

The Polyvagal Theory, Equine Behaviour, and the Horse-Human Relationship

Parasympathetic Nervous System

The PNS is primarily but not exclusively mediated by the vagus nerve (10th cranial nerve in mammals), which has 2 branches:

- **Ventral Vagus** (*myelinated, above the diaphragm*): integrates the neural regulation of the heart and lungs with that of the face and head (**social engagement system**). Connects the striated muscles of face / head, middle ears, larynx, pharynx, neck muscles (*turning, orienting*) with the heart and bronchi.

This face-heart connection links facial expressions, prosody and tone of vocalizations, and frequency range of other sounds to autonomic state, allowing mammals to signal that it is safe to approach and detect if another is safe to approach.

- **Dorsal Vagus** (*unmyelinated, mostly below the diaphragm*): neural regulation of the viscera/digestion. Supports homeostasis, growth, and restoration (*when safe*), or conservation and shutdown (*life threat*).

Neuroception

- **NEUROCEPTION**: The ability to detect safety, danger, or life threat from environmental, relational, and visceral cues. Neuroception impacts physiological state, which results in contextually-adaptive bio-behavioural responses to those cues.
- **WHEN SAFE**: Signals from the ventral vagus inform the sympathetic nervous system (SNS) and dorsal vagus to work harmoniously and support homeostatic balance. The social engagement system helps to slow the heart, dampen the hypothalamic-pituitary-adrenal (HPA) axis, reduce inflammation, and down-regulate defensive responses, keeping arousal in a functional range.

The main role of the dorsal vagus when feeling safe is to support homeostasis (*rest and digest*). The felt sense of safety supports **sustainable physiology**, including relating, sleep, healing, recovery, health, curiosity, listening, executive functioning (*cognition, attention, learning, memory, planning*), completing tasks, play and performance.

- **WHEN UNSAFE**: The cascade of defensive responses goes from newest to most primitive (**dissolution**), beginning with the social engagement system (*find, fawn*), then mobilization for self-defense (*fight or flight*) [**survival physiology**], then immobilization (*freeze/fright, fold/flag, faint, feign death, fragment*) [**conservation physiology**] if the other options were thwarted, ineffective, or impossible.

Whether or not an organism feels safe can predict attachment security, executive functioning, and performance, the latter of which are secondary to survival.

Three Branches

GREEN: Parasympathetic Nervous System (*brake system, ventral vagal complex or VVC*).

- **SAFETY:** Social engagement (*freedom, friends*)
- **DANGER:** Social survival (*find, fawn*)

GOLD: Sympathetic Nervous System (*gas pedal*).

- **SAFETY:** Arousal (*fun, flurry, fluster, force, fidget*)
- **DANGER:** Survival activation (*flight, fight, fidget*)

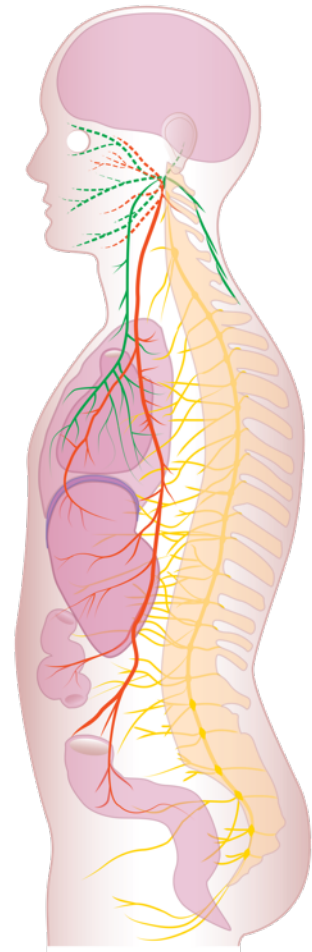
RED: Parasympathetic Nervous System, (*brake system, dorsal vagal complex or DVC*).

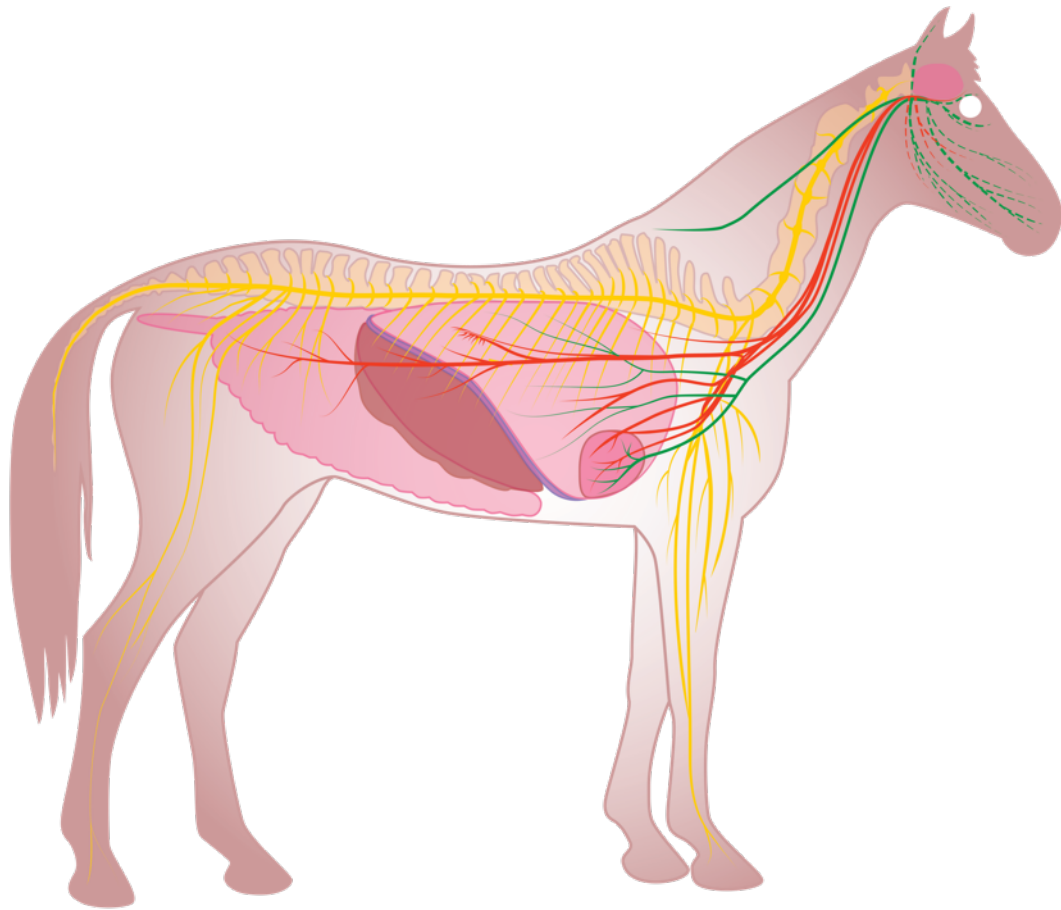
- **SAFETY:** Rest and digest (*forage, falling asleep*)
- **LIFE THREAT:** Conservation and shutdown (*freeze, fold, faint, feign death, fragment*)

All branches can fluctuate at the same time (blended states).

Practical Implications

- Autonomic states can be detected and communicated through facial expressions, movements, and vocalizations.
- Some behaviours can occur in more than one blended state (*e.g., fidget behaviours can occur when feeling safe and when sensing danger; dissociation can occur when in a neuroception of safety, danger, or life threat; stillness can occur when feeling calm or when shut down, etc.*).
- The neuroception of safety supports sustainable physiology and affiliative behaviours (*less physiologically costly*).
- The social engagement system provides the neural platform for connection and secure attachment (*safe haven conditions support the ventral vagal complex*).
- Chronic survival / conservation states (*more physiologically costly*) can lead to complex health and behavioural issues in horses and humans.
- "Difficult" behaviour could signal a neuroception of danger or life threat (*internally, such as pain, or externally, from past or current conditions*), and may be an attempt at seeking safety, comfort and calm (*as opposed to willful disrespect, dominance, incompetence, or other misinterpretations*).
- Mis-attunements, co-dysregulation and insecure attachment ("*unsafe cues*") between humans and horses could lead to conflict or re-enactments of projection, abuse, learned helplessness, appeasement, or submission.
- Accurate attunement, co-regulation, synchrony, relational repair, and appropriateness of response to autonomic states / thresholds of tolerance supports safety and trust.
- Address environmental and human cues of unsafety (*relational, somatic, and behavioural*) **before** trying to "fix the problem" through various methods (*Friedman's Humane Hierarchy*). Hold space and set the conditions / antecedents that support deactivation and social engagement first.





Consider blended states when timing interventions / training methods:

- Are you, the horse, or others you are working with overriding beyond your/their window of tolerance?
- How are the branches fluctuating for each organism (blended states)? Not all stillness is calm, compliance is not always consent, and stress, appeasement or calming signals can easily be missed or misread. Similarly, not all stress is distress and not all SNS energy is beyond threshold.
- Does your action, reaction, intervention, or choice of training method trigger their (or come from your own) activation, reflect your attachment style, or result in a double bind or co-dysregulation?
- How much VVC is available to keep each of you in an optimal arousal zone?
- What supports your own regulation, present moment awareness, and presence?
- Are you reliving or re-enacting problematic patterns, or are you renegotiating new outcomes?

The feeling of safety IS the treatment. - Dr. Stephen Porges

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