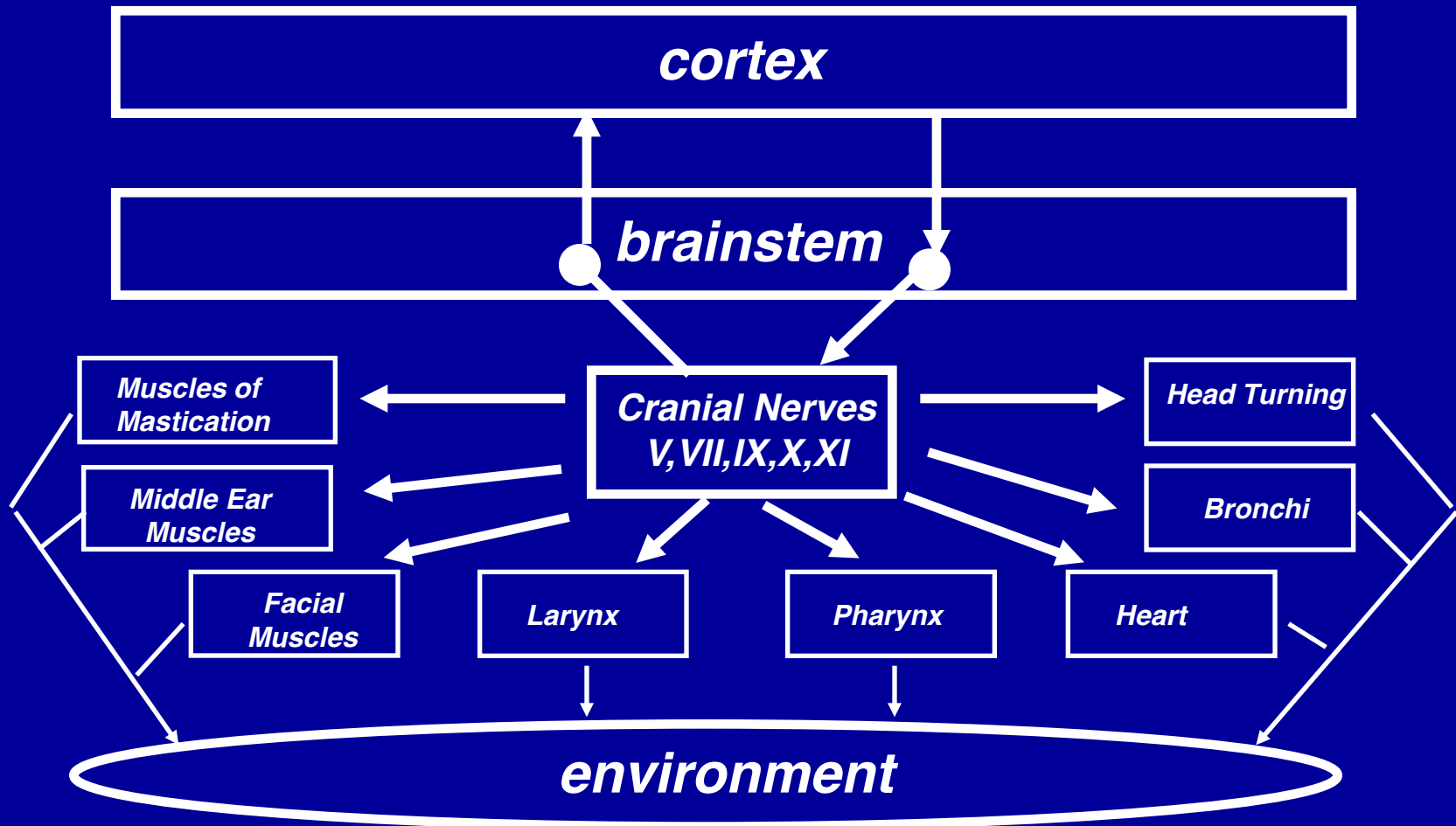
Phylogenetic Organization of the ANS: The Polyvagal Theory



Phylogenetic Organization of the ANS: The Polyvagal Theory



Deconstructing the “*Mammalian*” Social Engagement System



The Face-Heart Connection:

A Critical Component 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-Heart Connection:

A Critical Component of a Social Engagement System

- The face-heart connection provides a portal to exercise the neural regulation of physiological state via face-to-face social interactions.
- State regulation difficulties are a core feature of several psychiatric disorders and behavioral problems (e.g., school and home).
- Violation of anticipated face-to-face interactions shifts physiology from a calm state supporting social behavior, health, growth, and restoration to biologically costly and health challenging states of defense.

Bell's Palsy:

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

Social Engagement System: Observable Deficits in Several Psychiatric Disorders

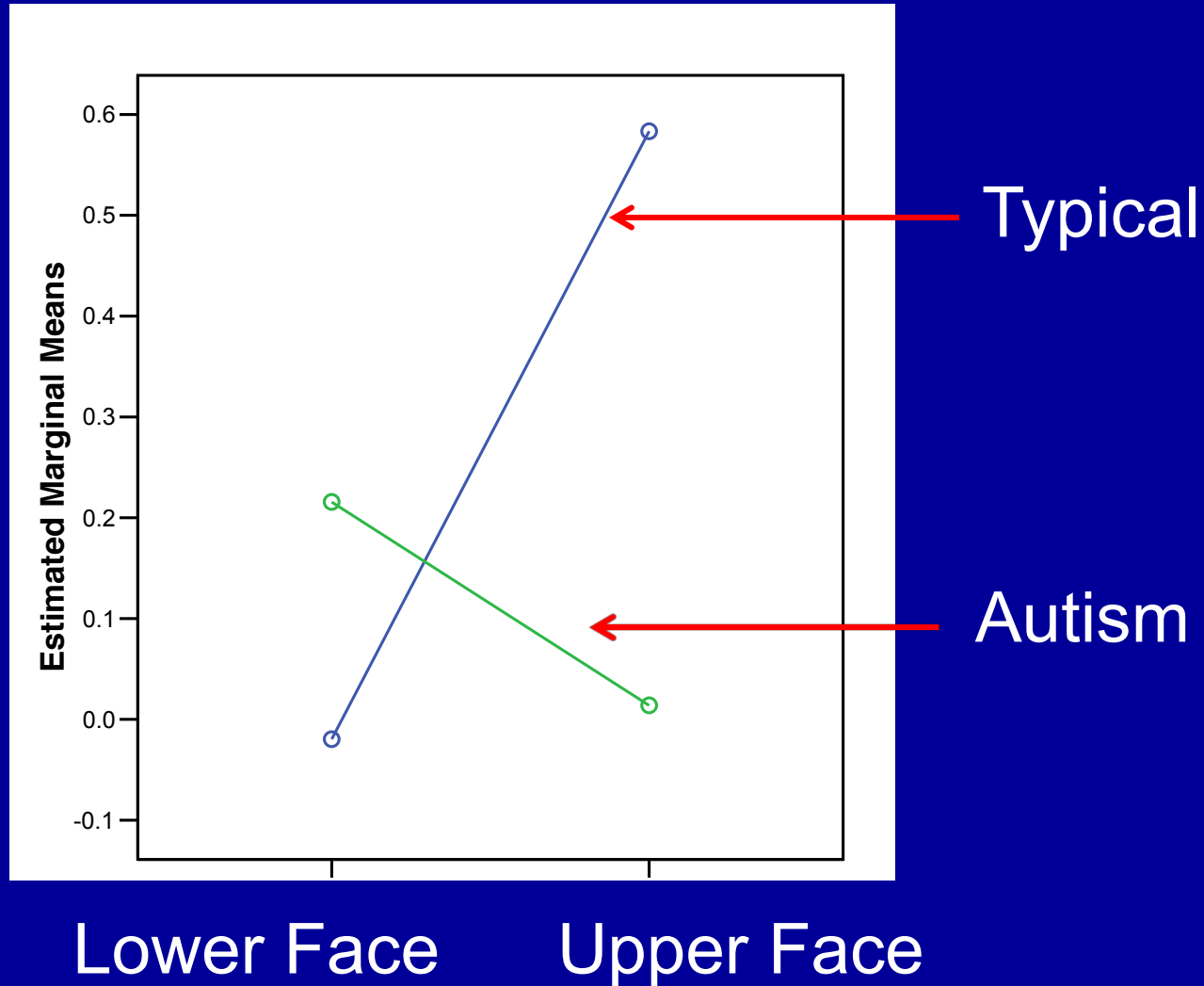
- Prosody
- Gaze
- Facial expressivity
- Mood and affect
- Posture during social engagement
- State regulation
- Sound hypersensitivities

When Faces Do Not Work!



Gabriel Metz, The Sick Child

Autism: Atypical Facial EMG



The Look of Love*

*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: A Polyvagal Perspective

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]

The Look of Love: A Polyvagal Perspective

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
[immobilization without fear (not restraint)]

Feature Detectors: The importance of the 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?

Lyin' Eyes (Eagles)

You can't hide your lyin' eyes

And your smile is a thin disguise

I thought by now you'd realize

There ain't no way to hide your lyin eyes

Violation of Face-to-Face: 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

Biological Rudeness

- ***Violation of a “neural” expectancy***
- ***Lack of reciprocity (poor attunement)***

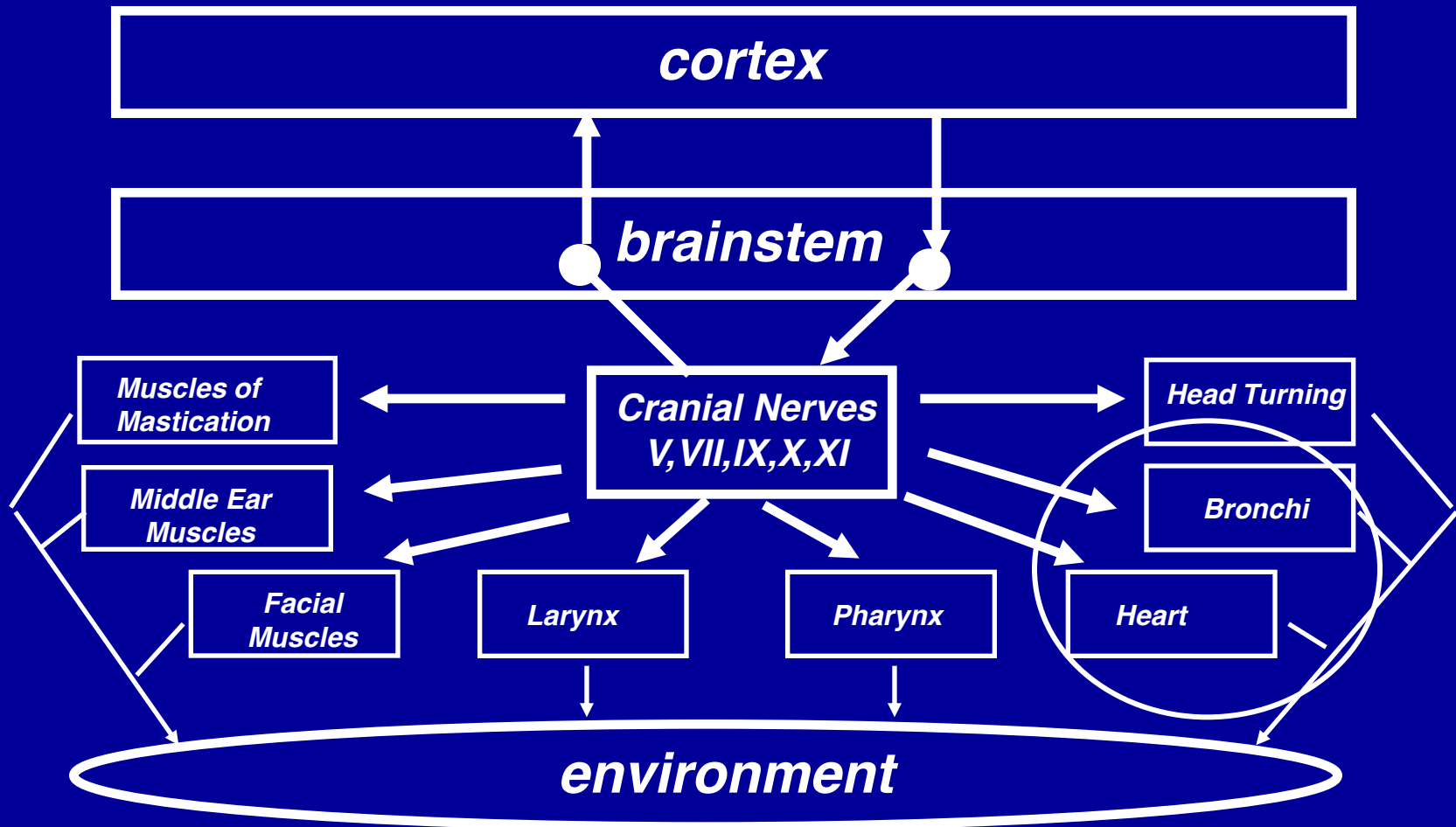
Biological Rudeness

- ***Is this a feature of several psychiatric disorders?***

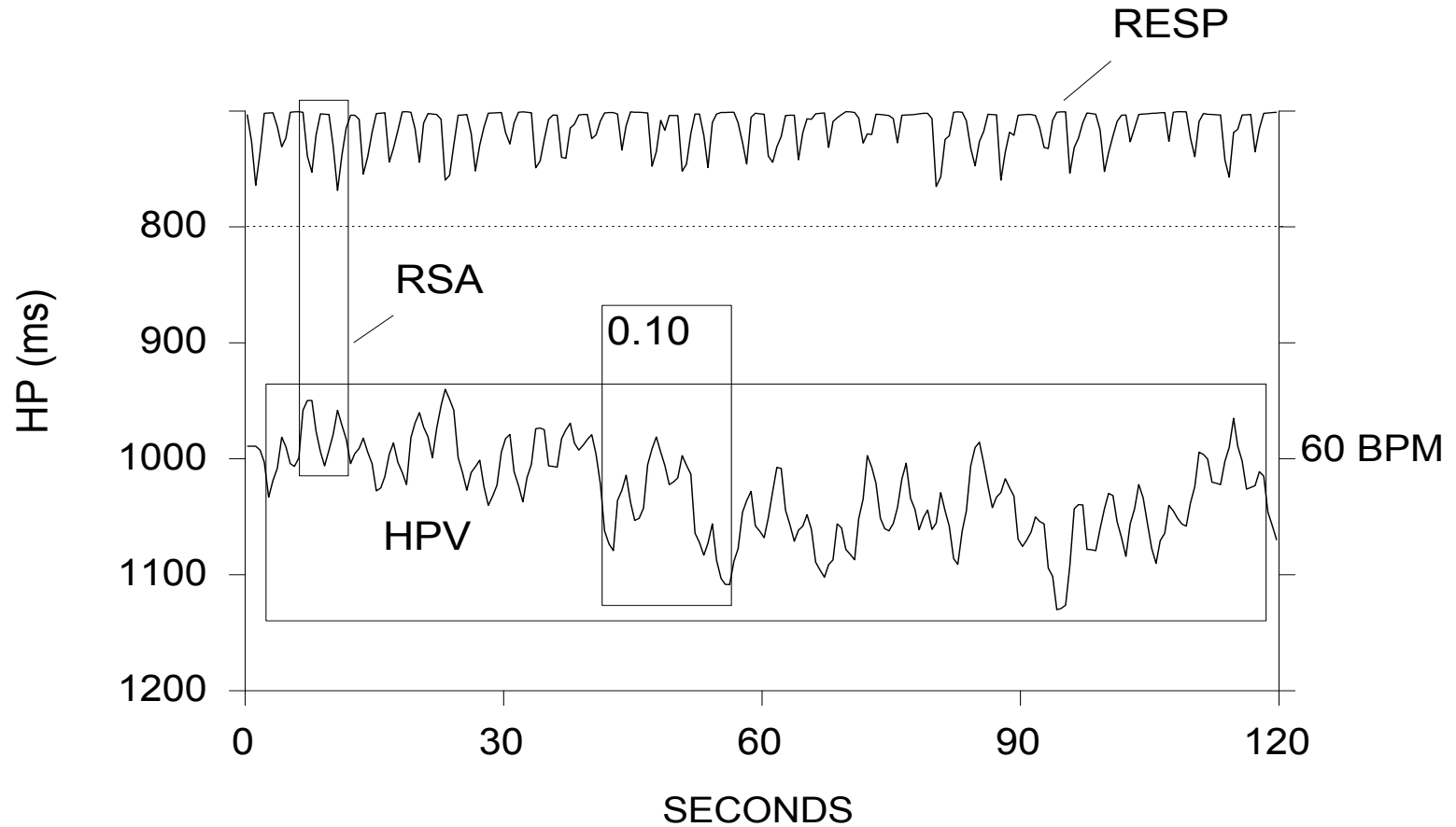
State Regulation Disorders

- Are there individuals who have great difficulties regulating state, especially in presence of others?
- Are these difficulties indexed by a compromised social engagement system including depressed vagal regulation of the heart?
- Are the above, features of *hyperarousal*?

Deconstructing the “*Mammalian*” Social Engagement System



Heart Rate Rhythms



Autism: Depressed Vagal Regulation

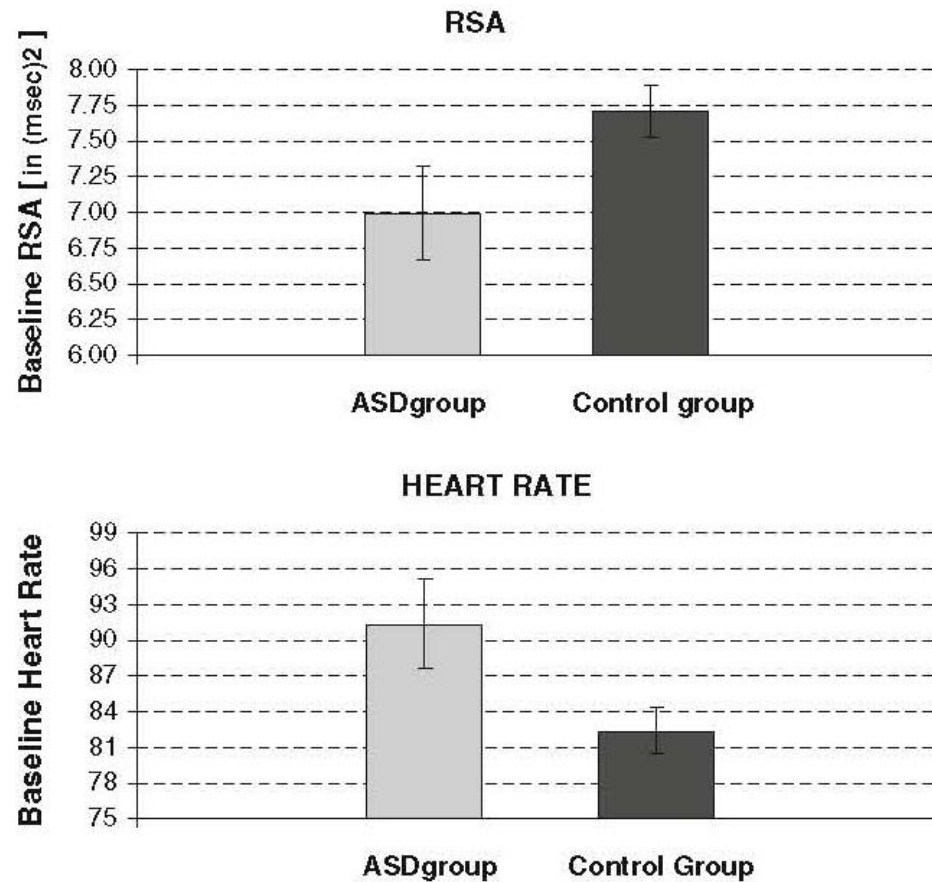
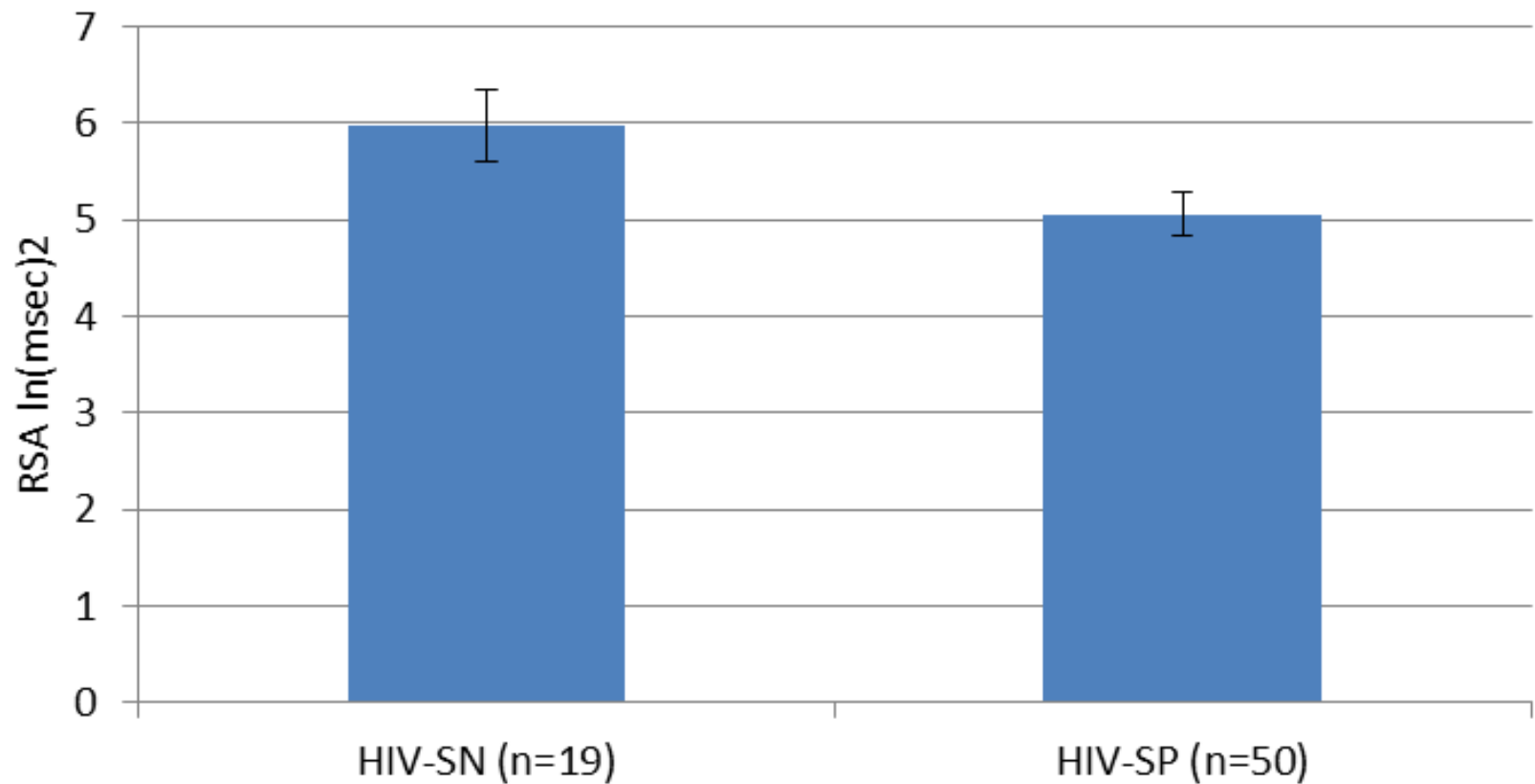


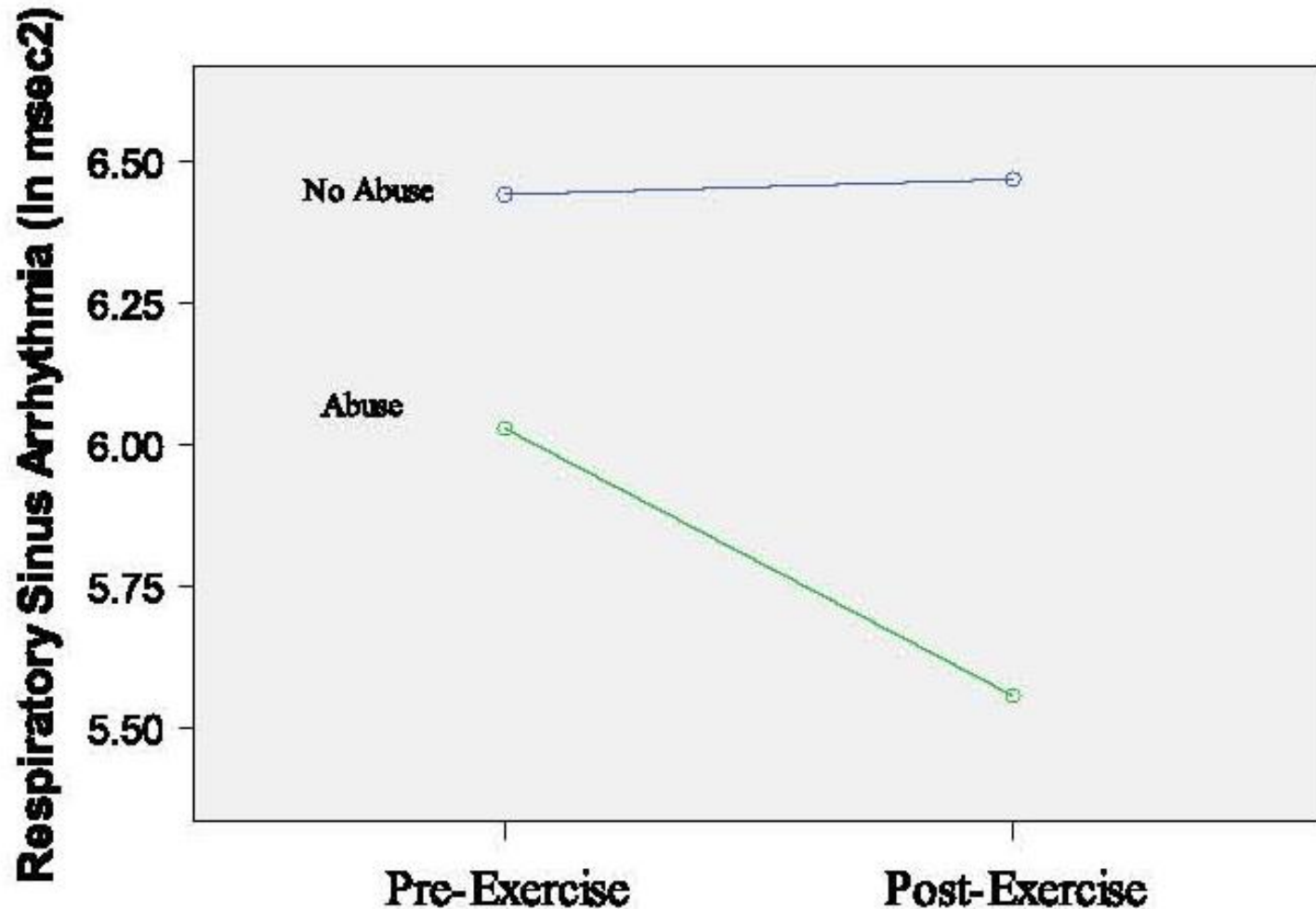
Fig. 2 RSA and heart rate during the 2-min baseline period

HIV: Depressed Vagal Regulation

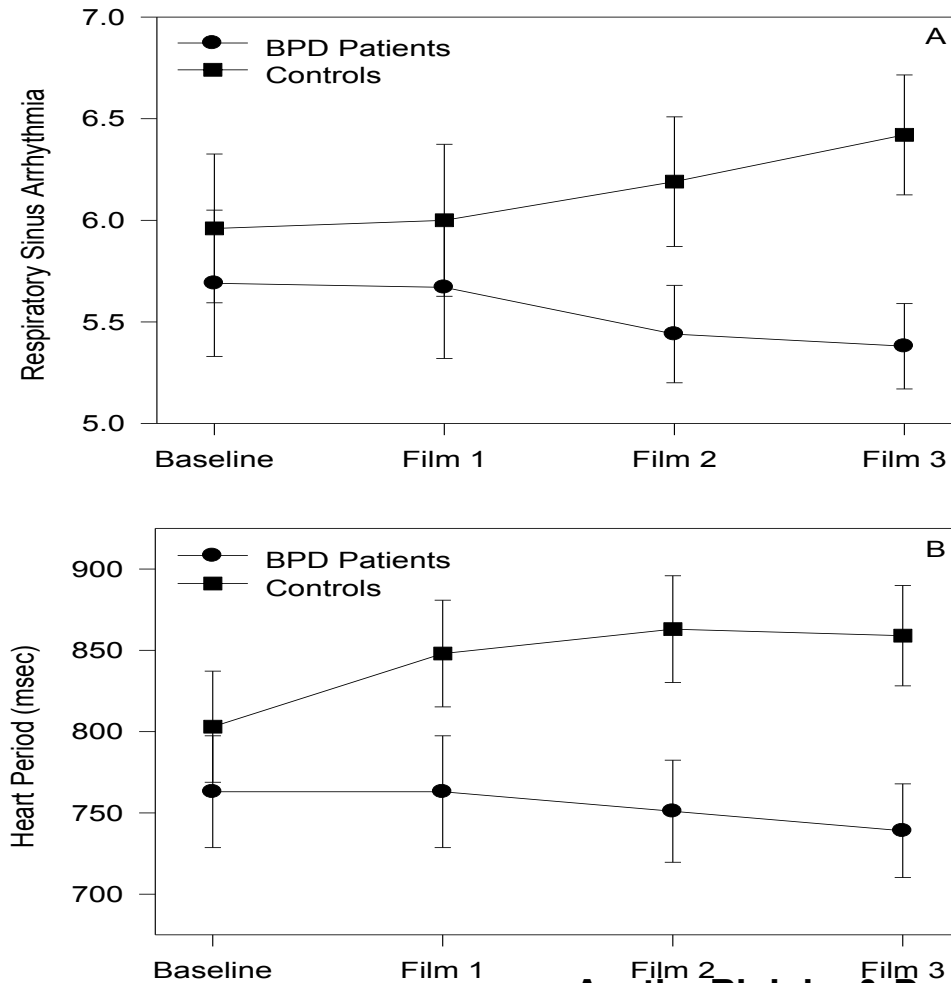
Initial baseline RSA



Abuse History: Poor Recovery of Vagal Regulation



Borderline Personality Disorder: Loss of Vagal Regulation in Social Context



Austin, Riniolo, & Porges, 2007
Brain and Cognition, 65, 69-76.

How Our Nervous System Detects Safety or Threat

Feeling safe is a necessary prerequisite before strong social relationships can be established and before social support can be effective in “healing” physical and mental illnesses.

What are the features that enable us to feel safe or become hypervigilant and defensive?

Principles to establish 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 as a neural exercise

The Neural Love Code: Turning off defenses

- How we feel determines whether we become friends, lovers, or enemies.
- Our feelings are dependent on our physiological state (autonomic nervous system).
- Love and intimacy require turning off our biobehavioral defense systems to feel safe and to enable proximity and physical contact.

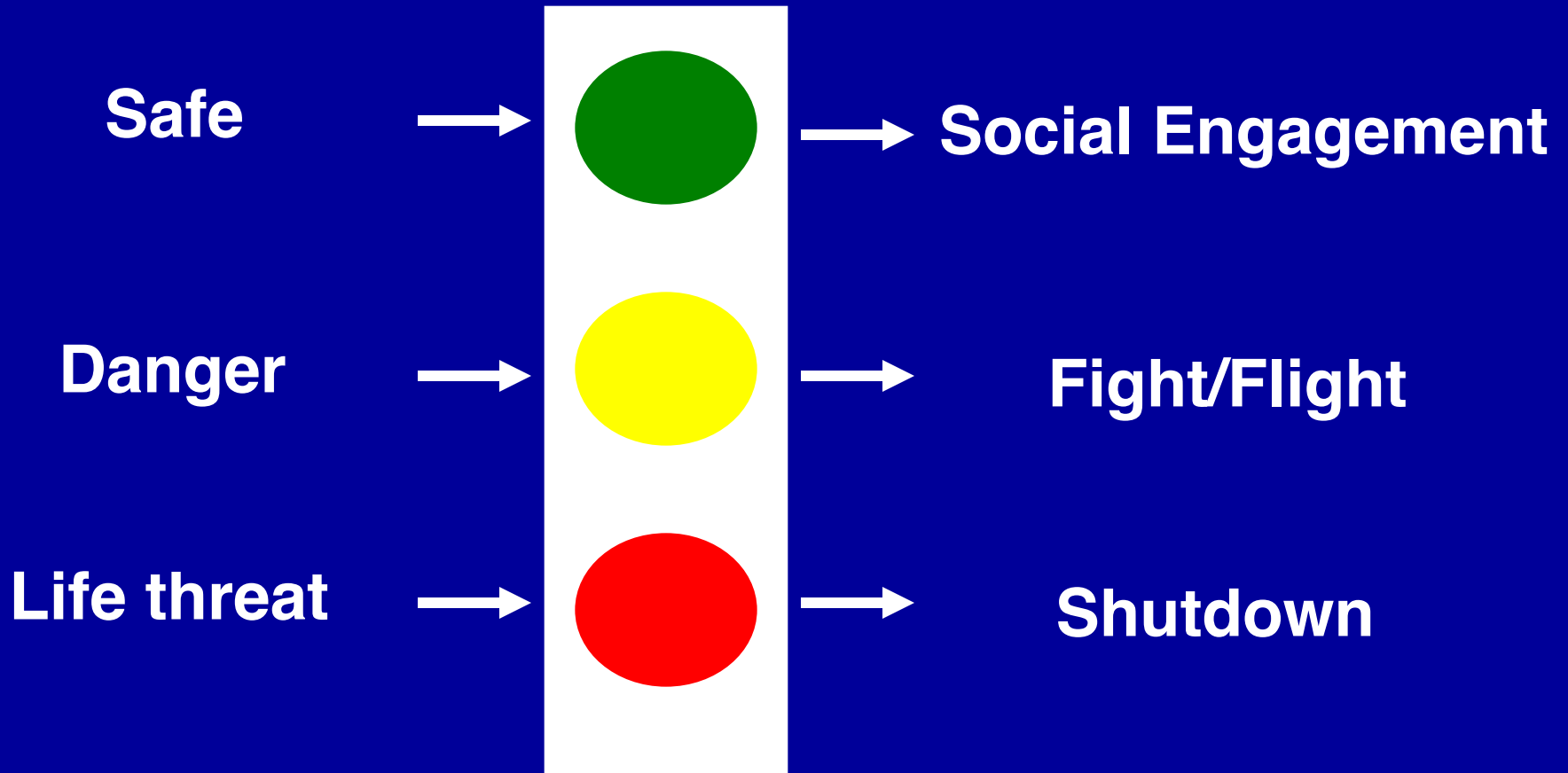
Neuroception

The detection of features in others or the environment – *without awareness* – that dampens defensive systems and facilitates social behavior OR promotes defensive strategies of mobilization (fight/flight) or immobilization (shutdown, dissociation).

Neuroception

Environment

Behaviors



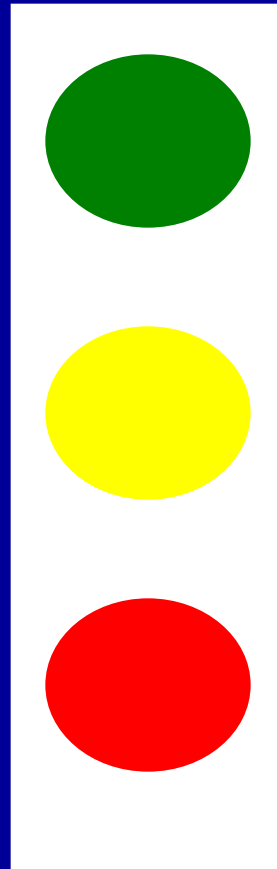
Physiological State

Neuroception

Environment

Behaviors

Safe



Social Engagement



Play



Loving Behaviors

Physiological State

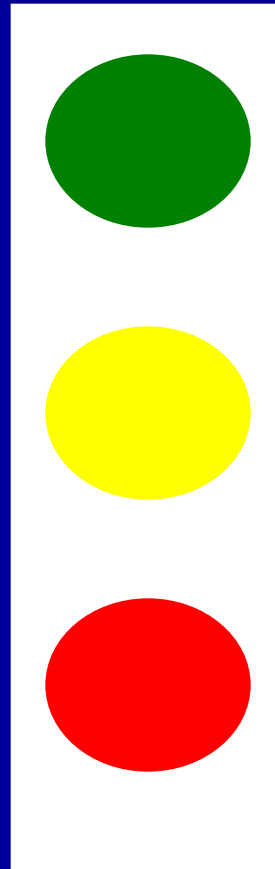
Neuroception:

Promote mental and physical health

Environment

Visceral state

Safe



Ventral Vagus

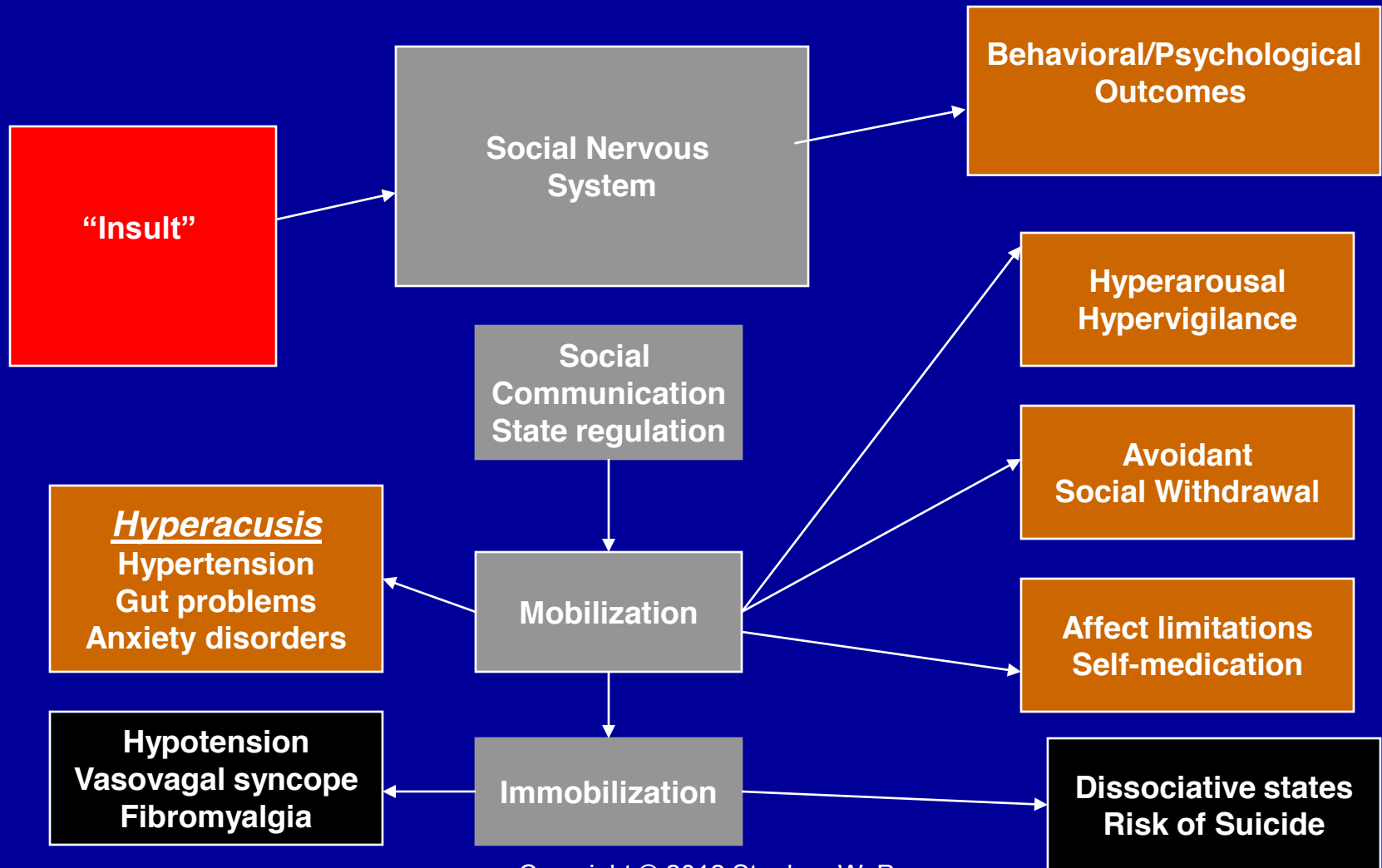


SNS

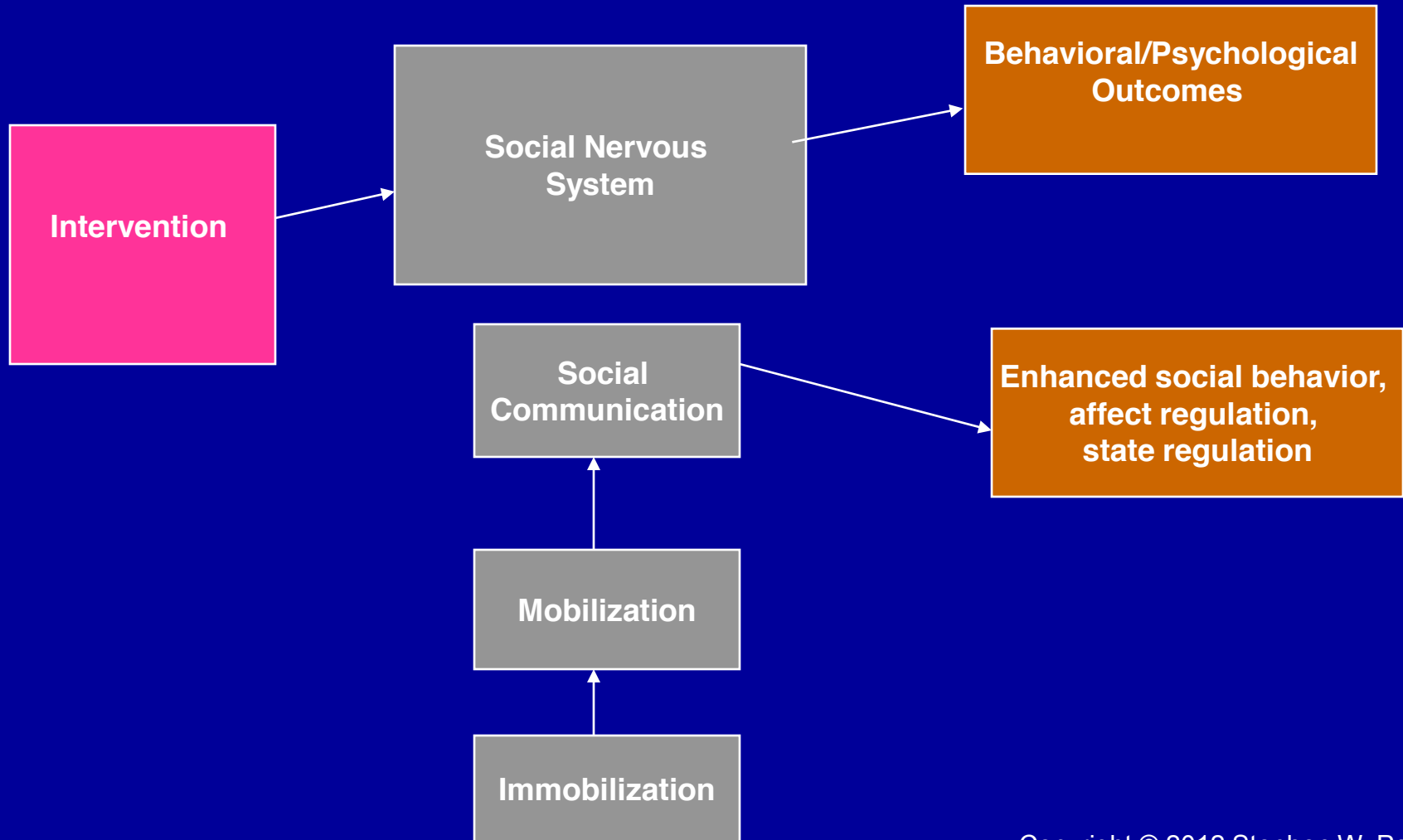


Dorsal Vagus

New Model



Reverse Engineering: A Treatment Model



A Neural Love Code:

Physiological State Colors our Perceptions

- Our nervous system “requires” reciprocal social interactions.*
- Reciprocal social interactions down regulate defensive strategies and enable states of safety.*
- States of safety enable immobilization without fear.*
- Immobilization without fear promotes health, growth, and restoration (e.g., subdiaphragmatic ANS balance).*
- The neural pathways of reciprocal social interactions, including play, provide a neural exercise to promote physical and mental health and resilience to stress.*
- Violations of reciprocity trigger defensive states that compromise mental and physical health.*

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