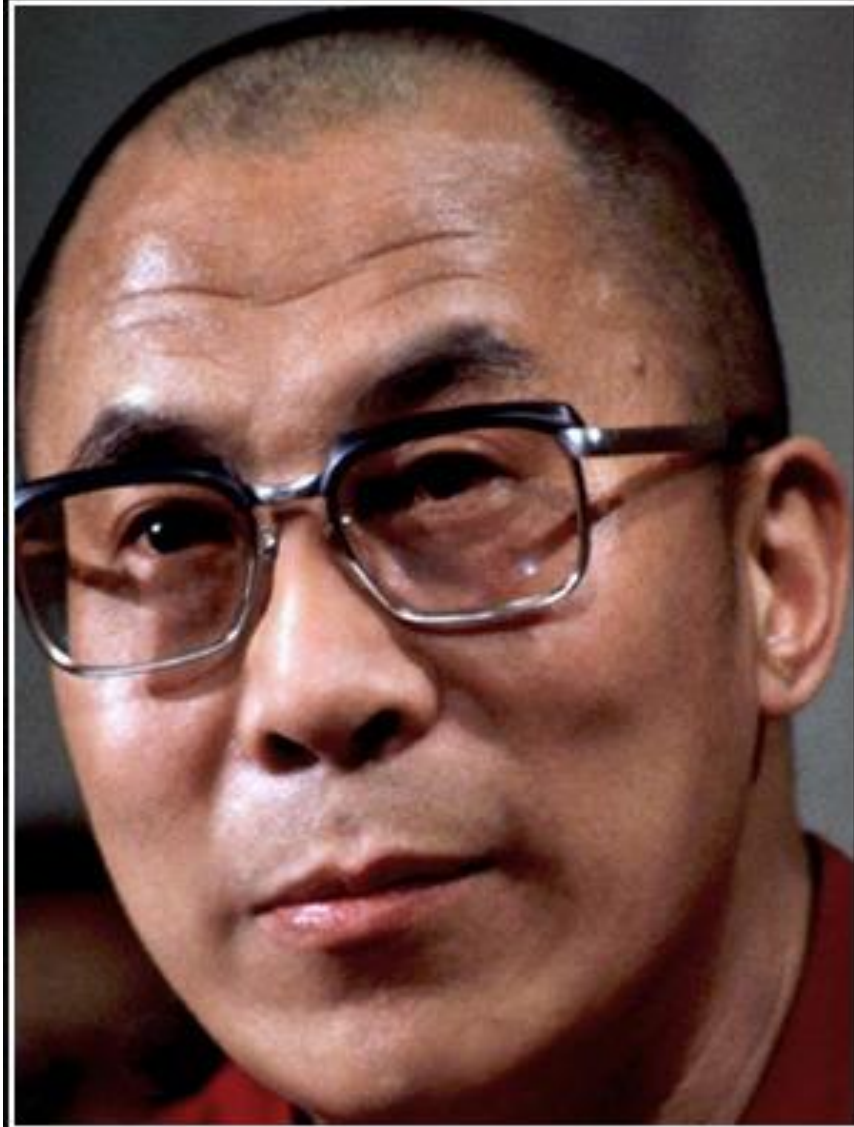


CULTIVATING COMPASSION, AND GRATITUDE WITH HRV BIOFEEDBACK AND MINDFULNESS

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When we develop a right attitude of compassion and gratitude, we take a giant step towards solving our personal and international problems

— *Dalai Lama* —

AZ QUOTES



GRATITUDE ASSOCIATED WITH

- Greater optimism, overall wellbeing, more exercise and fewer doctor's visits (Emmons and McCullough)
- Better sleep; less depressed mood; less fatigue; better cardiac function; lower levels of inflammatory biomarkers (in heart failure patients; Mills et al, 2015)
- Better self reported physical health (Hill et al, 2013)



GRATITUDE AND HRV

- Increases in HRV during gratitude journaling (Redwine et al, 2016)
- Gratitude associated with improved HRV in heart patients (Mills et al, 2015)



COMPASSION

- Wishing that oneself or another person be *free from suffering* (The Dalai Lama)
- Sensitivity to suffering in self and others, with a commitment to alleviate and prevent it (Paul Gilbert)



COMPASSION AND HEALTH

- **Less pain** (Carson et al., 2005)
- **Less anxiety and depression** (Hoffman, Grossman, & Hinton, 2011)
- **Better physical health and quicker recovery from illness** (Martin Seligman)
- **Less inflammation** (Pace et al, 2008, Breines et al, 2013)



FOUNDATIONS OF COMPASSION

- Sustained attention and orienting response
 - Social engagement at times of stress
 - Sense of safety in interpersonal connection
 - Ability to regulate one's own physiology
-
- Based on Kirby, Doty, Petrocchi, and Gilbert, 2017

HRV AND COMPASSION

- Sustained attention and orienting response are controlled by the Parasympathetic Nervous System (PNS)
- Compassion evoking stimuli (videos of other's suffering) produce vagally mediated parasympathetic response
 - Self reports of feelings of compassion highly correlated with PNS response
- Higher baseline HRV associated with greater likelihood of compassionate action in response to suffering





HRV AND COMPASSION

- Higher baseline HRV associated with greater ability to regulate emotions and better ability to self soothe
- Higher HRV associated with feelings of compassion, but not necessarily positive affect in general
- Recent studies reveal association between increases in compassion with increases in HRV



HRV AND COMPASSION

- Brain imaging studies:
 - Association between increased HRV and insula activation
 - Increased HRV associated with higher connectivity between amygdala and insula



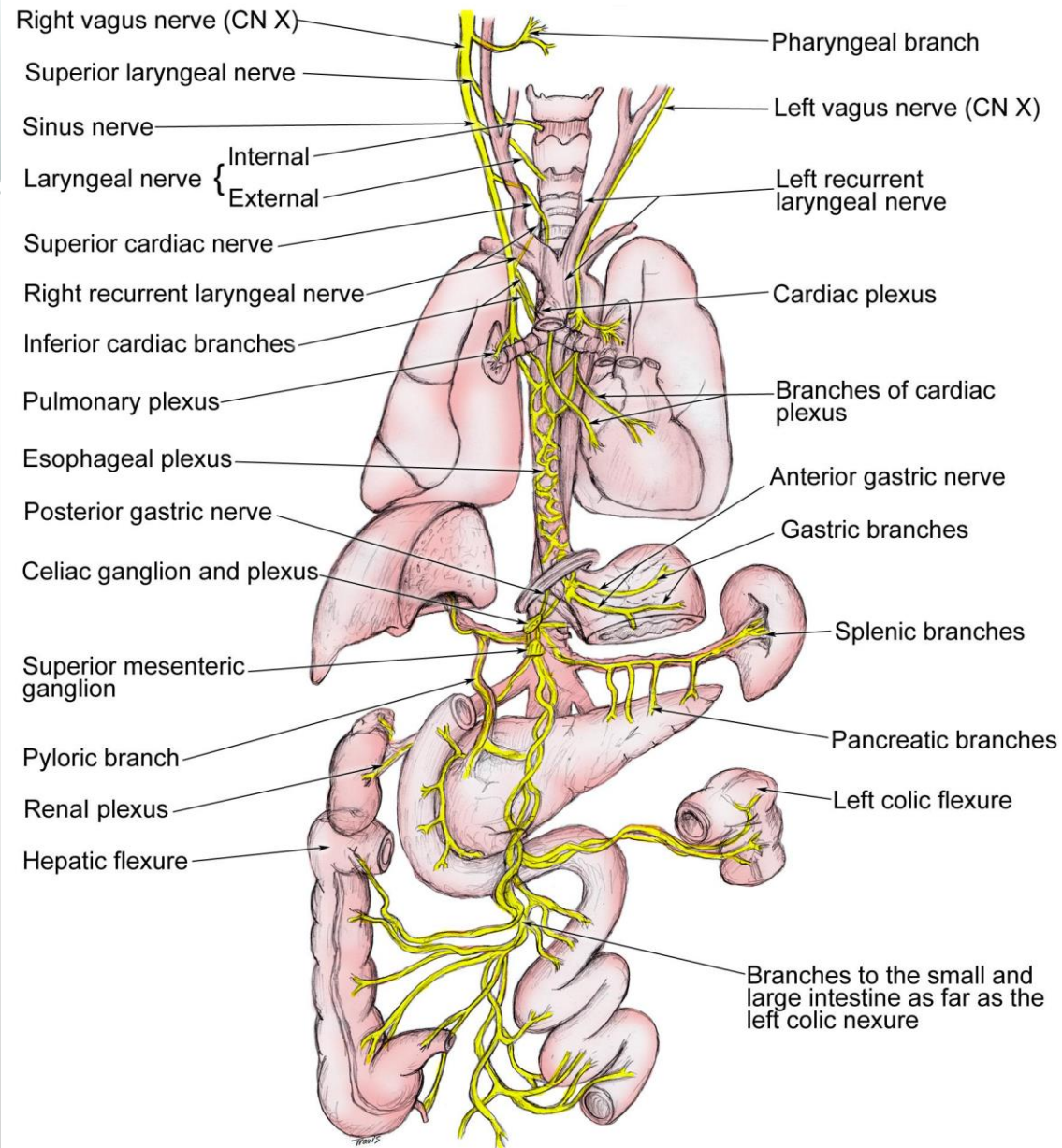
POLYVAGAL THEORY (STEPHEN PORGES)

- Evolutionarily developed defensive and protective system
- Comprises ventral (myelinated) and dorsal (unmyelinated) vagus



VAGUS NERVE

- 10th paired cranial nerve, longest one
- Supplies parasympathetic fibers to all organs (except adrenal glands)
 - from the neck down to the colon
- Has some sympathetic function via peripheral chemoreceptors

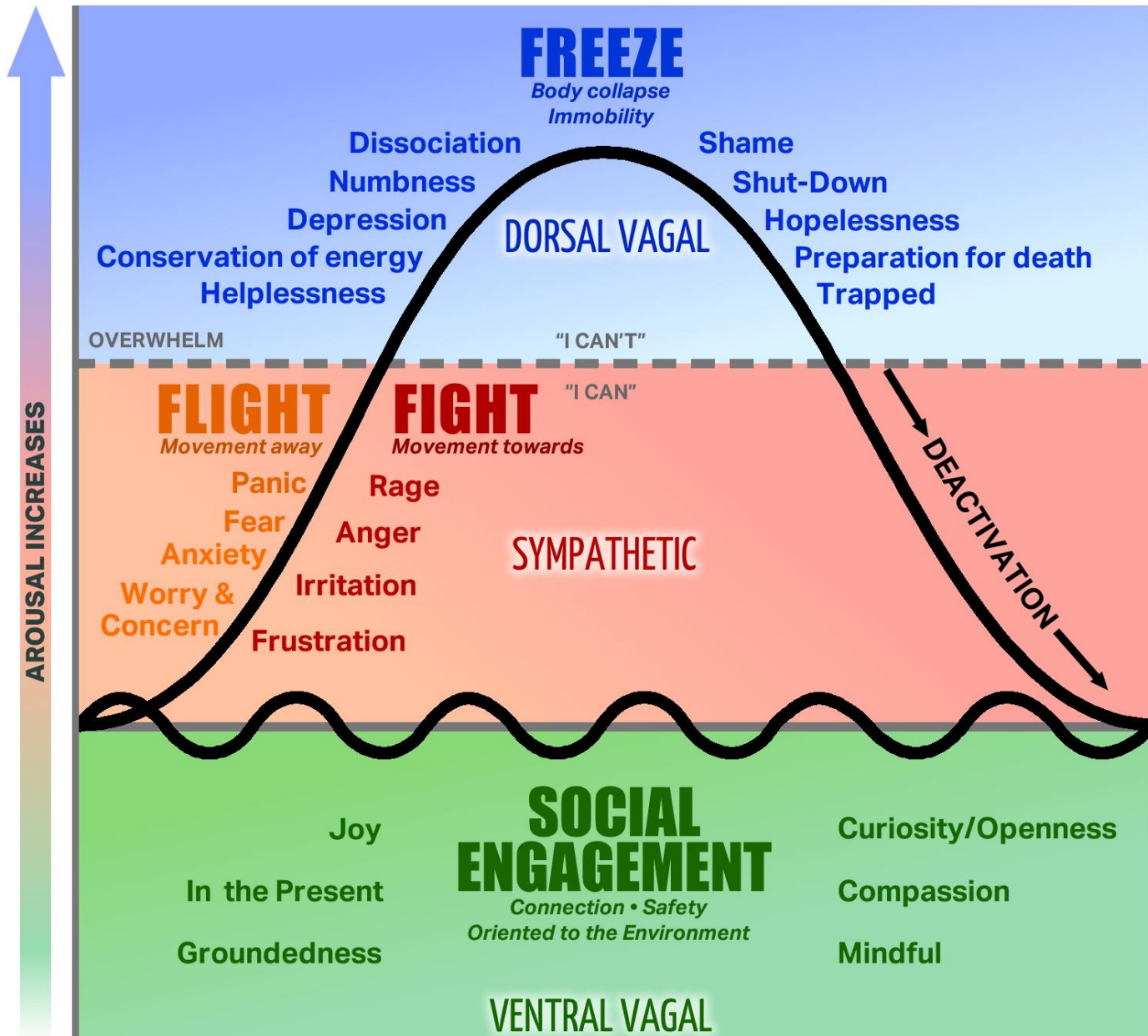


Vagus Nerve



HIERARCHICAL DEFENSIVE RESPONSE IN POLYVAGAL THEORY

- Newer system (ventral vagus) activated first
 - Puts on the brake to the fight or flight response, helps people feel safe through social engagement
- Older system (sympathetic nervous system)
 - Fight or flight response (aggressive engagement/defense)
- Oldest system (dorsal vagus system)
 - Freeze/play dead (passive defense)



PARASYMPATHETIC NERVOUS SYSTEM
 DORSAL VAGAL - EMERGENCY STATE

Increases

- Fuel storage & insulin activity
- Endorphins that help numb and raise the pain threshold.

Decreases

- Heart Rate • Blood Pressure
- Temperature • Muscle Tone
- Facial Expressions • Eye Contact
- Intonations • Awareness of the Human Voice • Social Behavior • Sexual Responses • Immune Response

SYMPATHETIC NERVOUS SYSTEM

Increases

- Blood Pressure • Heart Rate
- Fuel Availability • Adrenaline
- Oxygen circulation to vital organs
- Blood Clotting • Pupil Size

Decreases

- Fuel Storage • Insulin Activity
- Digestion • Salvation
- Relational Ability
- Immune Response

PARASYMPATHETIC NERVOUS SYSTEM
 VENTRAL VAGAL

Increases

- Digestion • Intestinal Motility
- Resistance to Infection
- Immune Response
- Rest and Recuperation
- Circulation to non-vital organs (skin, extremities)
- Oxytocin (neuromodulator involved in social bonds that allows immobility without fear)
- Ability to Relate and Connect

Decreases

- Defensive Responses



TRAINING COMPASSION WITH HRV

- Higher HRV increases capacity for compassion, through training physiological and neurobiological foundations necessary for experience of compassion



TRAINING GUIDELINE

- Select characteristic to train (e.g. compassion, gratitude, courage, resilience, equanimity, wisdom, patience, etc)
- Mindfulness training
- HRV training through Resonance Frequency breathing
- Combine mindful HRV practice with meditation cultivating characteristic of choice