# Clinical Applications of the Polyvagal Theory:

## *The Transformative Power of Feeling Safe*

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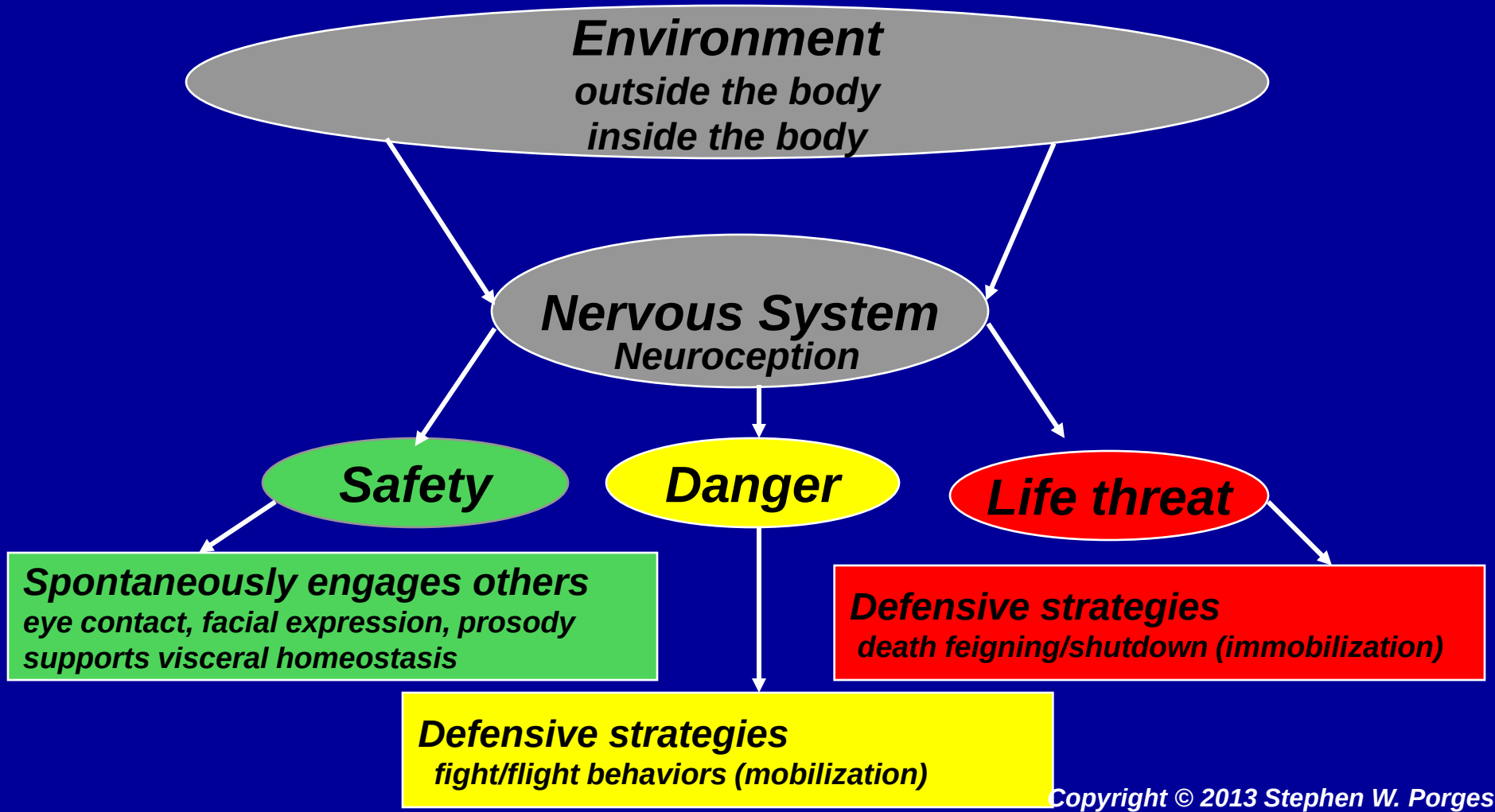
# Polyvagal Theory:
## Clinical Applications

- 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*

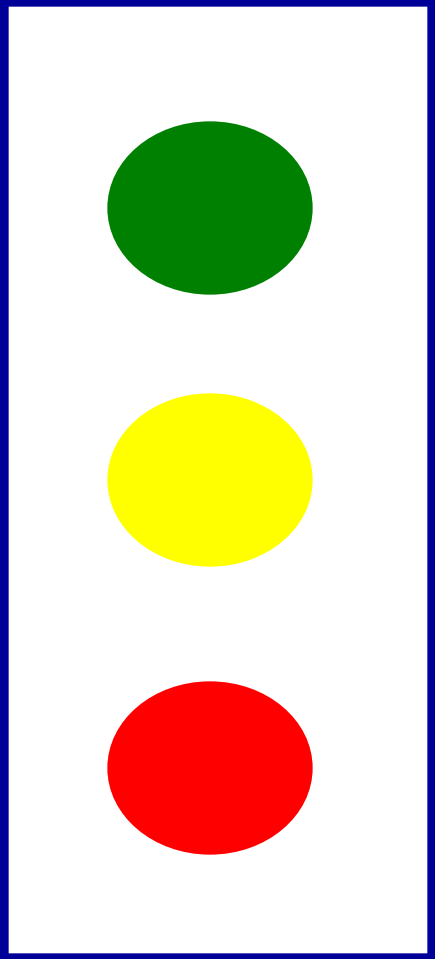
1. Evolution provides an organizing principle to understand neural regulation of the human autonomic nervous system as an enabler of social behavior.
2. Three neural circuits form a phylogenetically-ordered response hierarchy that regulate behavioral and physiological adaptation to safe, dangerous, and 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



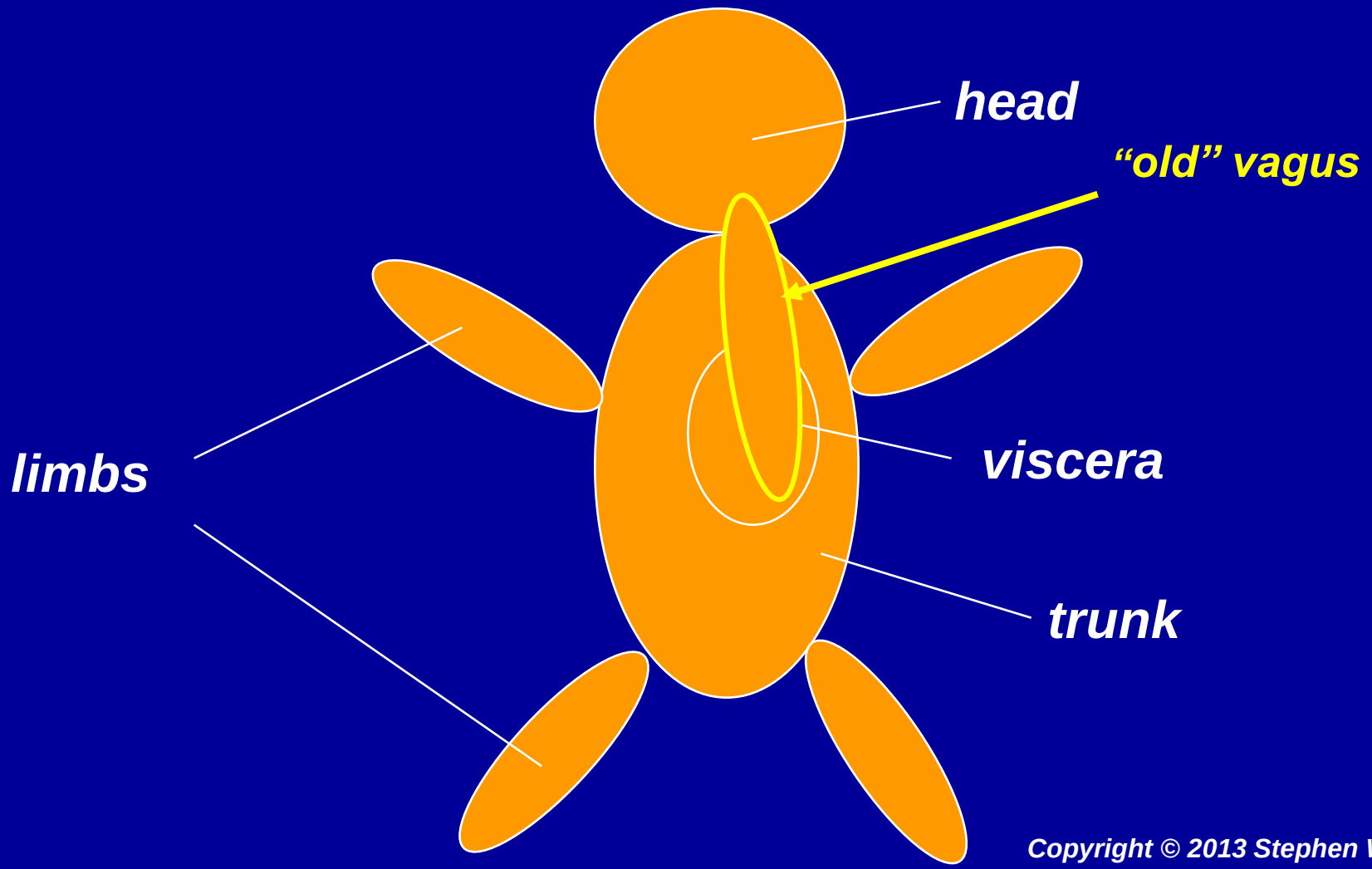
# *Physiological State Colors our Perception*

*S - - R*



*Physiological State*

# Phylogenetic Organization of the ANS: The Polyvagal Theory



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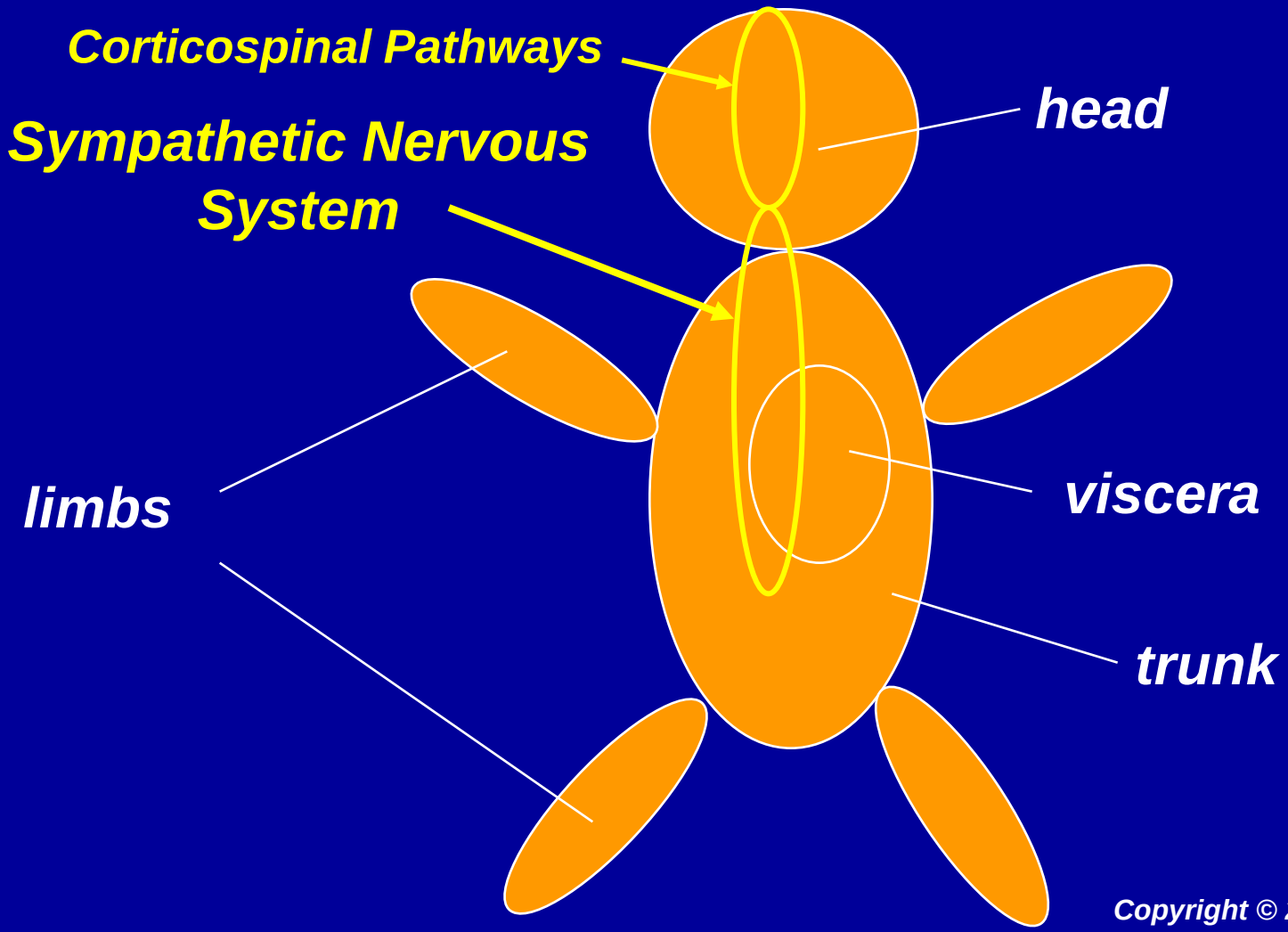

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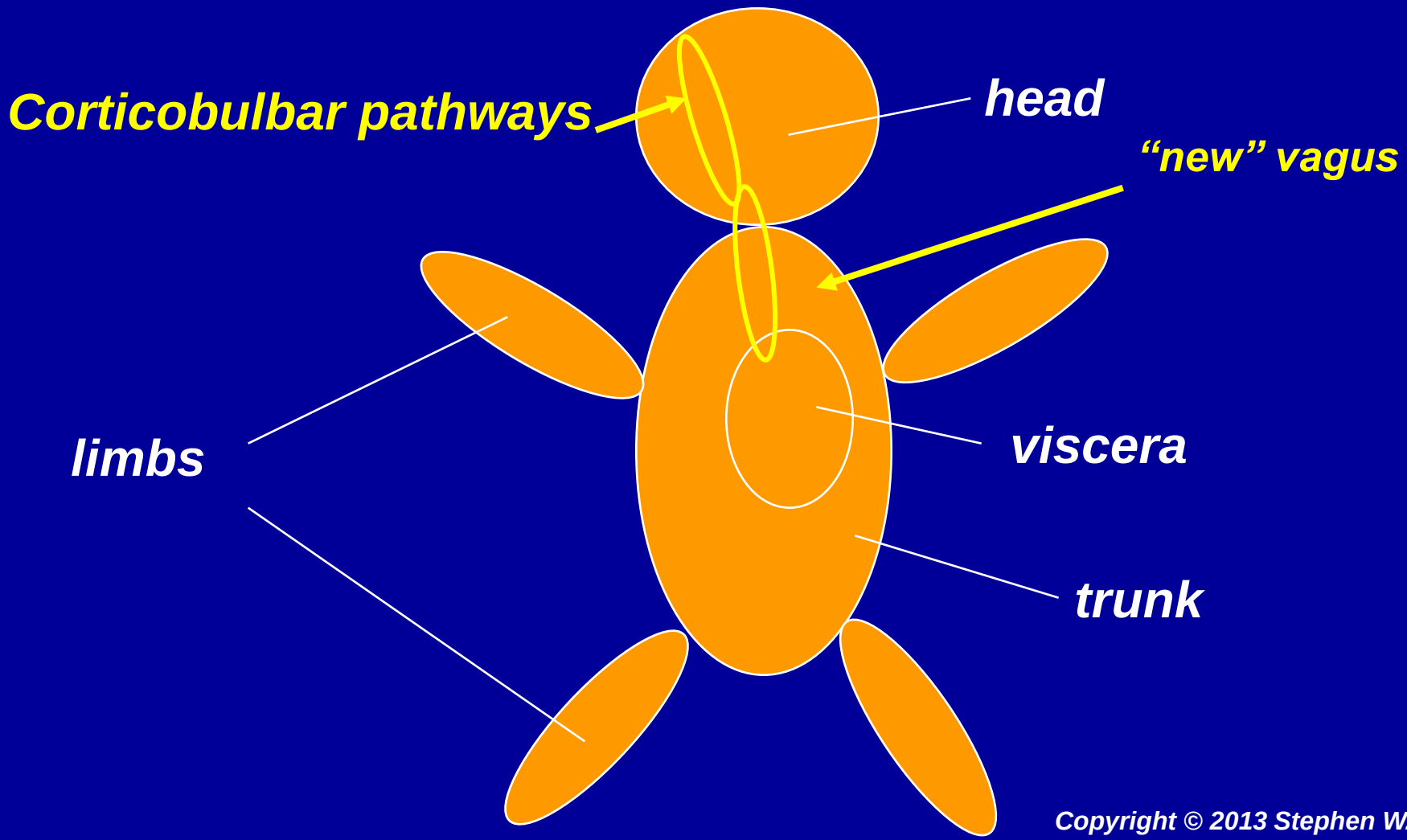
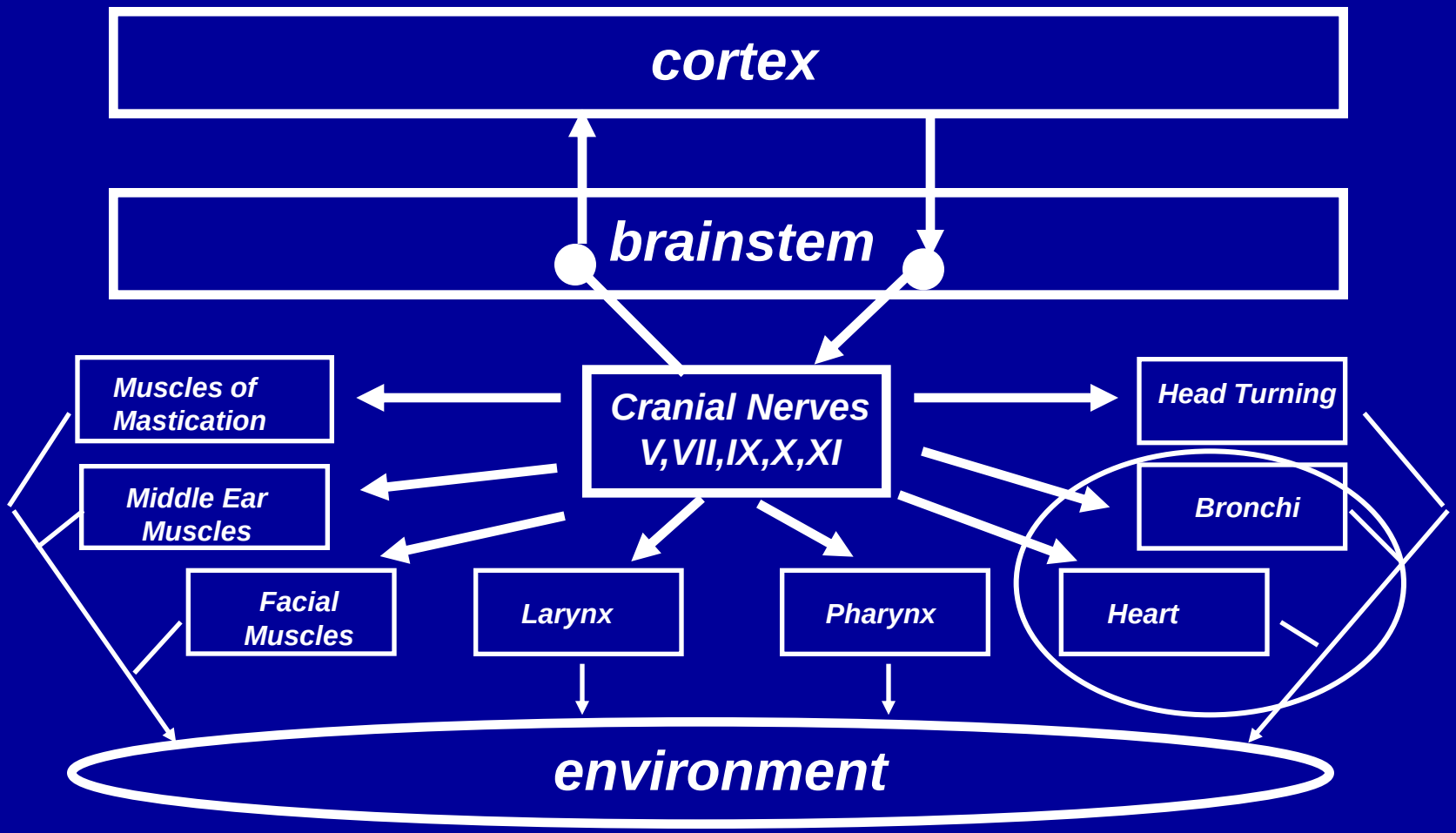


# Deconstructing the "*Mammalian*" Social Engagement System



# The Heart-Face Connection:

## *A Critical Component of a Social Engagement System*

- In mammals, at birth the bidirectional neural communication between the face and the heart 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.

# 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

# 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

# Reciprocal Interaction (play)

# Still Face (1)

# Still Face (2)

# Still Face (3)

# Violation Repaired

# With whom do we feel safe?

# 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

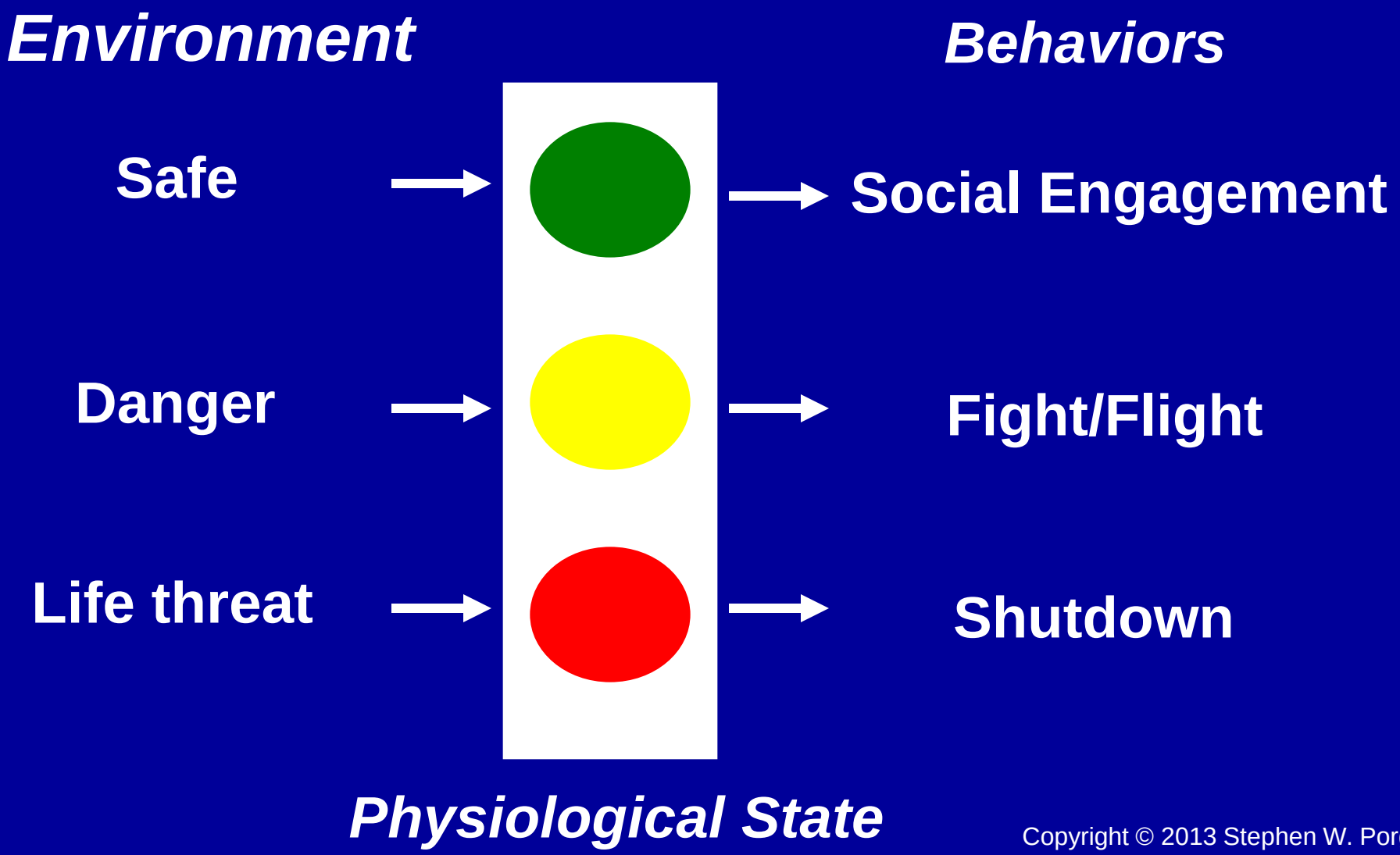
# The Neural Love Code: Turning off defenses

- 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

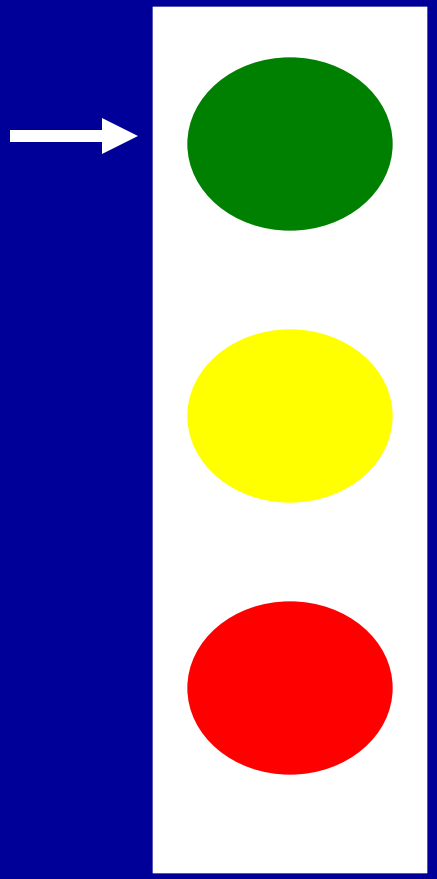


# Neuroception

*Environment*

*Behaviors*

Safe



Social Engagement

Play

Loving Behaviors

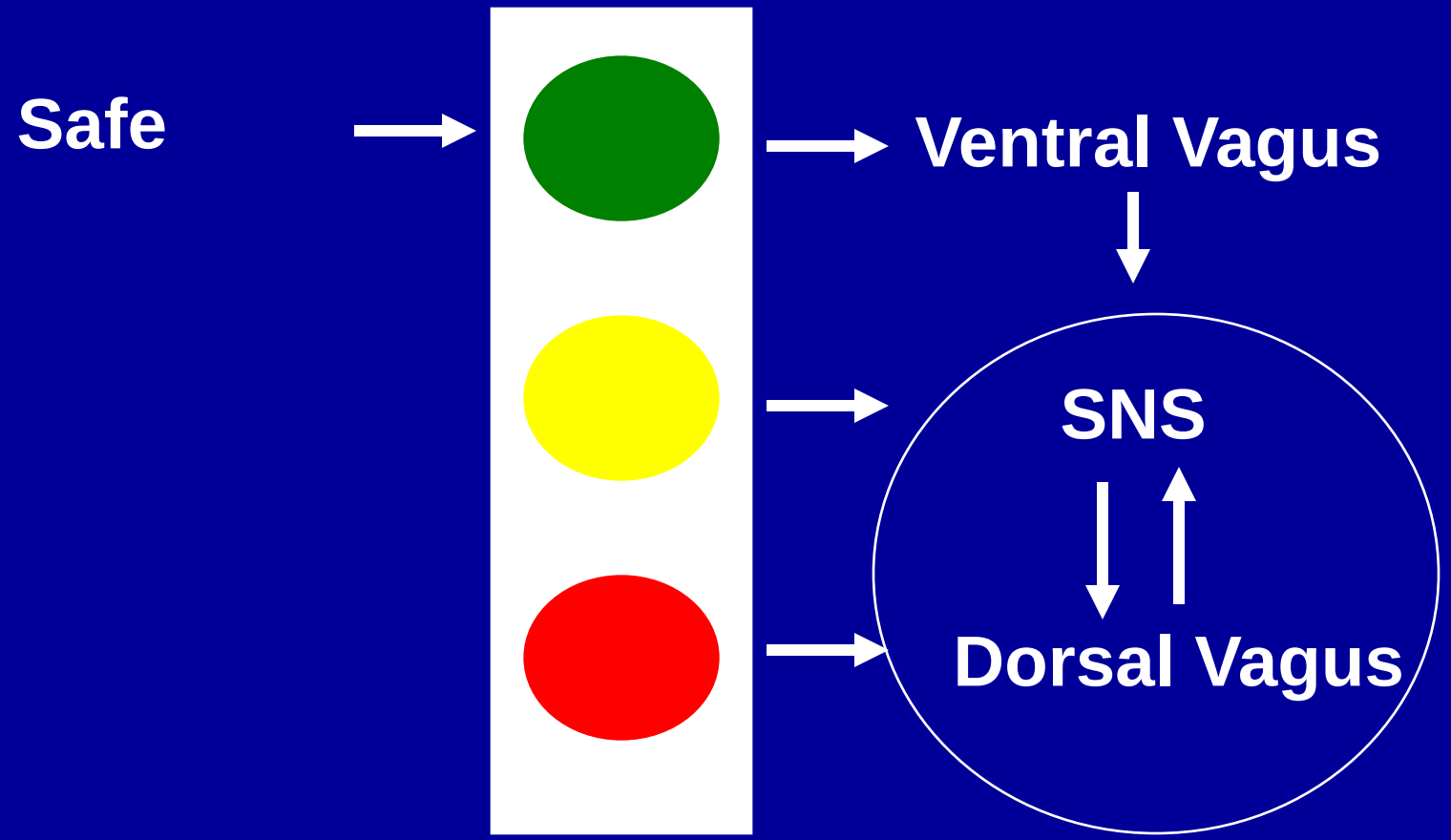
*Physiological State*

# Neuroception:

## Promote mental and physical health

*Environment*

*Visceral state*



# 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.

# Biological Rudeness

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

# Repairing Violations

- Recruit features of the Social Engagement System
  - Face-to-face interactions
    - Facial expressions and gestures
    - Intonation (prosody) of vocalizations
- Does this strategy have anything in common with therapy?

# Neuroception:
## 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?

# With whom do we feel safe?

# Mammal-Reptile Interactions: Immobilization without fear

Reciprocity is missing!

Reciprocal social interactions are a "neural exercise."

# 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 Vagal Paradox:
## Discovering a Lost Defense System

# The Vagal Paradox

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

# Immobilization With Fear

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

# Trauma and Loss of Function: Individual Differences

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.

***Other dogs lost all their conditioned reflexes and this deficit persisted for several weeks.***

# Safe Familiar Features Rehabilitate

When the experimenter remained with the dog, all conditioned reflexes were immediately restored.

When the experimenter left the dog alone, all deficits immediately returned.

Walter B. Cannon (1942). “Voodoo” Death, *American Anthropologist*, 44:169-176

# Voodoo Death: 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.

# 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?

# 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?

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

# 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)**

Myron A. Hofer (1970). Cardiac and Respiratory Function During Sudden Prolonged Immobility in Wild Rodents. *Psychosomatic Medicine, 32, 633-647.*

# Hofer (1970)

Recently captured wild rodents were subjected to sudden stimulation and a natural predator. The rodents responded with prolonged immobility accompanied by very low heart rate and a high incidence of cardiac arrhythmias.

# Hofer (1970)

8/31 (26%) died after being trapped

13/23 had arrhythmias (3 died shortly after the study)

10/23 who had no arrhythmias during the studied

# Immobilization With Fear

A missing concept in psychology and psychiatry

Not all stressors result in “fight/flight”

Not all vagal (parasympathetic) influences are restorative

# Why?

# The Autonomic Nervous System:
## 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.*

# The Autonomic Nervous System:
## Integrative Perspectives

Walter Hess (1949) *The central control of the activity of internal organs.*

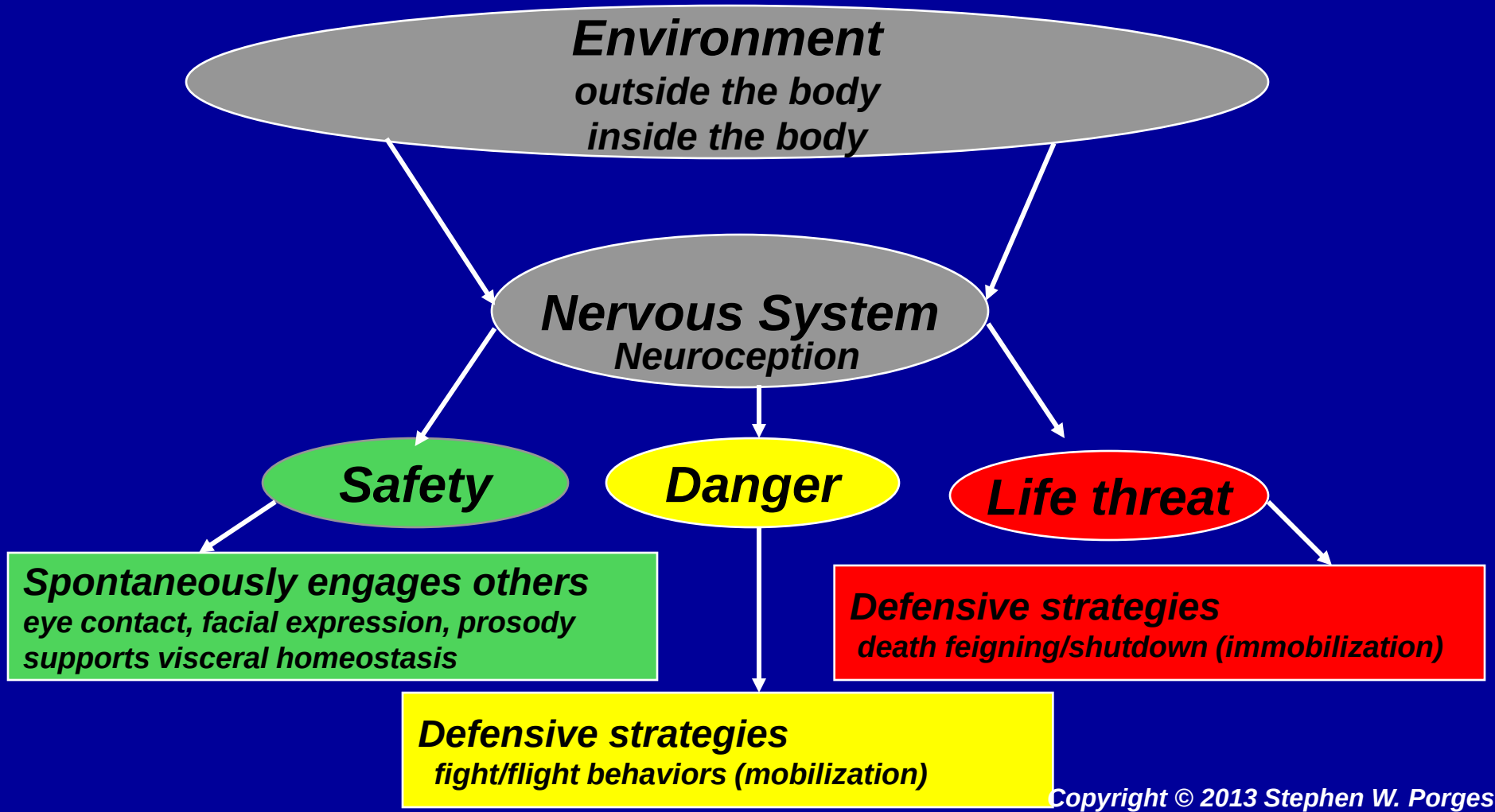
"A recognized fact which goes back to the earliest times is that every living organism is not the sum of a multitude of unitary processes, but is, by virtue of interrelationships and of higher and lower levels of control, an unbroken unity."

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

# Polyvagal Perspective:
## 5 Levels of Inquiry

1. ANS responses as behavior (biofeedback)
2. ANS as peripheral physiology (traditional physiology and internal medicine)
3. ANS influenced by psychological processes (psychophysiology, “correlates” or “biomarkers”)
4. ANS regulated by central mechanisms (W. Hess, brain-ANS interactions)
5. ANS reactivity is not only centrally regulated, but reflects adaptive functions dependent on the phylogeny of the neural circuit recruited (Polyvagal Theory)

# The Quest for Safety:
## Emergent "Adaptive" Properties of Physiological State



# The Polyvagal Theory

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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.

# Polyvagal Theory:
## Phylogenetic Stages of Neural Control

| Stage | ANS Component | Emergent Behavioral Functions |
|---|---|---|
| III | Myelinated vagus<br>***(VVC – ventral vagal complex)*** | Social communication, self-soothing and calming, inhibit sympathetic-adrenal influences |
| II | Sympathetic-adrenal system<br>***(SNS – sympathetic nervous system)*** | Mobilization (active avoidance) |
| I | Unmeyelinated vagus<br>***(DVC – dorsal vagal complex)*** | Immobilization (death feigning, passive avoidance) |

# Dissolution: Definition

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

John Hughlings Jackson

# Dissolution:

Polyvagal response strategies are phylogenetically ordered with newest components of the ANS responding first

# Dissolution: Polyvagal Response Strategies

- Removal of VVC Tone
- Increase in Sympathetic Tone
- Surge in DVC Tone

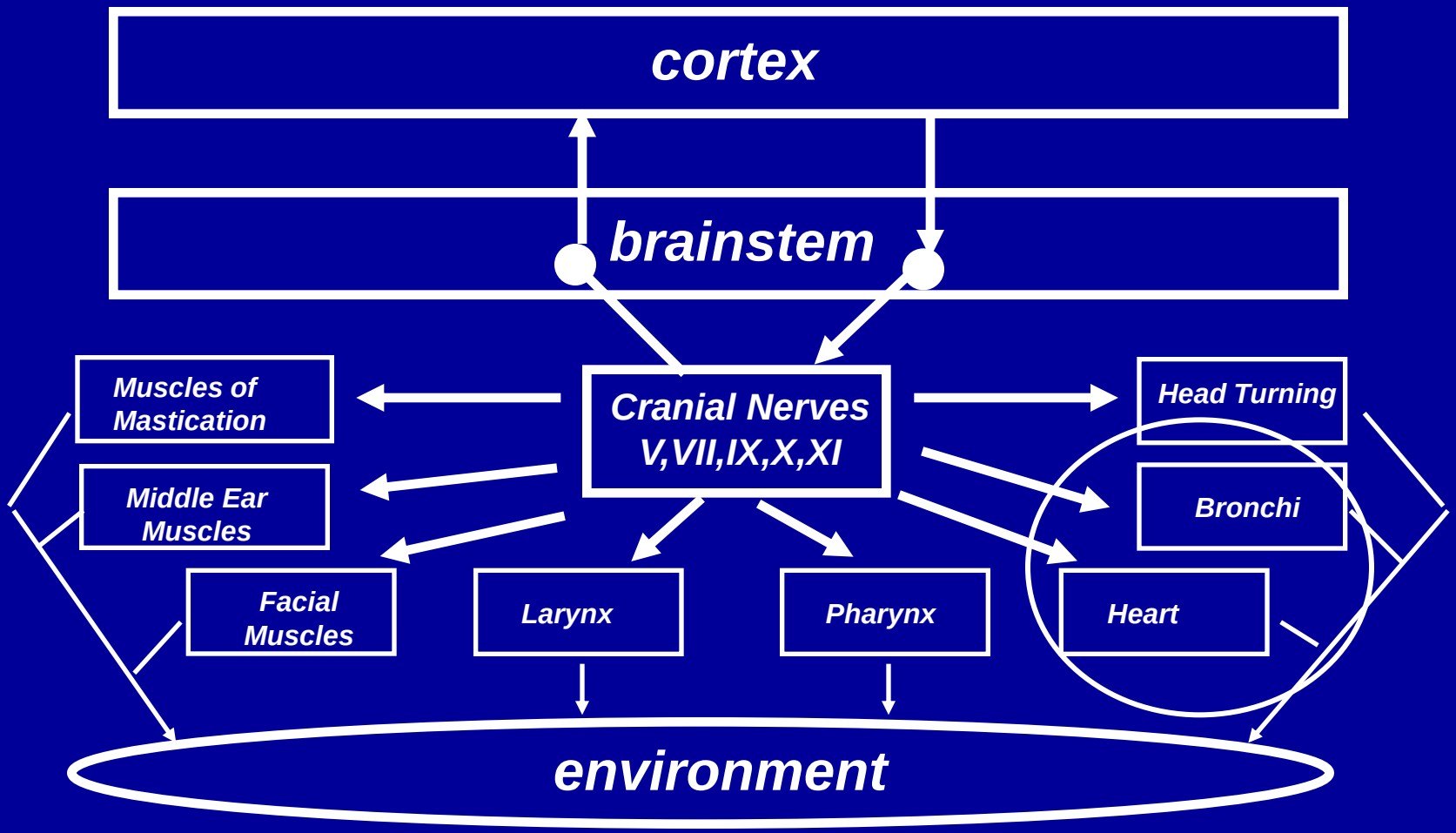
# Polyvagal Theory:
## A Phylogenetic Hierarchy of Response Strategies

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

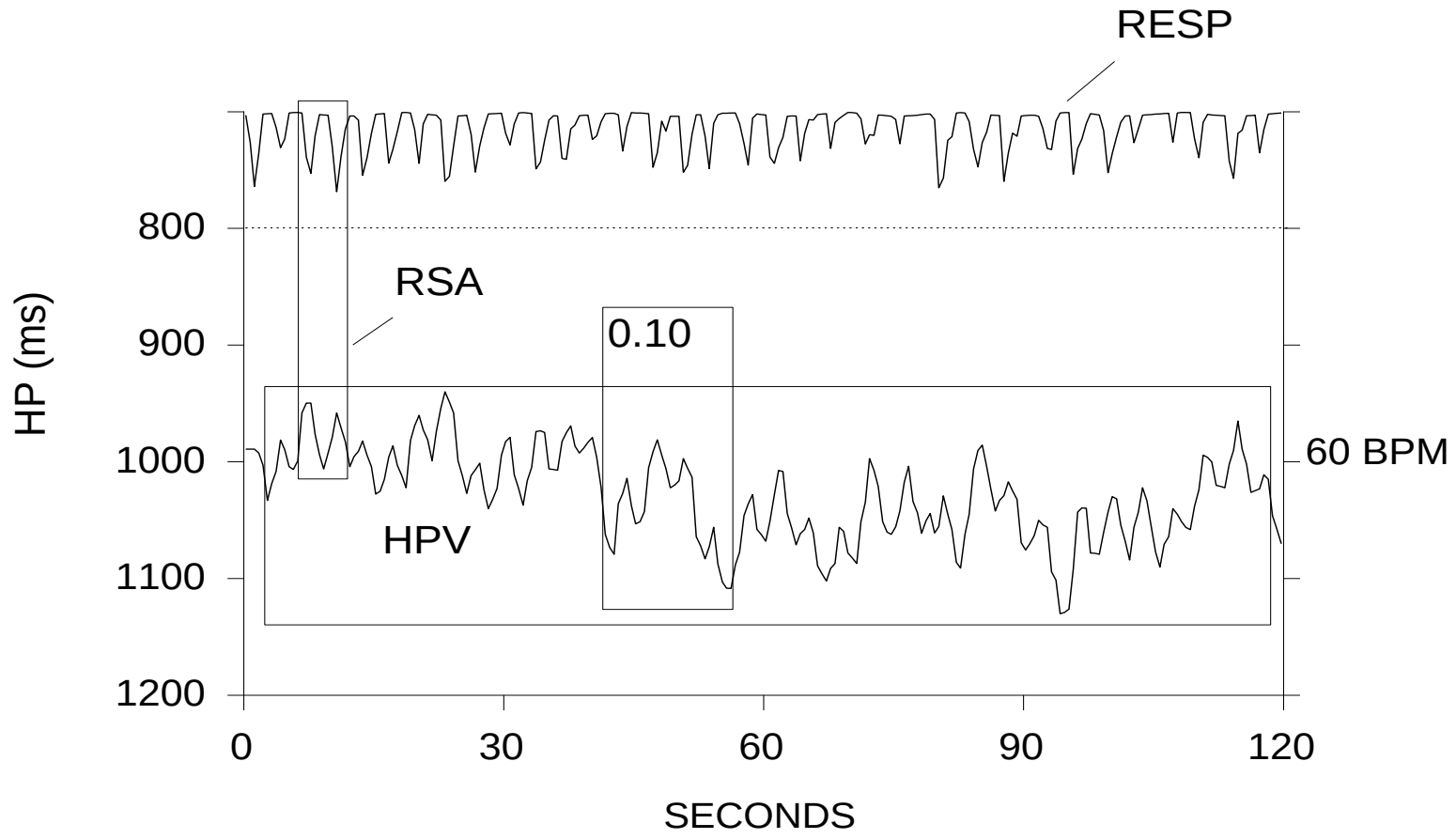
# State Regulation Disorders

- 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*?
- Are the above features of hypoarousal?

# Deconstructing the "*Mammalian*" Social Engagement System



# Respiratory-Heart Rate Rhythms



# 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

# Autism: Depressed Vagal Regulation

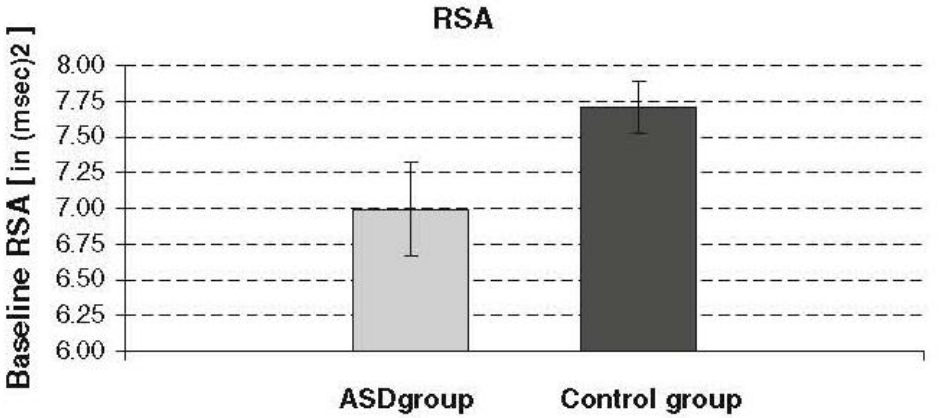
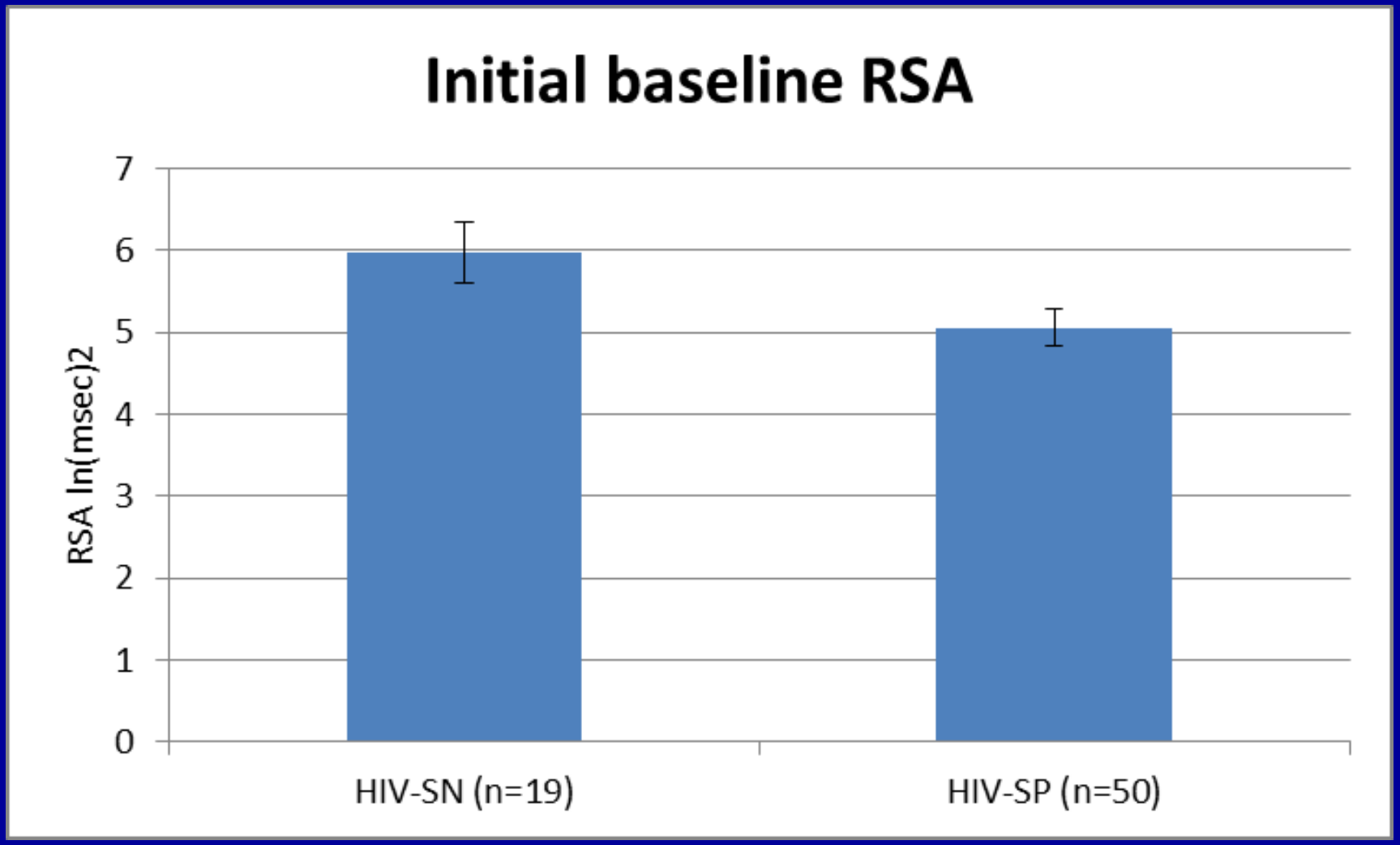



**Fig. 2** RSA and heart rate during the 2-min baseline period

Bal et al. (2010) *Journal of Autism and Developmental Disorders*

# HIV: Depressed Vagal Regulation



# Neural Basis for Establishing Safe Relationships

- Our nervous system is continuously evaluating risk in the environment.
- The human nervous system evolved to shift efficiently between conditions of safety and danger using elements of the social engagement system (e.g., face-to-face).
- Intimacy requires the co-opting of ancient neurobiological immobilizing mechanisms with social engagement strategies that enable individuals to feel safe and to immobilize without fear.

# The Face-Heart Connection:

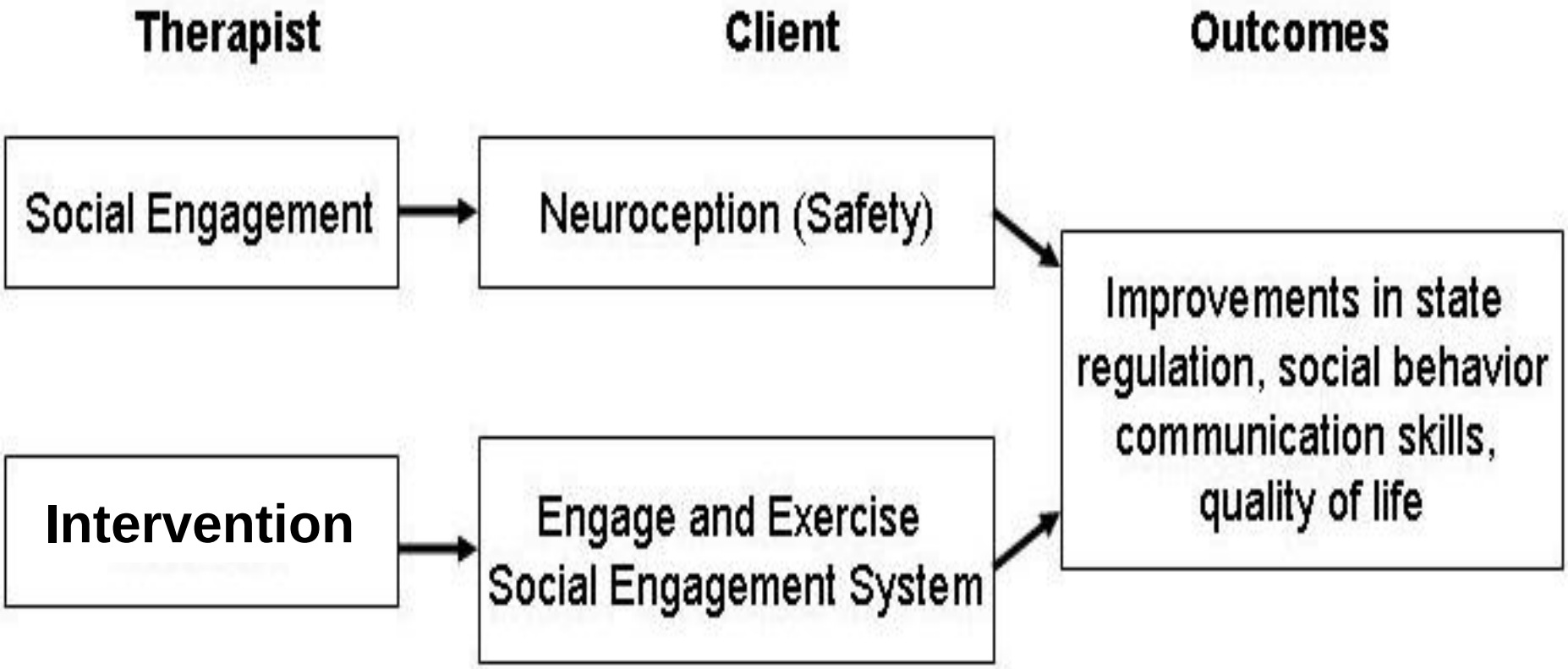
## *A Critical Component of a Social Engagement System*

• The face-heart connection provides a portal to exercise the neural regulation of physiological state via face-to-face social interactions.

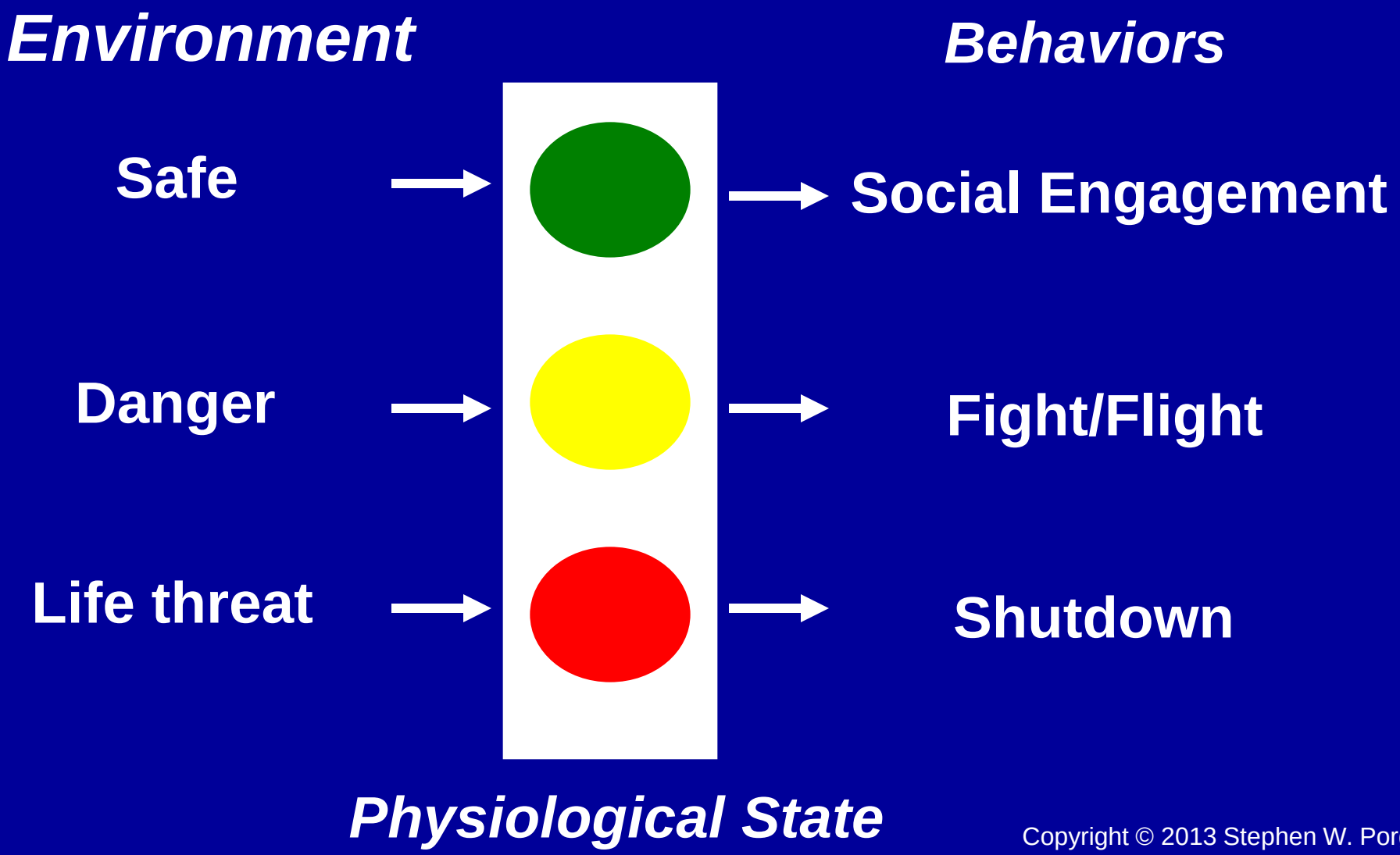
• State regulation difficulties are a core feature of several psychiatric disorders and behavioral problems (e.g., school and home).

•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.

# Therapeutic Model



# Neuroception

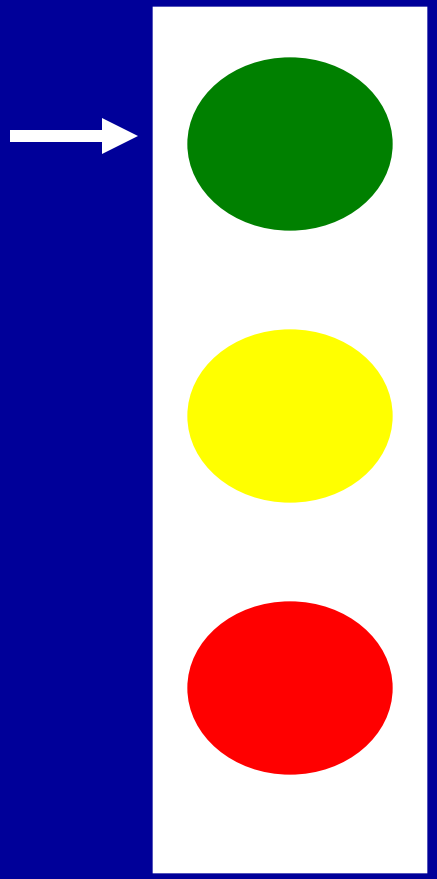


# Neuroception

*Environment*

*Behaviors*

Safe



Social Engagement

Play

Loving Behaviors

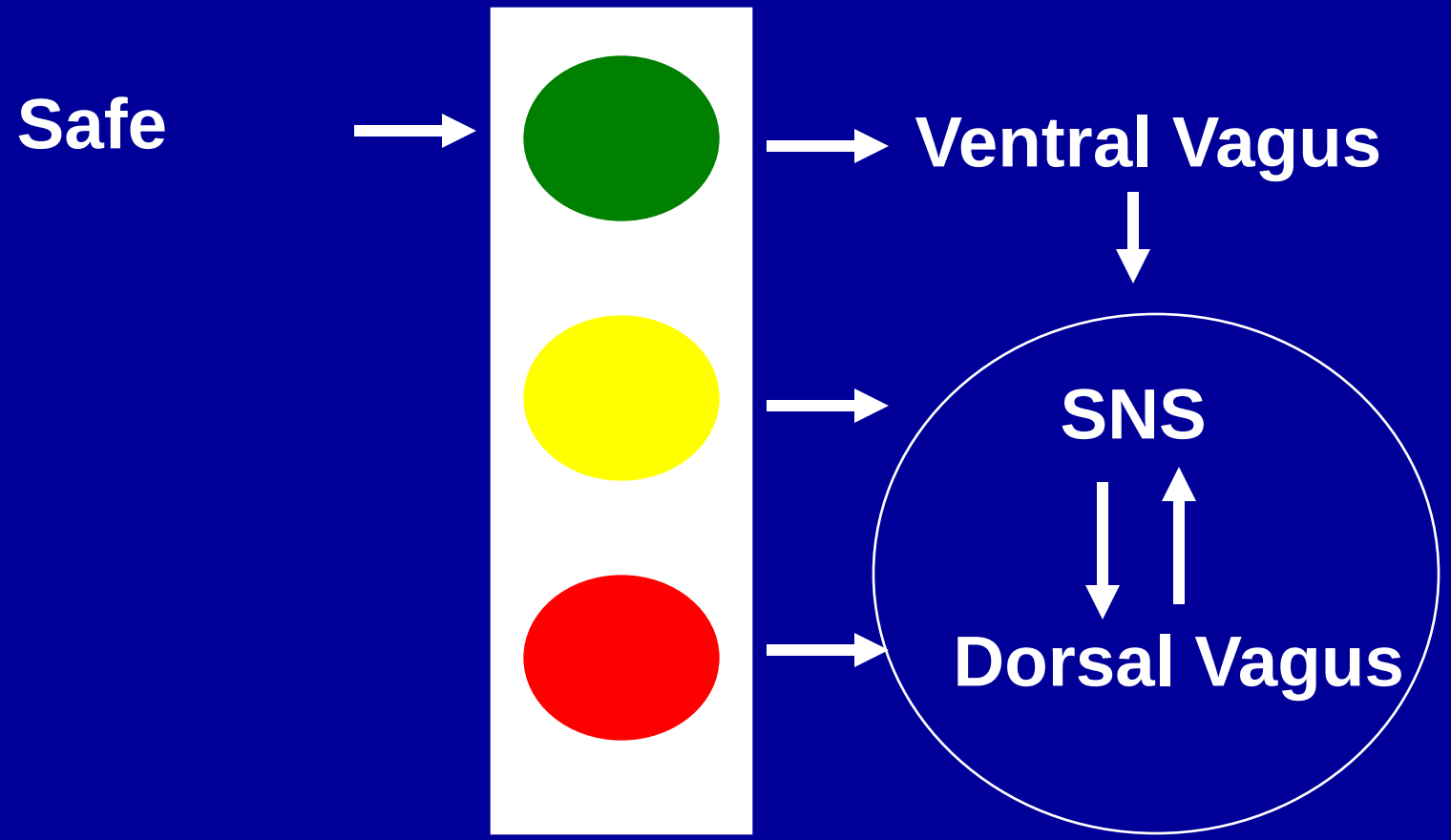
*Physiological State*

# Neuroception:

## Promote mental and physical health

*Environment*

*Visceral state*

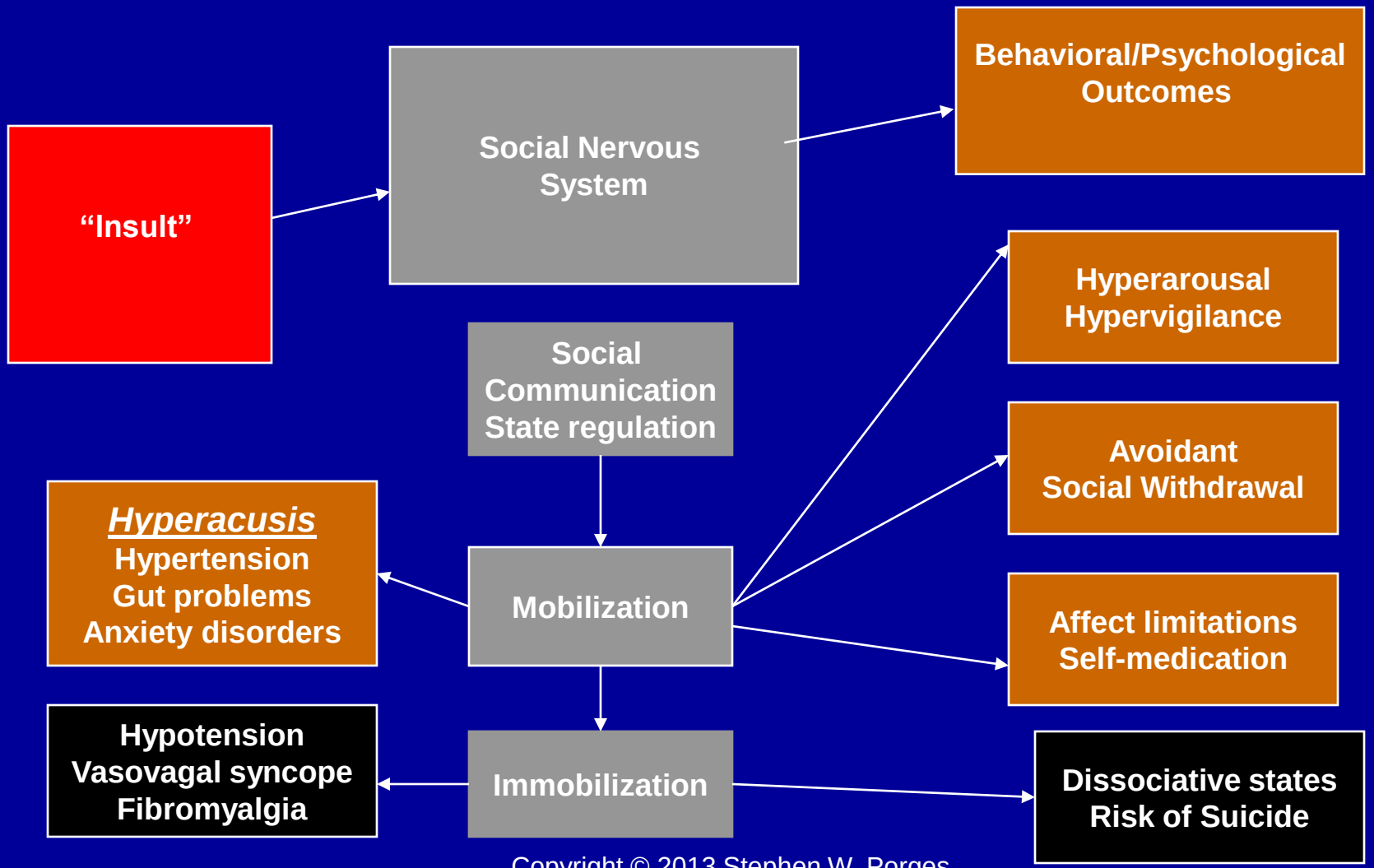


# A New Paradigm?

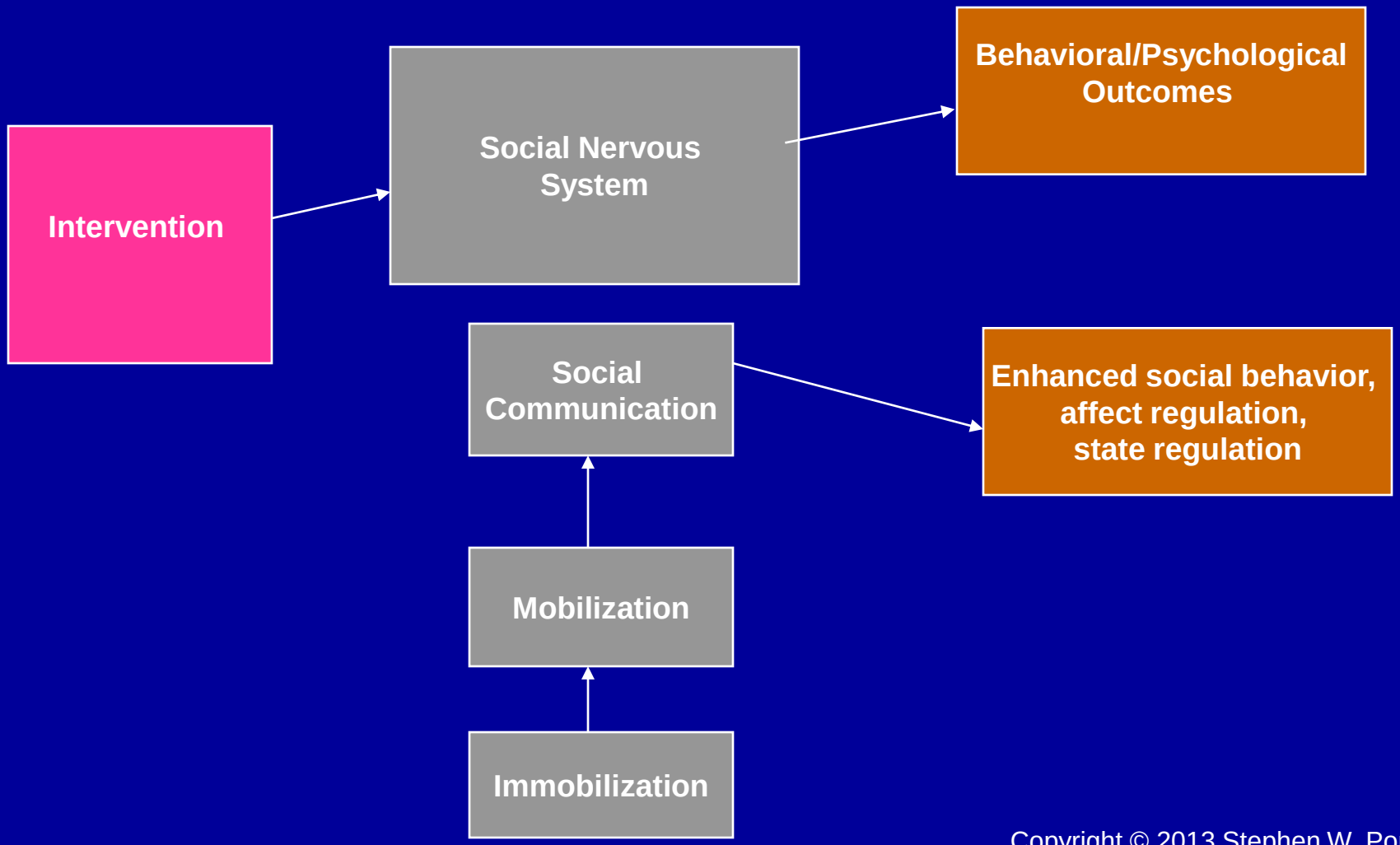
- **If social behaviors are not learned, are they emergent properties of specific neurophysological states?**

- **If dysfunctional social behavior is a spontaneously occurring emergent property of the nervous system (i.e., part of a feedback loop), 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?**

# New Model



# Reverse Engineering:
## A Treatment Model



# Summary

- Our nervous system is continuously evaluating risk in the environment.
- The human nervous system evolved to shift efficiently between conditions of safety and danger using elements of the social engagement system.
- In contrast to challenges of danger, reactions to life threat are not easily reversed.

# 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.

# Polyvagal Theory:
## An Interpersonal Neurobiology Narrative

- The theory provides a neurobiological narrative that focuses on the importance of “safety” and the adaptive consequences of detecting risk on physiological state, social behavior, psychological experience, and health.
- Can this narrative be applied to mindfulness?

# The “Mindfulness” Narrative

- Objective science has documented the “parallel” between mindfulness exercises (MBSR) and health (i.e., mindfulness-based stress reduction).
- Is there a narrative that interweaves the exercises and experiences of mindfulness meditation with a knowledge of our biology?
- Are there biologically relevant features in mindfulness meditation that could be explained by the Polyvagal Theory?

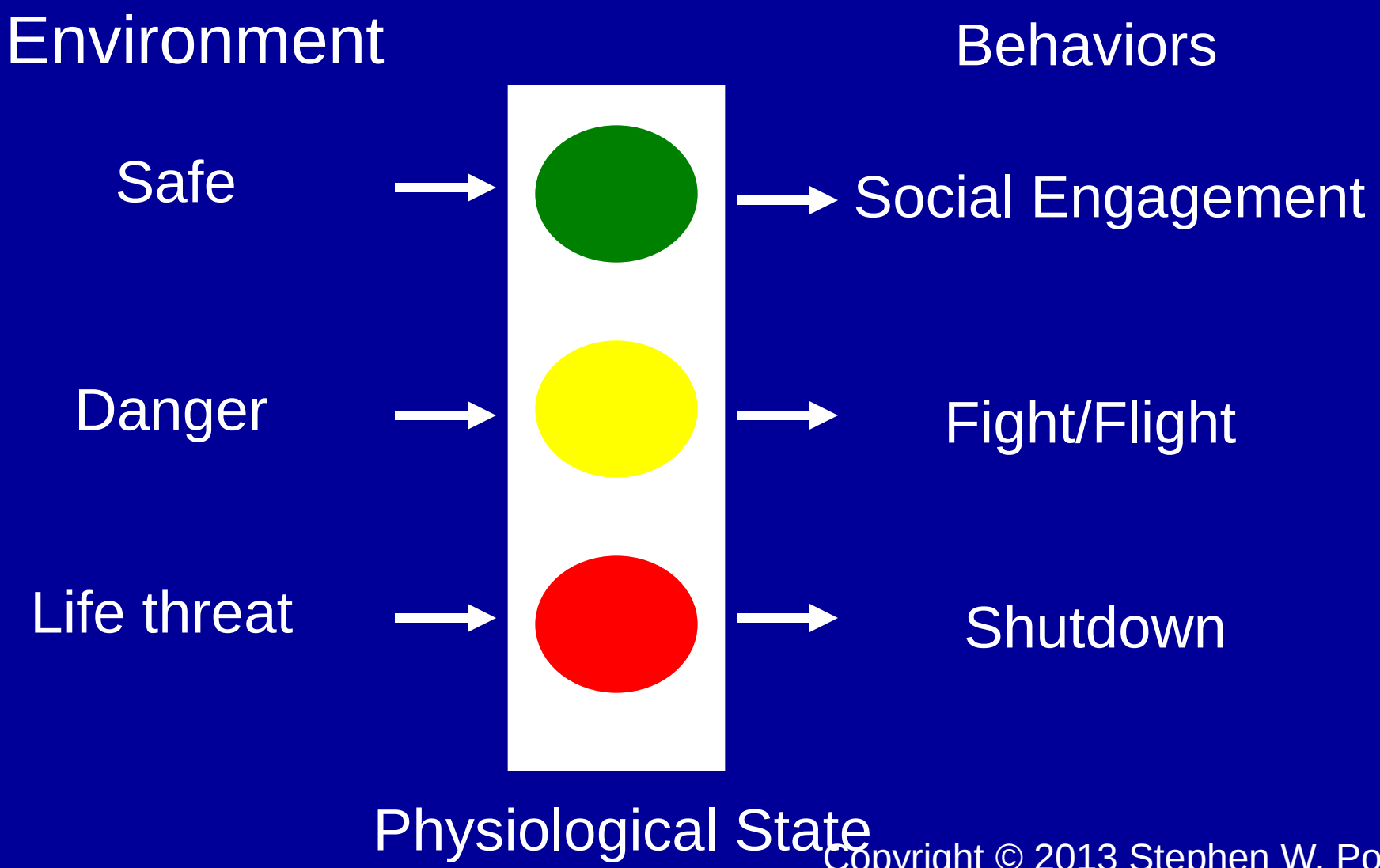
# Mindfulness and Neuroception

- Is the success of mindfulness meditation linked to the down regulation of defensive systems?
- Is the state of mindfulness incompatible with the evaluative states linked to defensive strategies?
- Is a state of safety a prerequisite for the health benefits of mindfulness meditation?

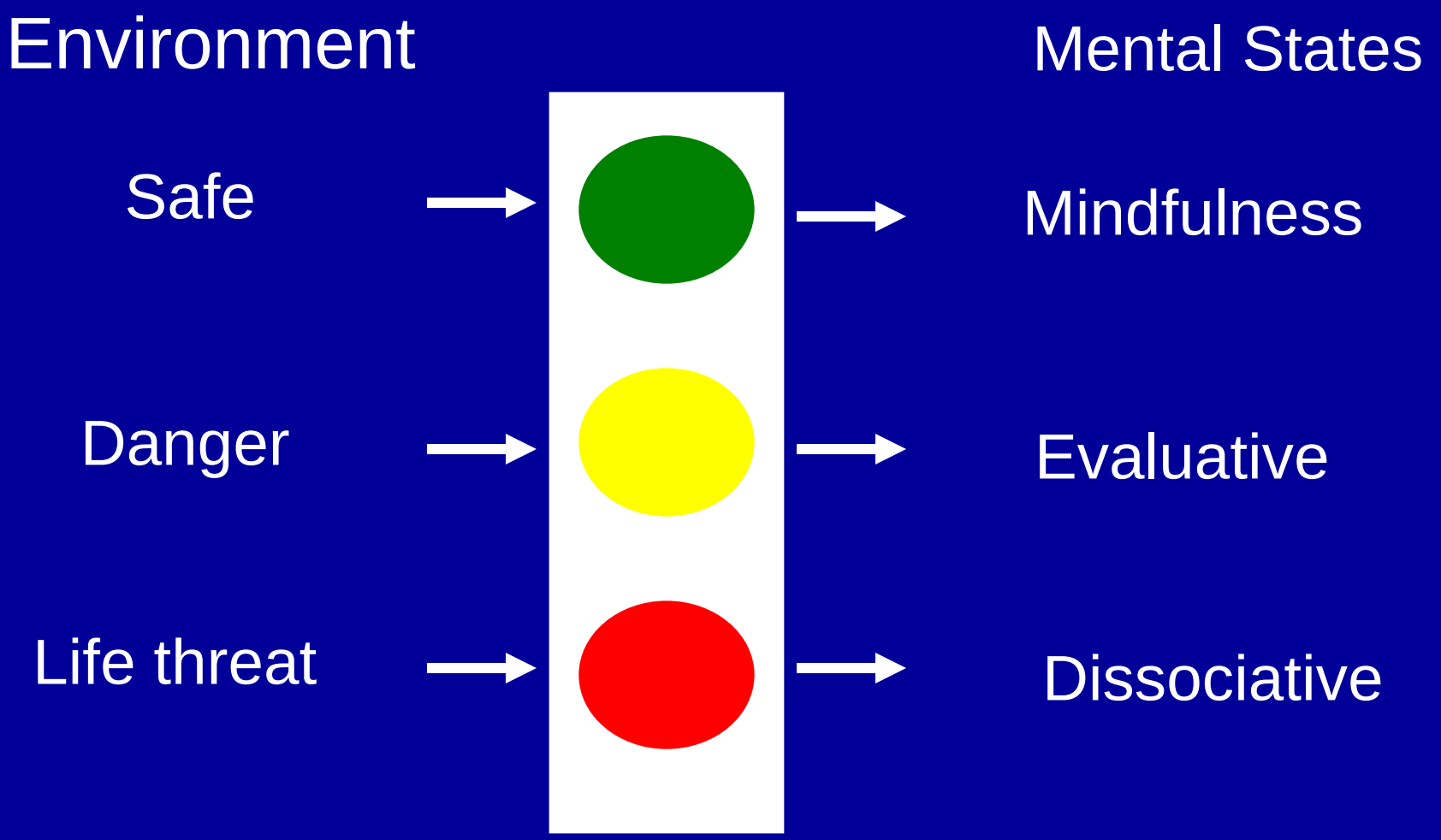
# Mindfulness and Neuroception:

- If a goal of mindfulness meditation is to down regulate defensive systems, then the environmental cues need to support the physiological state associated with safety.
- Only in a state of safety are features of the environment unlikely to trigger defensive (evaluative) reactions.

# Neuroception



# Mindfulness and Neuroception



# Can Posture Regulate State?

Examples?

# Can Breath Regulate State?

Examples?

# The Role of Breath

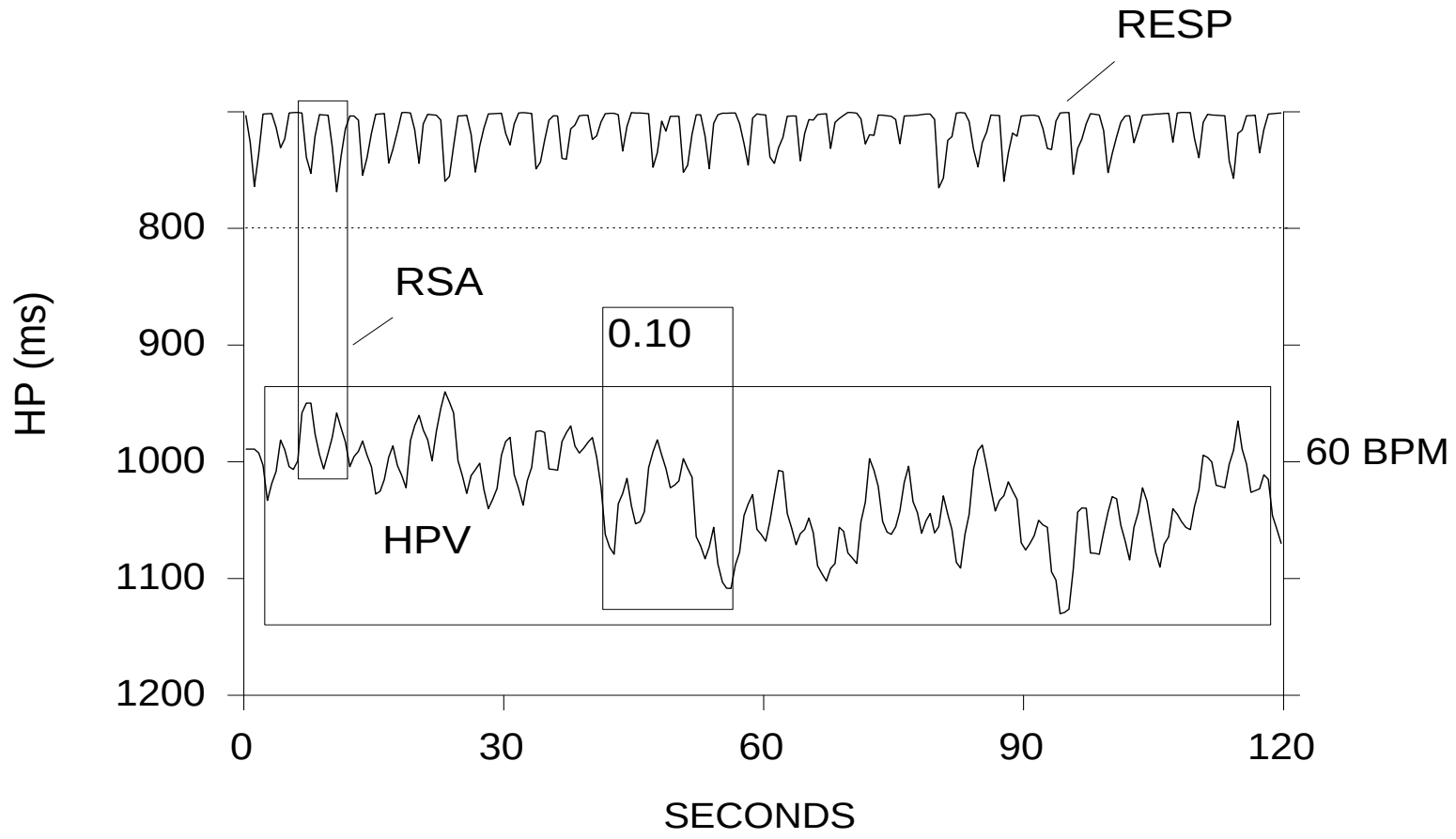
# The Role of Breath

- 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

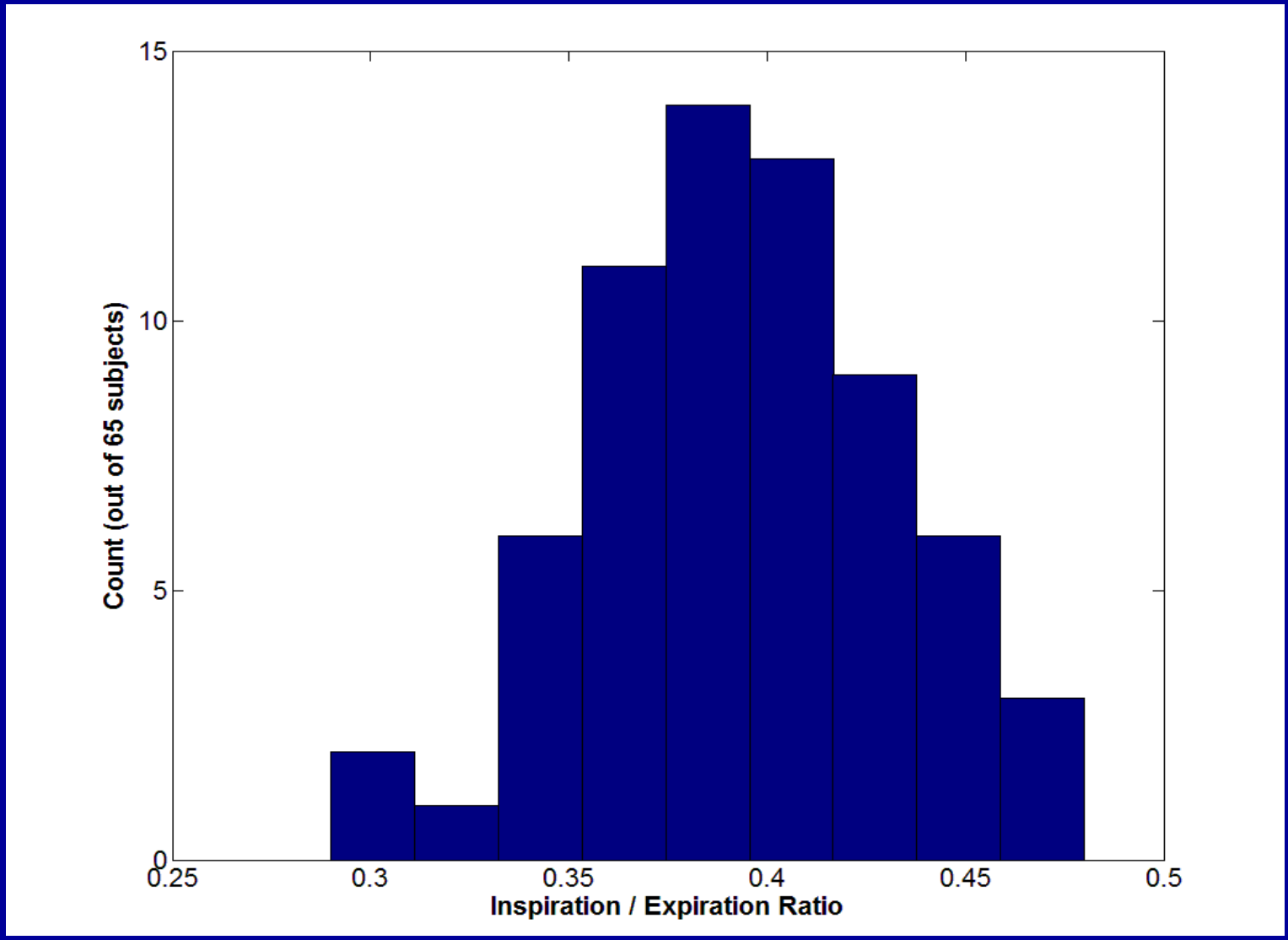
# Evolution and the Diaphragm

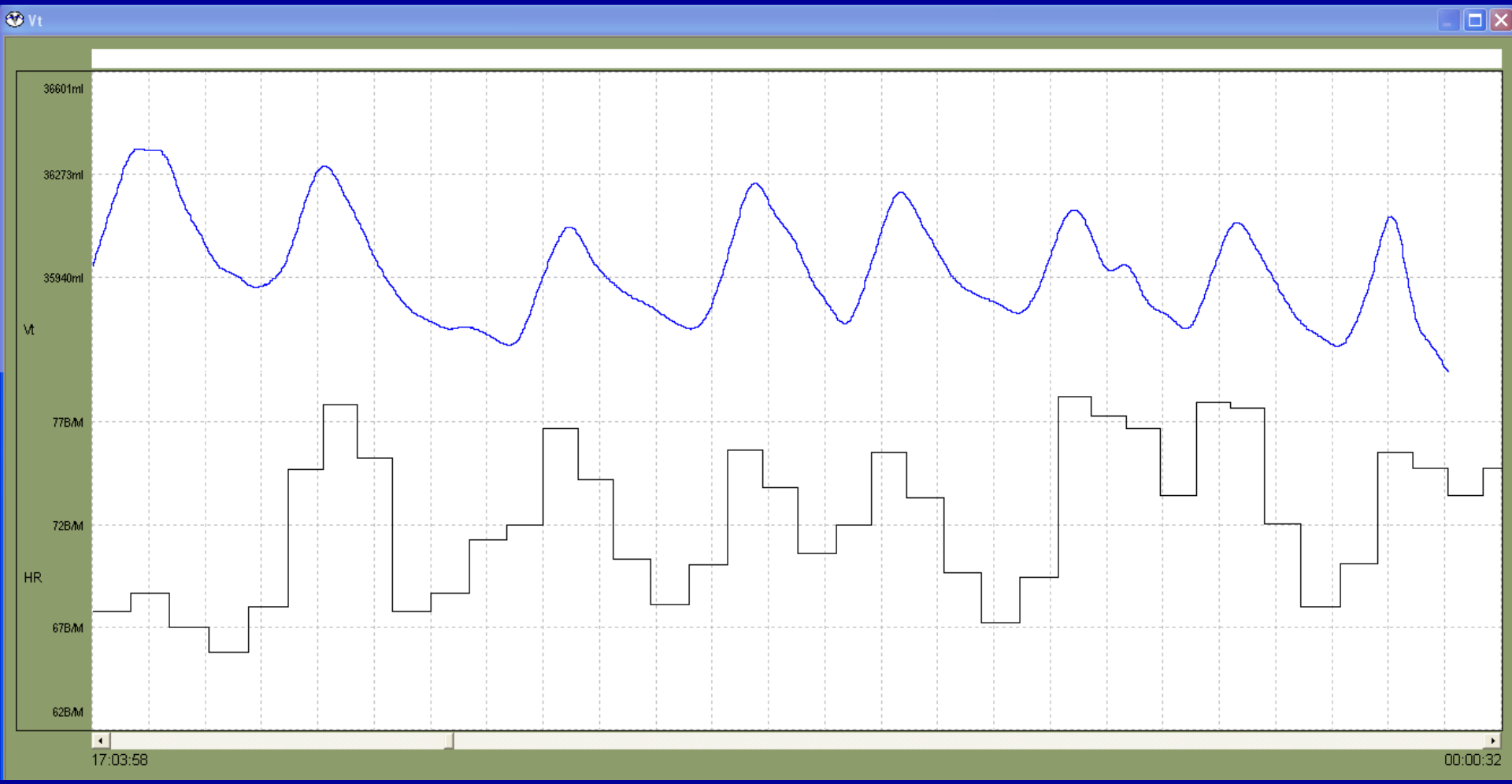
- Mammals are the only vertebrates with a true diaphragm.
- The diaphragm is a muscle that separates the body cavity into two sections.
  - Above the diaphragm: Heart and lungs
  - Below the diaphragm: Liver, kidneys, stomach, intestines, etc

# Respiratory-Heart Rate Rhythms



# Breathing is Asymmetrical



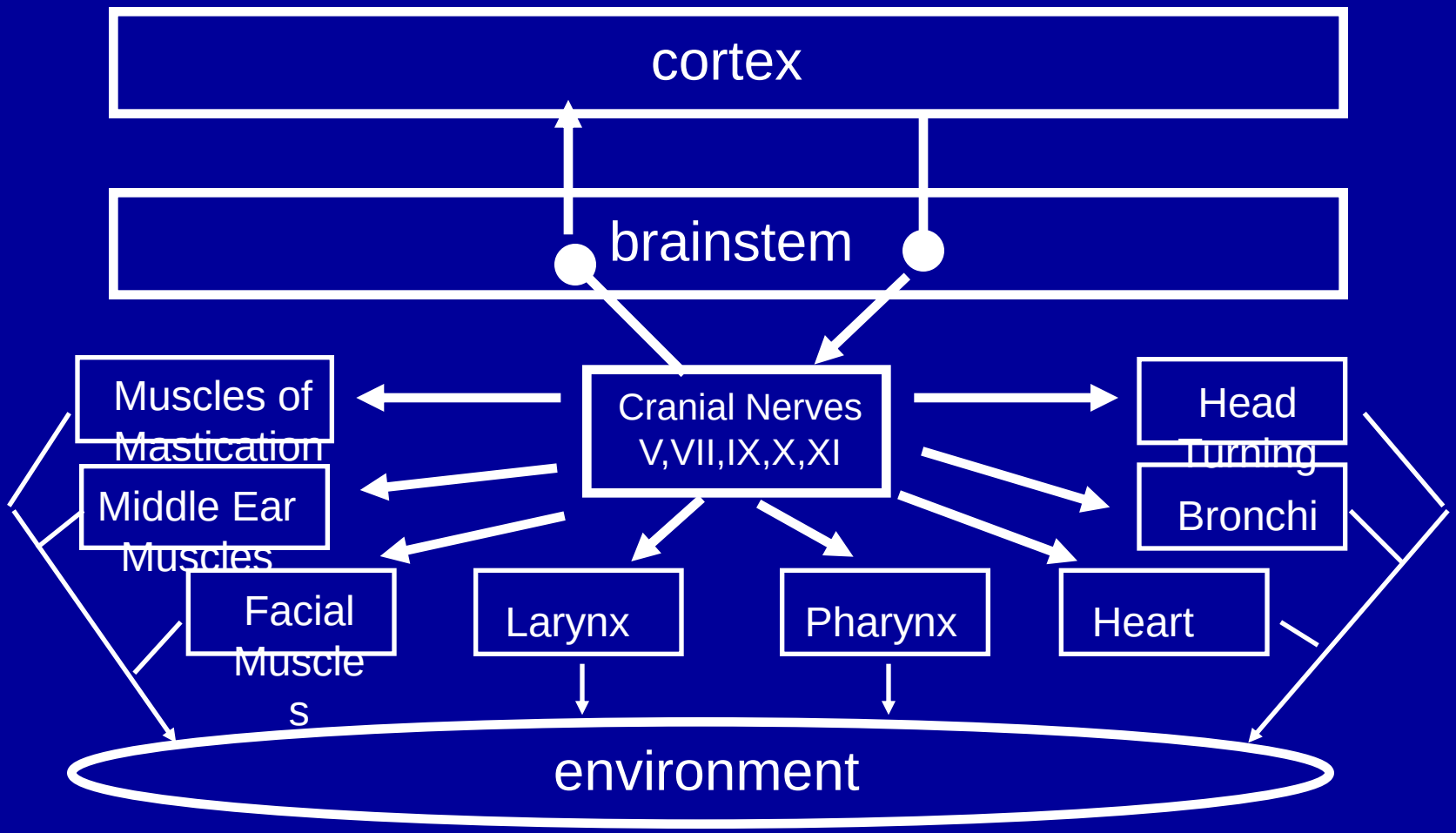


# Breathing Exercises:
## Triggering Neural Regulation of State

# Common Features between Wind Instruments and Pranayama Yoga

- Pranayama yoga is yoga of the Social Engagement System
- Exercising the Social Engagement system
  - Striated muscles of the face to play and listen (embouchure, middle ear muscles)
  - Respiratory-heart rate regulation (diaphragmatic breathing)

# The Social Engagement System
## *(Pranayama)*



# Can Sound Regulate State?

Examples?

# Sound and Neuroception

- Do the acoustic features of voice, music, or background noise influence our ability to feel safe?
- Do therapies use “listening” as a portal of treatment?

# Listening as a Methods to Feel Safe

- Acoustic features
  - Frequency band
  - Modulation of frequencies (e.g., prosody, melody)
  - Rhythm (heart beat, breathing)
  - (Syntax)

# Prosody

- Prosody describes the perception of feelings expressed in speech.
- Predates the evolution of human language.

# Prosody

“Even monkeys express strong feelings in different tones — anger and impatience by low, fear and pain by high notes.”

Charles Darwin, The Descent of Man (1871).

# Sound and Neuroception

- Composers use different acoustic frequencies to express their musical narrative.
  - Frequencies of human voice (especially female) signal safety
  - Lower frequencies signal predator.

# Can Sound Regulate State?

- Do the acoustic features of voice, music, or background noise influence our ability to feel safe?

# Can Sound Regulate State?

- What are the influences of frequency band (e.g., bass, no bass) and modulation of frequency (e.g., melody, prosody)?
  - Chants
  - Popular examples
    - Disney
    - Barry White
    - Rap
    - Lullabies

# Music and Emotion:
## Peter and the Wolf (Prokofiev)

What emotions (pleasant or unpleasant) do the sounds represent?

- Peter
- Grandfather
- Bird
- Cat
- Duck
- Wolf
- Hunter

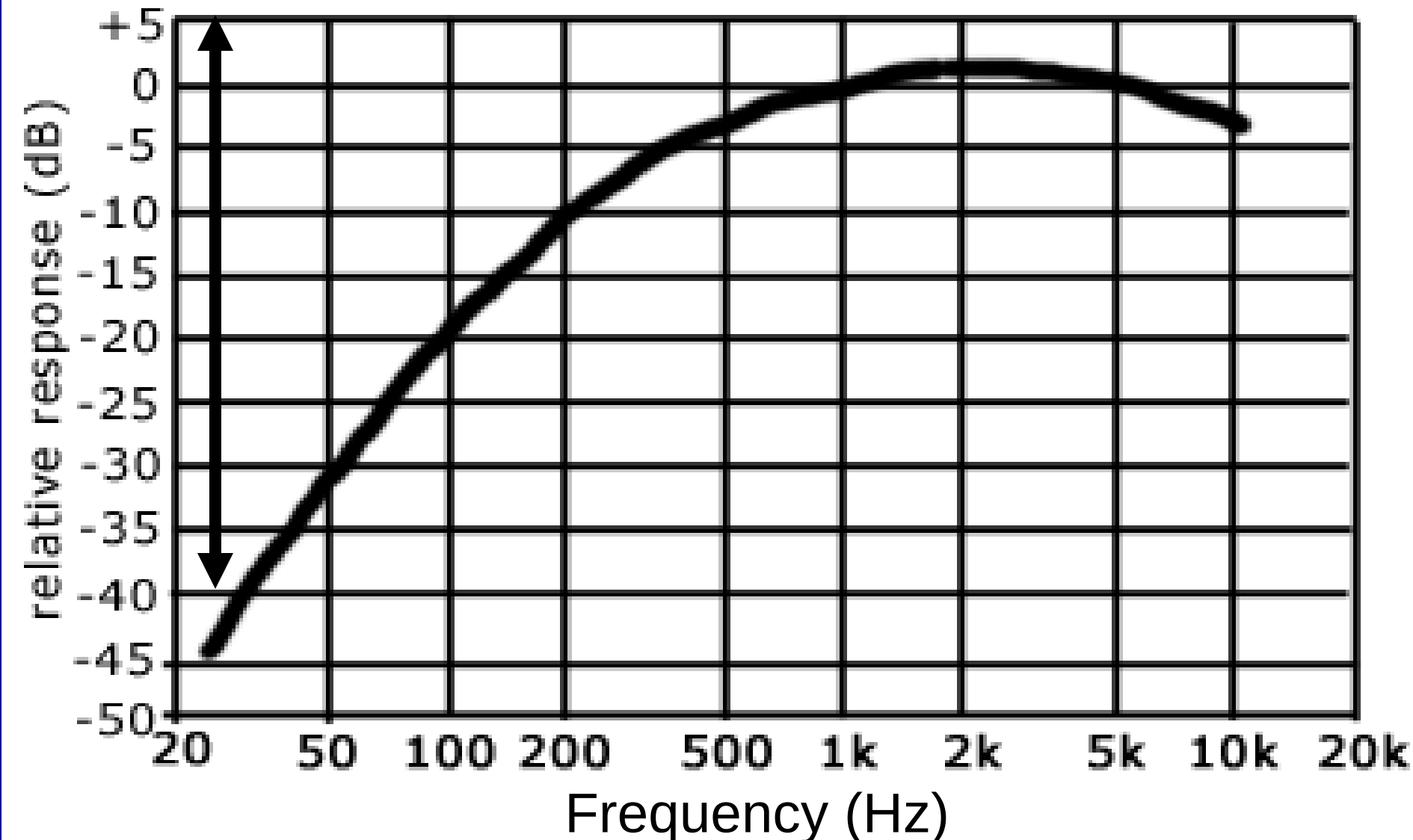
# The Role of the Middle Ear:
## Extraction of Human Voice

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

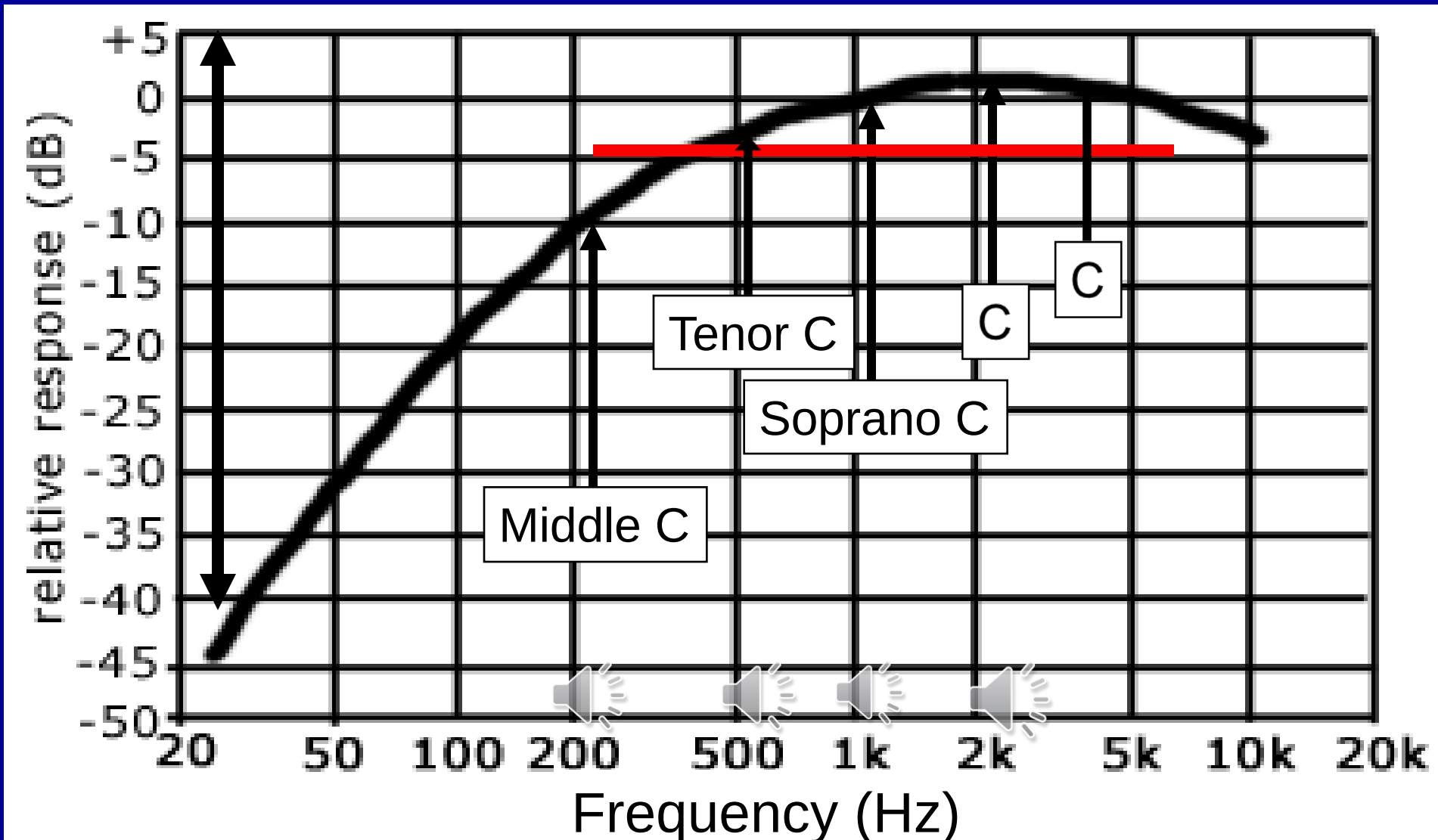
# Detached Middle Ear Bone:
## A mammalian feature

- 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.
- Without functioning middle ear muscles we are hypersensitive to the low frequencies that signal predator!

# What Normal Ears Hear:
## Low Frequency Attenuation



# Articulation Index:
## Determining intelligibility of voice



# 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
- Relation of MEM to other physiological, neurological, psychological features
- Therapeutic “exercise” of MEM

# Listening to Music and Voice as Therapy

1. Does music share features with human voice?
2. Is there a biobehavioral basis to support the hypothesis that listening to music and/or human voice will facilitate social, emotional, and cognitive function?

# “Visceral” Definitions of Sounds:
## A phylogenetic interpretation

- Acoustic frequencies in well define frequency bands trigger select physiological states via neuroception.
- Modulated frequencies of human voice (especially female) signal safety
- Low frequencies (not requiring MEM) signal predator.
- High frequencies (not requiring MEM) signal pain or eminent danger.

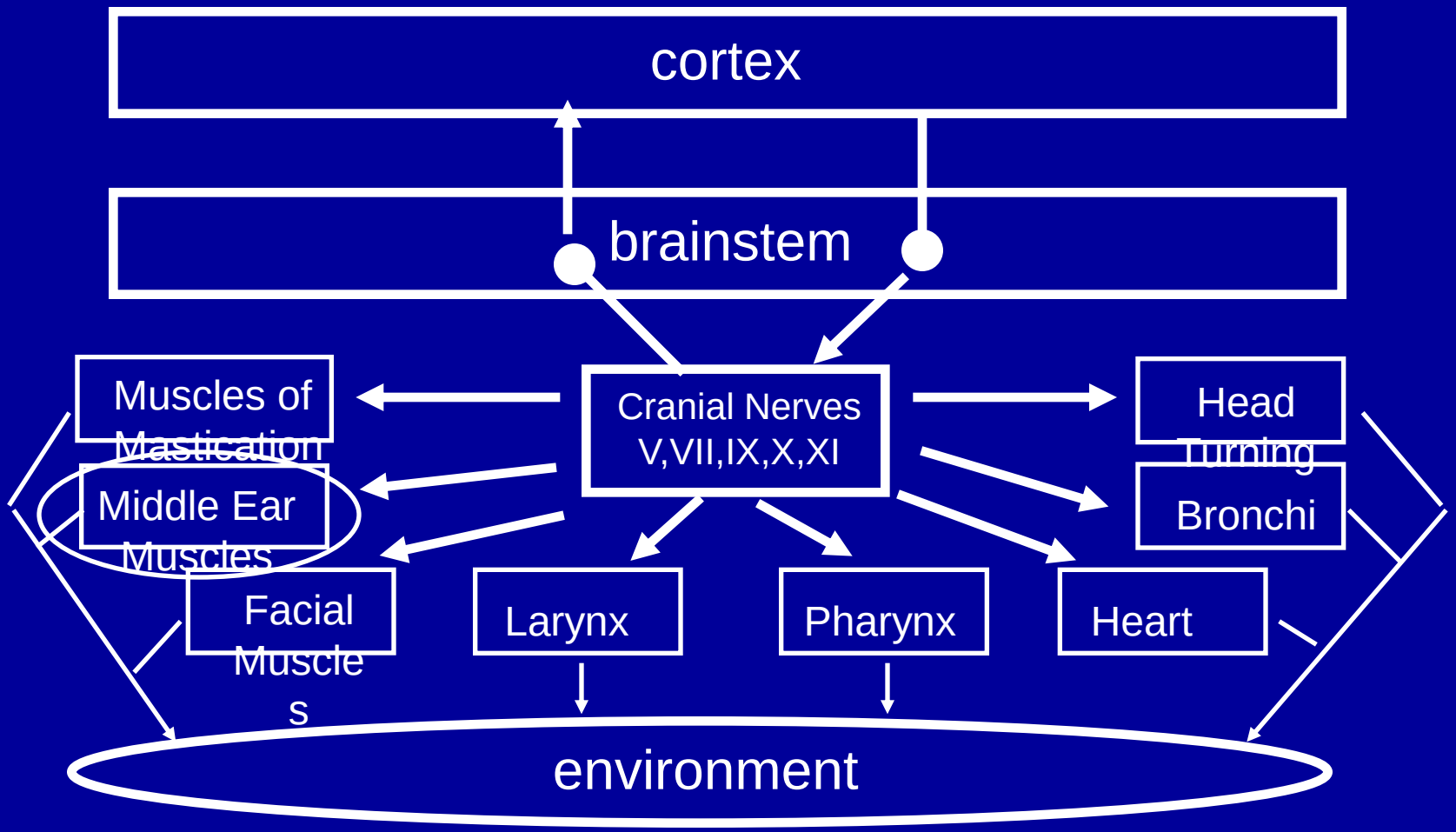
# Prosody

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."

# Music and Human Speech:
## Common "Neuroceptive" Features

- Our nervous system may process music similar to prosody in human voice.
- Music may be more salient than voice to neural "feature detectors" scanning the environment for risk.
- Vocal music (chants) might be very effective in triggering a neuroceptive state of safety and dampening defense systems.

# Listening:
## Accessing the Social Engagement System



What happens when the middle ear muscles are not working correctly?

# Atypical Sensory Experiences

***…the prevalence of abnormal sensory phenomena may be over 60% for individuals with autism. …..***

***…abnormalities are particularly evident in hearing (Goldfarb, 1963; Ornitz, 1974; Grandin & Scariano, 1986) and a hyper-reactivity to auditory stimulation (i.e., hyperacusis) (Grandin & Scariano, 1986; Rosenhall, Nordin, Sandstrom, Ahlsen, & Gillberg, 1999).***

***An increased awareness of environmental noises and difficulty in hearing speech in background noise are also prominent auditory features in autism (Grandin & Scarianoi, 1986; Boatman, Alidoost, Gordon, Lipsky, & Zimmerman, 2001).***

# Auditory Hypersensitivities:
## A Feature of Autism?

46% autism (n=146)

Porges et al. (under review)

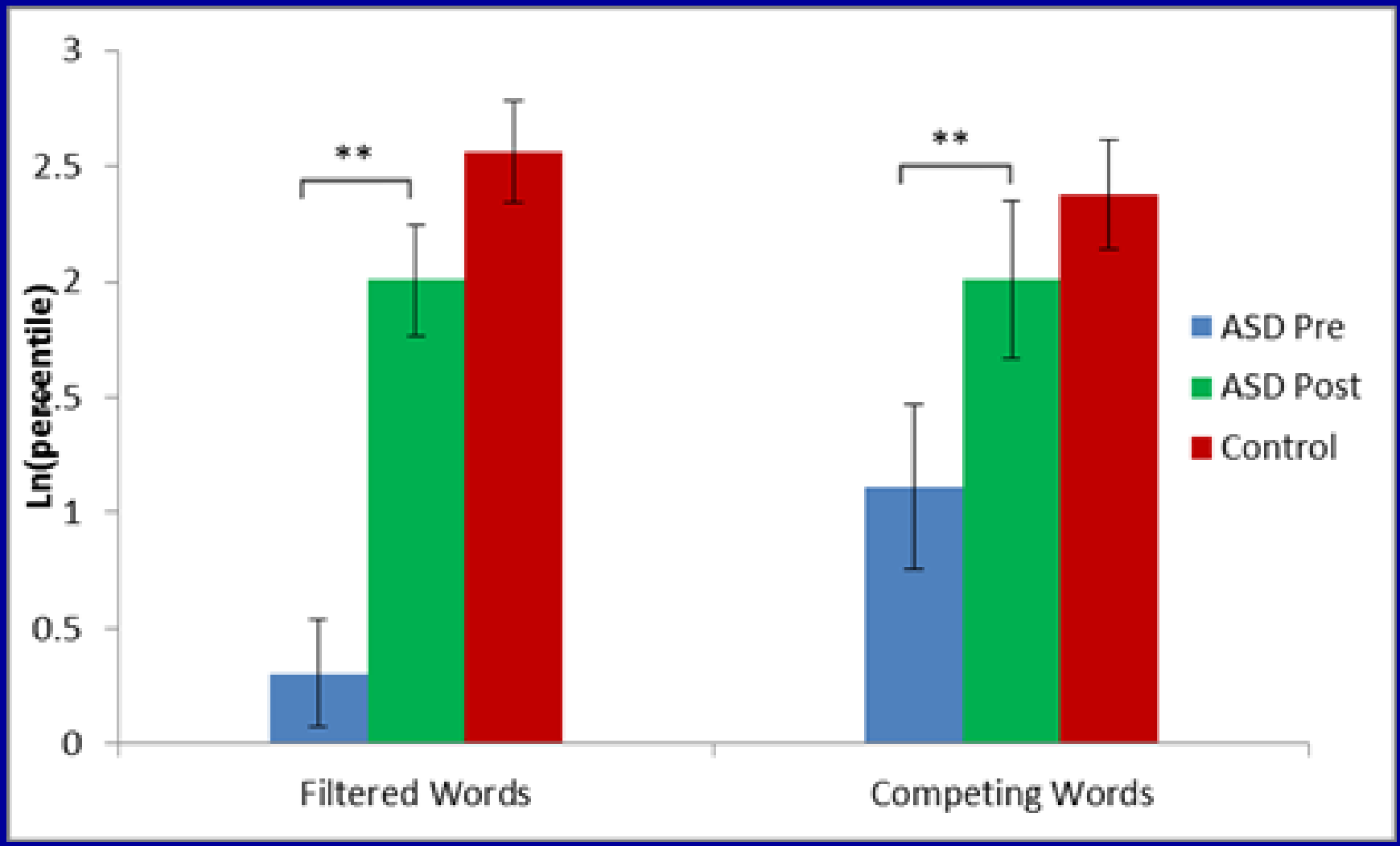
46% autism (n=230)

Dr. Ira Cohen (personal communication)

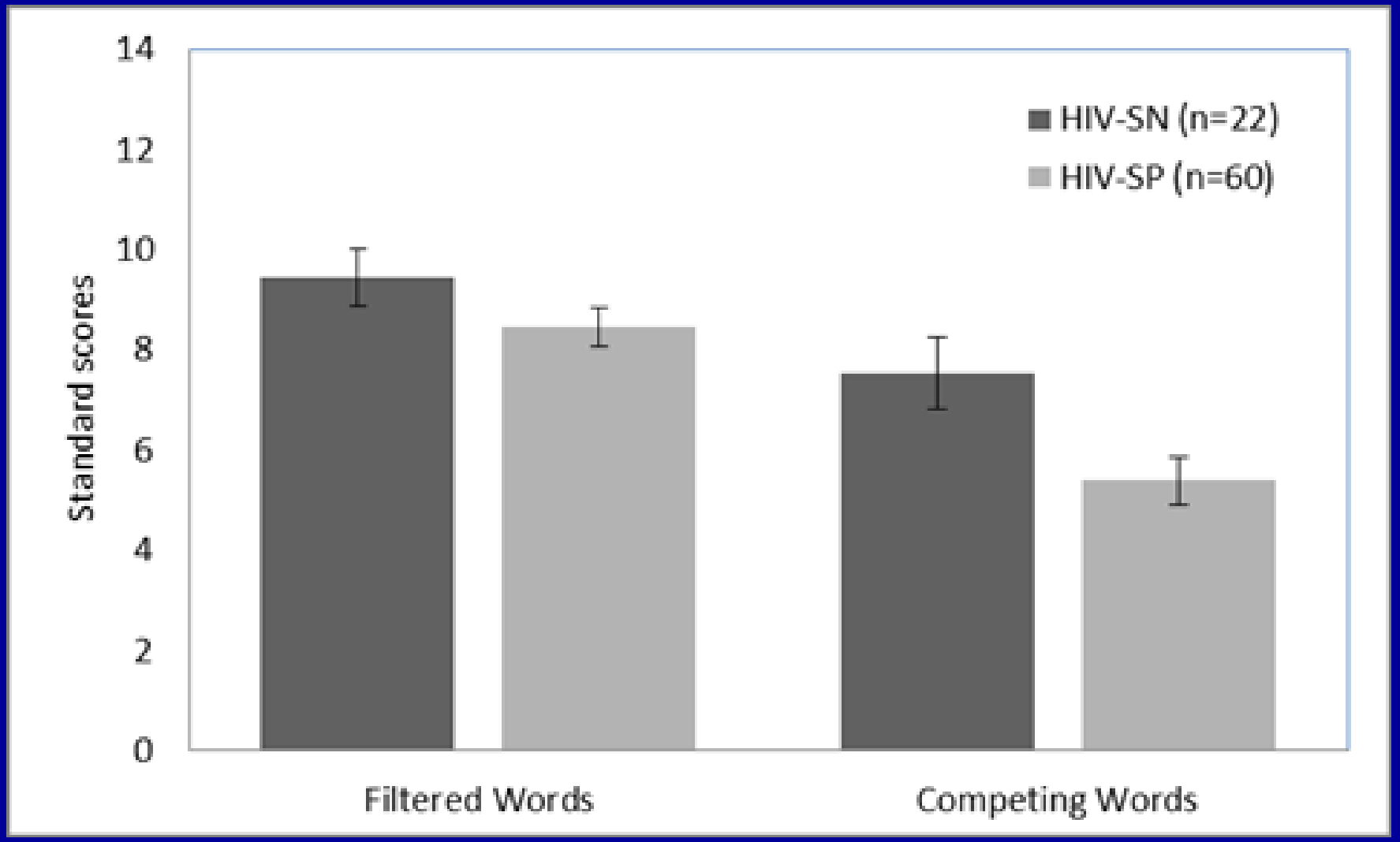
57% autism (n=177)

Dr. David Skuse (personal communication)

# Auditory Processing: Autism



# HIV: Auditory Processing



# The Polyvagal Theory and the Social Engagement System

Neural mechanisms link middle ear muscles to facial expression, prosody, social awareness, and state regulation.

Can physiological state changes influence the function of the middle ear muscles?

Are auditory hypersensitivities a signal that the entire Social Engagement System is compromised?

# Temple Grandin:
## Hearing as a child

"My hearing is like having a sound amplifier set on maximum loudness. My ears are like a microphone that picks up and amplifies sound. I have two choices: 1) turn my ears on and get deluged with sound or 2) shut my ears off… Hearing tests indicated that my hearing was normal. I can't modulate incoming auditory stimulation."

# Temple Grandin:
## Hearing as an adult

I am unable to talk on the telephone in a noisy office or airport. If I try to screen out the background noise, I also screen out the voice on the telephone. Autistic people with more severe auditory processing problems are unable to hear a conversation in a relatively quiet hotel lobby

# Listening and Health

- There is a biobehavioral basis to support the hypothesis that listening to music and/or prosodic human voice will facilitate access to the neural circuits that promote social behavior, emotional regulation, and health.
- Listening, as a form of non-judgmental attention, is incorporated into mindfulness exercises.

# Underlying Mechanisms of Auditory Hypersensitivities?

# Sensory Abnormalities:
## Common in psychiatric disorders?

1. Are hypersensitivities observed in autism and PTSD also observed in other psychiatric disorders?
2. What strategies are used to deal with features of hypersensitivity to sound, to light, and to touch?
3. Are hypersensitivities to sound, to light, and to touch shared or independent clinical symptoms?

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# A Neural Love Code:
## The Body's Need to be Safe

- A biological quest for "safety" in proximity of another
  - To interact through social engagement behaviors (neural exercises)
  - To immobilize without fear (foster growth, health, restoration)
- Explains the health benefits of social support

# How Our Nervous System Detects Safety or Threat

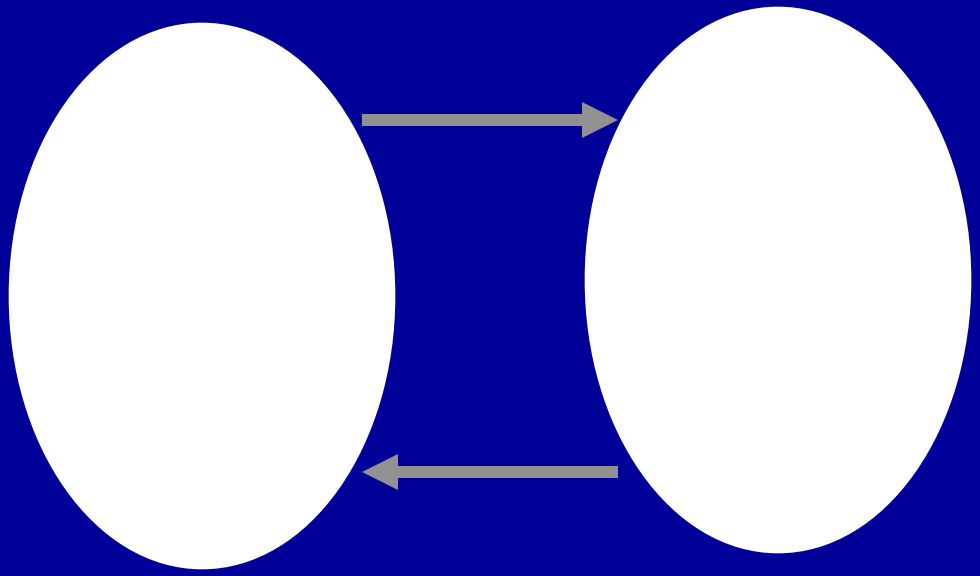
Feeling safe is a necessary prerequisite before strong social relationships can be established and before social support can be effective in “healing” physical and mental illnesses.

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

# People Need People:
## A Biological Basis for Social Behavior

Regulators of physiology are
"embedded" in relationships

M. Hofer
New York State Psychiatric Institute



# Neural Basis for Establishing Safe Relationships

- Our nervous system is continuously evaluating risk in the environment.
- The human nervous system evolved to shift efficiently between conditions of safety and danger using elements of the social engagement system (e.g., face-to-face).

# Summary

- Intimacy requires the co-opting of ancient neurobiological immobilizing mechanisms with social engagement strategies that enable individuals to feel safe and to immobilize without fear.
- In contrast to challenges of danger, reactions to life threat are not easily reversed.

# 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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