



## THE VAGUS NERVE – Cranial nerve 10 (CNX) The ‘wandering’ nerve

Cranial nerve 10 (CNX) aka the vagus nerve, is one of the most important nerves in your body. The CNX is why your heart races when you sense a threat, why you feel “butterflies” in your gut when excited or anticipating something, why your mouth goes dry and your throat tightens before giving a speech, why your breathing slows, and your body relaxes when in a happy and safe environment.

Your vagus nerve is critical for many functions of our physiology. It is the key player in the autonomic nervous system (ANS). The ANS controls your internal organs.

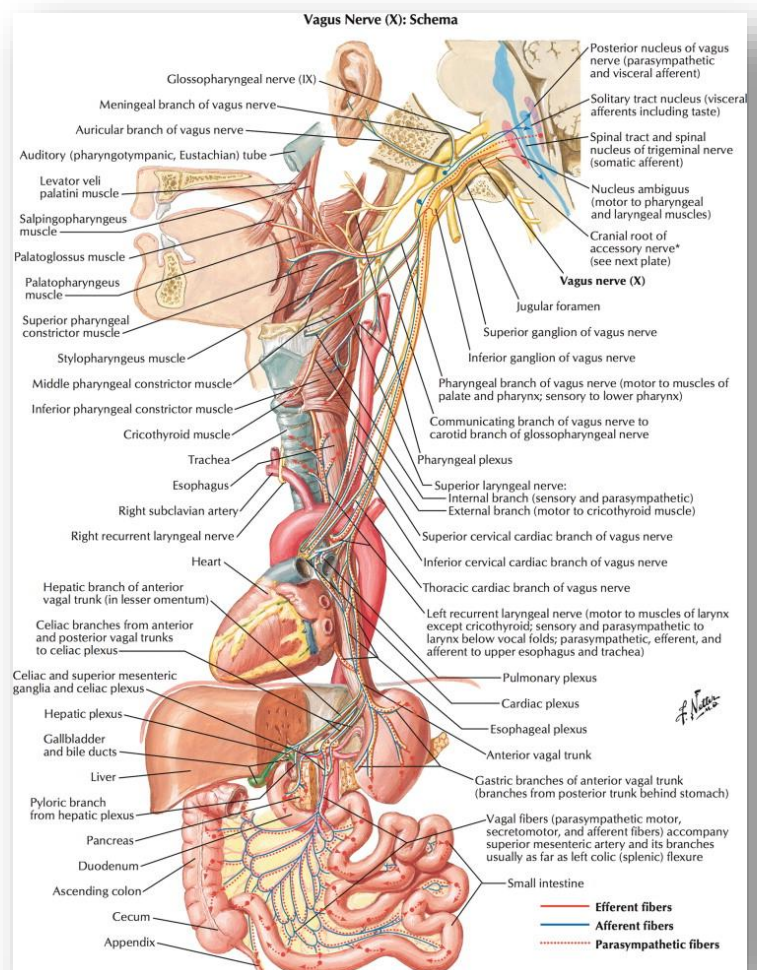
There are actually two vagus nerves, one on the left and one on the right of the head, and they have multiple branches that diverge from the brainstem and ‘wander’ to the lowest viscera of your abdomen, touching most major organs along the way.

It begins at the base of the brain at the medulla oblongata, then branches down and supplies innervation to our major blood vessels, the mouth and throat, the larynx, oesophagus, heart, airways and the lungs, the diaphragm, the digestive tract / gut, liver, gallbladder, and pancreas.

The branches of the vagus nerve enable the organs to adjust instantly to the demands of a person’s surroundings.

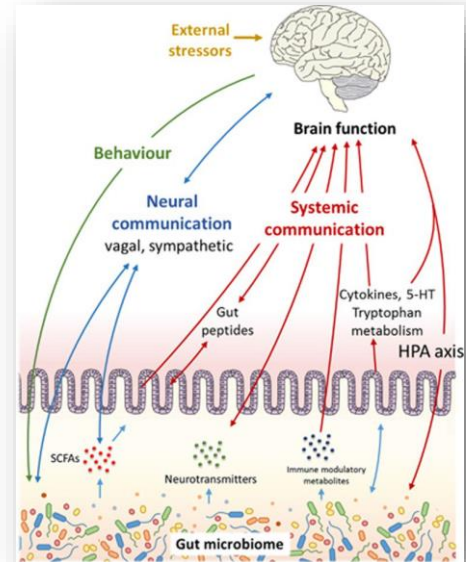
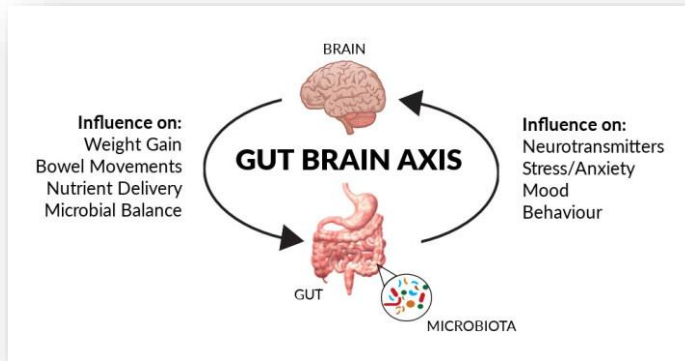
The influence of the vagus nerve reaches far and wide within your body. According to **Dr Jockers** the seven areas of greatest influence are:

1. **BRAIN:** The vagus nerve (CNX) helps reduce anxiety and depression. It opposes the sympathetic response to stress.
2. **INFLAMMATION:** CNX suppresses inflammation via the cholinergic anti-inflammatory pathway.
3. **MOUTH:** Taste information is sent via 3 cranial nerves, one of which is the CNX. The CNX is needed for the gag reflex, swallowing, and coughing.
4. **HEART:** CNX decreases heart rate, vascular tone.
5. **BLOOD VESSELS:** CNX decreases vascular tone, lowering blood pressure.
6. **GUT:** CNX increases gastric juices, gut motility, and stomach acidity
7. **LIVER & PANCREAS:** CNX regulates insulin secretion and glucose homeostasis in the liver





The vagus nerve is the main neural connection between your brain and your gut. It carries important sensory and motor information to and from the gut and brain – called the gut-brain axis (our first or second brain ?).



*“This second brain, known as the enteric nervous system, is a unique anatomical unit that extends from the oesophagus to the anus. Like the nervous system, it produces a whole series of psychoactive substances, such as serotonin, dopamine, and opioids for pain, and synthesizes benzodiazepines. In it, we find the microbiota: a set of microorganisms (viruses and bacteria). Together with the brain, the microbiota directly influences mood, character, or sleep.”<sup>i</sup>*

Many intrinsic and extrinsic factors influence signalling along this axis, modulating the function of both the enteric and central nervous systems.<sup>ii</sup>

The vagus nerve is tied to the calming parasympathetic nervous system (PNS). The PNS regulates inhibitory “rest- digest-repair” responses and slows down our psychophysiology. On the flip side, the excitatory sympathetic nervous system (SNS) drives “fight-flight-freeze” stress responses and revs us up. Hyperactivity of the HPA axis is fuelled by the SNS and marked by weaker vagal tone (VT). When the vagus nerve is strong, then VT is higher, and someone can cope with stress more effectively.

Stimulation of the vagus nerve can effect memory, hyperactivity disorders such as ADHD and also in the treatment of depression.<sup>iii</sup>

## POLYVAGAL THEORY

Neuroscientist Stephen Porges<sup>iv</sup> developed the Polyvagal Theory from decades of study of the vagus nerve. The Polyvagal Theory explains how threat can retune the autonomic nervous system (ANS) into states of defence that disrupt social interactions, sexual function, and health. Basically, this theory helps to understand how the nervous system limits our behaviour concerning how safe or in danger we feel. It is a cornerstone for anyone who works with traumas, stress experiences and post-traumatic stress disorder (PTSD).<sup>v</sup>

Learning about the CNX and its interconnectedness of body reactivity, cognitive and emotional function, and social behaviour, Porges discovered that information flows both to and from the brain via vagal pathways, with the vagus nerve as the major “mind-body highway”.



Through the vagus nerve, you react to signals in your environment in ways that calm, alarm, or dysregulate the body, and these states in turn create emotional experience and can manifest in behaviour.

The ANS has always been historically divided into two branches - the SYMPATHETIC and PARASYMPATHETIC. Polyvagal Theory, named for the anatomical basis of Porges' discoveries, changes this picture. Now the ANS has three branches, and they are sequential, not reciprocal. The third (more modern) branch of the ANS is called the **SOCIAL NERVOUS SYSTEM**.

Actually "Polyvagal" is a misnomer and not a fully accurate descriptor of the new concept, because the vagus nerve is only one component of the newly-defined third branch. The phrase "**Triune Autonomic**" is a more accurate representation of this new understanding. It is based on phylogeny, the study of the evolution of living organisms. <sup>vi</sup>

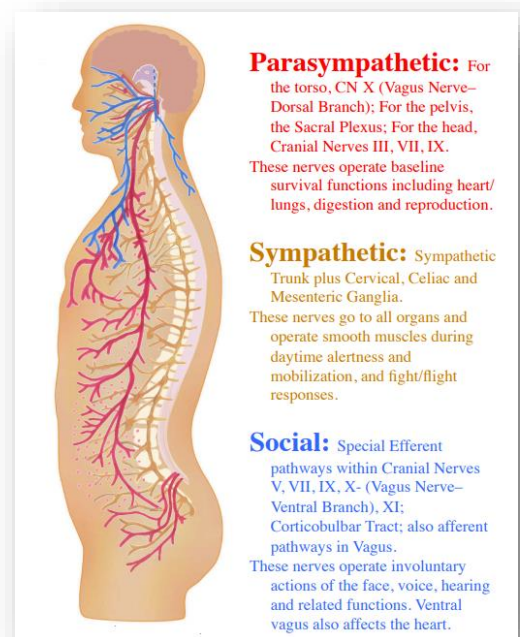
Each branch has a well-defined anatomy and physiology. So the three sequential branches of the ANS are:

1. the modern sophisticated **Social** branch (attachment & communication),
2. the more primitive **Sympathetic** branch (daytime excitation and mobilization),
3. and the ancient **Parasympathetic** branch (baseline metabolism and times of rest). Under stress, healthy people, including babies, try their social responses first (social - contact and engagement). If these do not work, they try the more primitive (sympathetic - flight or flight) and if that doesn't work they try the oldest (parasympathetic - freeze, withdrawal, collapse).<sup>vii</sup>

**Parasympathetic** (most ancient) "A primitive passive feeding and reproduction system creating a metabolic baseline of operation to manage oxygen and nourishment via the blood."

**Sympathetic** (newer) "A more sophisticated set of responses enabling mobility for feeding, defence and reproduction via limbs & muscles."

**Social Engagement** (most modern) "A sophisticated set of responses supporting massive cortical development— enabling maternal bonding (extended protection of vulnerable immature cortex processors) and social cooperation (language and social structures) via facial functions."<sup>vi</sup>



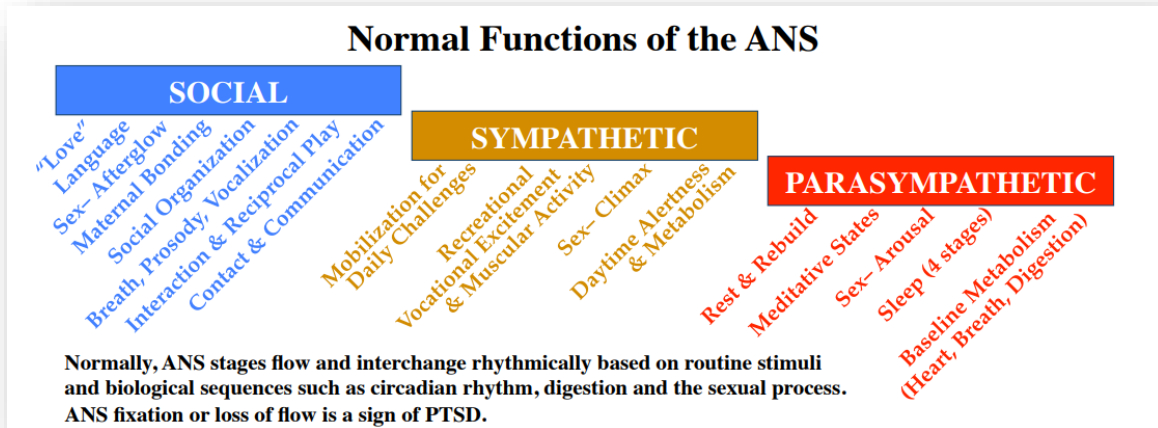
## Differentiating Normal ANS Functions from Stress Responses

Although commonly used, "Fight/Flight" vs. "Rest/Digest" or "Rest/Repair" is a confusing characterisation of the Sympathetic and Parasympathetic branches, because "Fight/Flight" is a stress response whereas "Rest/Rebuild" is a normal function.

*A high percentage of health conditions centre on the Autonomic Nervous System, including immune system disorders, attention deficit conditions, psychosomatic issues, post-traumatic stress effects and others.*<sup>vi</sup>

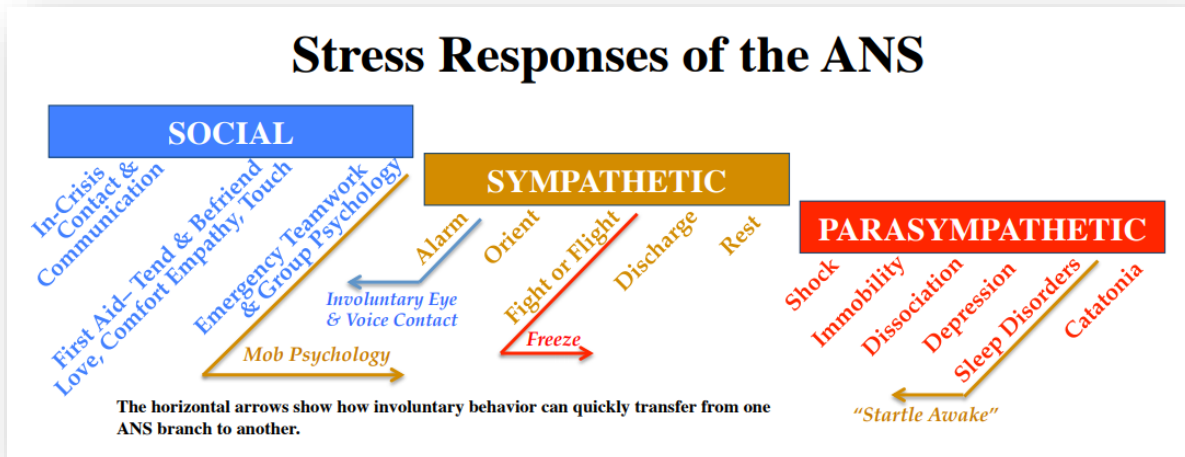


### Normal Functions of the ANS



Voluntary and involuntary functions overlap significantly – most of the actions listed here could be either – but they can be identified by close observation. Autonomic responses are immediate and universal across differences of age, gender, education and culture. The conscious mind cannot fully control face and body expressions; the ANS itself seems to be mainly incapable of inauthenticity or deception (Paul Ekman, 2009).

### Stress Responses of the ANS



In the presence of novelty or threat, we try our phylogenically newest, best strategy (Social) first. If that does not work or has not worked in the past, we try our older, second strategy (Sympathetic). If that does not work, we try our most primitive, last strategy (Parasympathetic). If that does not work we are in danger, appearing as immobilization, deep depression or parasympathetic shock.



## Recognizing ANS Phenomena

SNS & PNS Reference: Babette Rothschild, *The Body Remembers* (Norton, 2000), p 48.

<b>SOCIAL</b>	<b>SYMPATHETIC</b>	<b>PARASYMPATHETIC</b>
Eye and voice contact Capacity for empathy & social interaction; Spontaneous feelings in social contexts Involuntary motor actions of face, mouth, throat Facial warmth, tingling Interpersonal responses & awareness; involuntary physical responses to contact with, or memories of, significant people and events.	Faster respiration Quicker heart rate (pulse) Pupil dilation Pale skin colour Increased sweating Cold skin (possibly clammy) Decreased digestion & peristalsis Mobilization behaviours including anxiety, anger and fear	Slower, deeper respiration Slower heart rate (pulse) Decreased blood pressure Pupil constriction Flat affect Dry skin (usually warm) to touch Increased digestion & peristalsis Immobilization behaviours including indecisiveness, seclusion, depression.

Recognizing ANS states has great value in therapy and child-care. By accurately identifying the state, the practitioner or parent can apply an appropriate strategy to re-establish ANS equilibrium, especially by supporting the Social Nervous System.

John Chi.y, [www.energyschool.com](http://www.energyschool.com), from Chapter Six in “Dancing with Yin and Yang” (CSES, 2013)

## “Body-Low-Slow-Loop” for Sympathetic NS First Aid

- **Body**
  - Direct the attention into the body to notice a sensation
  - This effectively means present-tense orientation, countering trauma’s past-future tendency
- **Low**
  - Direct the attention to the lower border or downward generally
  - This effectively counters the upward effect of trauma (alarm & orienting responses)
- **Slow**
  - Ask about the details of the sensation
  - This effectively slows down the awareness, countering trauma’s tendency to speed things up
- **Loop**
  - Direct the attention somewhere else for a minute or so, then back to the first site. Repeat as needed, slowly and gently.
  - This effectively re-establishes Polarity movement and counters the trauma’s tendency towards fixation.

More details on YOUTUBE - **DWYY: Attachment Mastery Presentation - Part 2**

<https://www.youtube.com/watch?v=Ha537mUPGcY&list=UUsf26dlqfPbVHld2bc9cn9w&index=12>

**Trauma and the Nervous System: A Polyvagal Perspective**

<https://www.youtube.com/watch?v=ZdlQRxwT1I0>



## BREATHING & THE VAGUS NERVE

When the body is in states of danger or even in complete shutdown, it is possible to restore calm and regain behavioural flexibility by redirecting vagal activity, which can be accomplished through a deceptively simple technique – abdominal / diaphragmatic breathing. Specifically, the effect requires breathing deeply and exhaling slowly, ideally so that the exhalation lasts twice as long as the inhalation.

By engaging the diaphragm, deep-breathing activates vagal pathways that counteract both the flight-or-fight stress response and behavioural shutdown. It allows people to feel “centered.” Such vagal breathing not only lowers defences, relaxes the body, and slows heart rate, but also gives people access to their higher mental powers; studies show that, among other things, it improves decision-making. The deep breathing can be done anytime, anywhere, to foster relaxation.

In diaphragmatic breathing, the belly expands and rises as the lungs fill with air. The movement of the diaphragm stimulates the calming circuit of the vagal nerve. Most techniques advise breathing in slowly—ideally to a count of 10—through the nose so that the stomach moves out (placing a hand on your stomach can be a helpful guide). The extended, slow inhalation is followed by an even more extended, complete exhalation through pursed lips. Repeating the process five or 10 times is advised.

Deep, slow breathing that moves the diaphragm is an integral part of many ancient meditation traditions. Yoga long ago incorporated the power of respiration—bellows breath is one exercise—to change physical and mental states. The ancients knew that it worked; they just didn’t know *how* it did.

<https://www.psychologytoday.com/ca/basics/vagus-nerve>

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