## MODULE 4: THE SCIENCE OF BREATHING

### LESSON 5: THE VAGUS NERVE

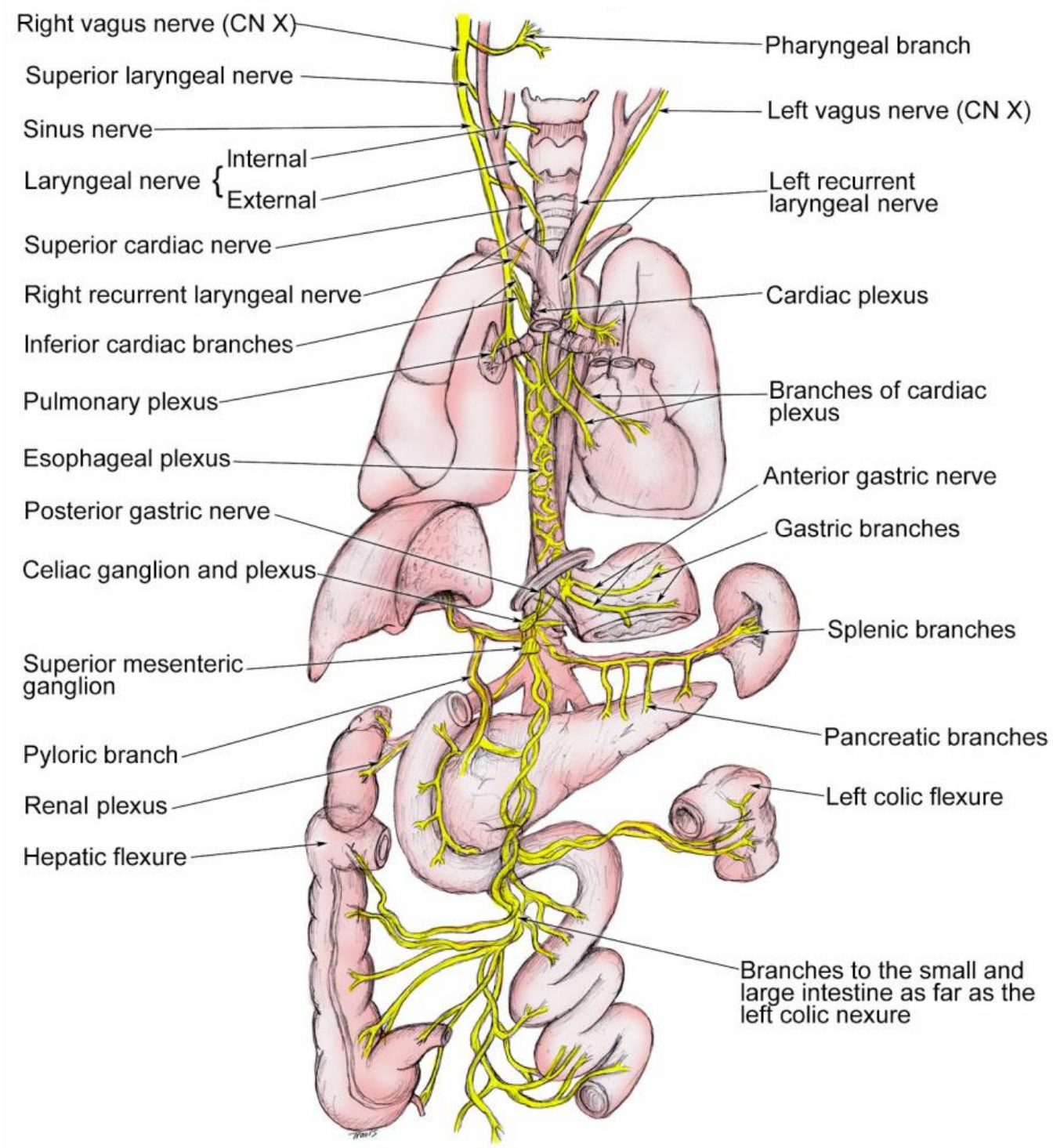
All the functions affected by the autonomic system occur automatically: heart rate, blood flow distribution, temperature regulation, blood pressure, breathing, digestion, glandular functions, reactions of the immune system. However, there is only one that can be controlled with conscious intention, and that is breathing.

The study of the vagus nerve will help us to understand the mechanism through which this happens.

The Vagus nerve or "wandering nerve" is so named because it is the longest of all 12 cranial nerves connecting the brain to the periphery, including the gastrointestinal tract and organs such as the pancreas and liver.

It is primarily through the function of this nerve that the body can apply handbrakes on itself and prevent adrenalised energy from completely running the show. This fascinating and complex nerve is essentially responsible for the 'body-mind' connection. Besides being a parasympathetic nerve, sending fibres from the brain to the body (efferent functions), it is also an afferent nerve which means it sends sensory information from the body back to the brain.

The body uses the Vagus nerve to deliver the neurotransmitter, Acetylcholine into the system. Acetylcholine is responsible for learning and memory. It is also calming and relaxing. New research has found that acetylcholine dampens inflammation in the body.



Exciting new research has also linked the Vagus nerve to supporting the growth of new neural pathways, repair of brain tissue, and to actual regeneration throughout the body through stimulation of stem cells. Because the vagal tone both influences and is impacted by breathing, we can increase vagal tone through manipulation of the breath. The vagal tone increases during exhalation. By slowing down our respiration through deep, intentional breathing and elongating our exhalation, we can activate the vagal brake and elicit the relaxation response almost immediately.

The lungs, airways, throat, chest wall, and diaphragm contain thousands of receptors (pressure, stretch, chemical) sending thousands of messages about your breathing through the Vagus nerve. These messages travel through pathways leading to the emotion processing centres (limbic system, amygdala, hippocampus), hormone regulation centres (hypothalamus), and processing centres for perceptions and thoughts throughout the cortex (via the thalamus). Through these routes, breathing patterns exert a strong influence on how we think, feel, react, and perceive ourselves and others.

By voluntarily changing the pattern of the breath, we can change the messages the body is sending to the brain and thereby change the way we think, feel, and react. Once this response is initiated and the PNS (parasympathetic nervous system) is dominant, our brains cease to be governed by the limbic system and fear circuitry that limits our capacity to effectively think, plan, reason and respond to others. This means that we are no longer subject to a narrow range of defensive or knee jerk reactions. Through consciously deepening the breath and prolonging exhalation, we access not only the relaxation response, but also the capacity to be mindfully present in relationship. With time and practice, intentional breathing can be used as a powerful tool to diffuse stress and manage difficult or conflictual interpersonal circumstances. Through changing the body via the breath, we have the capacity to not only change our mindset, but also our relationship to others.

Skilful control of breath patterns can be used to calm the emotions, eliminate anxiety, stop obsessive worry, reduce stress over-reactivity, and induce greater mental clarity and focus. There are many forms of breathing derived from Yoga, Qigong, Buddhism, Christianity, Judaism, Zen, American Indians, martial arts, and other traditions. One of the simplest methods and most researched methods is to slow the breath rate down to between 5 and 6 breaths per minute.

**Exercise:**

Experiment with these vagus nerve stimulation methods:
Deep/slow belly breathing.
'OM' Chanting
Cold water face immersion after exercise
Filling the mouth with saliva and submerging your tongue to trigger a hyper-relaxing vagal response
Loud gargling with water
Loud singing

**References:**

YogaU and Marlysa Sullivan, MPT: Your Well-Being Power Switch: The Role of the Vagus Nerve in Health and Healing

Richard P Brown and Patricia L Gerbarg. Part I. Longevity and Aging Advancements. Yoga Breathing, Meditation, and Longevity. Annals of the New York Academy of Sciences. 2009, 1172:54-62.