

Somatic Stress Relief Explained

Disclaimer

This handout, alongside our classes, is destined to help you understand your bodies physical responses to stress and anxiety.

We will focus on the physical, not the mental, and we advise that you speak to your healthcare provider about any needed support for your mental health.

This handout and course is not in any way a substitute for therapy, if you are suffering from ill mental health you should seek support from professionals.

The Mind Body Connection

We all consider ourselves made up two parts The mind, which is our feelings, personality and thoughts and The Body: a vessel with which we do, make and move. This concept extends so far that we don't have a word in the English language that describes them as one, the closest we come to is Self as in myself, yourself, ourselves. But it doesn't quite convey the truth of a connected body and mind.

Every thought releases some type of chemical. When positive thoughts are generated, if we're feeling happy, or optimistic, cortisol decreases and the brain produces serotonin, creating a feeling of well-being. This puts our bodies into the parasympathetic part of our autonomic nervous system, which relaxes our muscles, lowers our heart rate, improves sleep, optimises digestion, relaxes muscles and creates a feeling of calm.

However repeated negative thoughts, such as anger, resentment, fear, or depression, may cause our bodies to release the stress hormones cortisol and adrenaline. This can trigger the sympathetic side of the autonomic nervous system, it's known as fight or flight and it readies us for action or danger, it

gives us extra strength and speed to keep us safe. But the down side is that it puts strain on the body by pausing it's other activities, this can cause insomnia, poor digestion, muscle tension, low immunity, elevated heart rate and anxiety.

We know that thoughts and feelings effect the body, what many people don't consider is that the exchange goes both ways.

Exercises is known to produce endorphins, decrease overall levels of tension, elevate and stabilise mood, improve sleep, and build self-esteem. Various studies have noted the importance of posture in affecting one's personally and relationships to people and the world. A straight backed open posture that takes up space can boost confidence and increases social interactions, whilst a slouched, contained and closed off posture can isolate and contribute to depression and low self esteem.

Now a persons posture isn't always a choice, often we fall into patterns in how we sit and stand because muscle memory has decided that's the most comfortable.

For example if the nervous system gets stuck in fight and flight mode due to a long period of stress or a traumatic event, then our muscles adapt and take on the tension as the new normal. So even when the stress has passed and our mind is calm, our body can still be trapped in the response, this then effects our thoughts and feelings.

Contracting our muscles uses a large amount of energy and when we have chronically tense muscles the constant sapping can cause us to feel fatigued, unfocused, stiff and achy. When these aches progress into pain it can have have a dramatic effective on our emotional wellbeing and ability to function in day to day life. This creates it's own stresses and anxieties, which causes more tension within our muscles, that brings on more stress, becoming a vicious circle.

Working on our mental heath will help us navigate stressful situations more smoothly and switch us back into our calm parasympathetic nervous system swiftly, reducing the negative effects on our physical health such as breathing difficulties, heart problems, digestive issues and poor posture.

But it is also important to work from a physical side as well, understanding your nervous system's individual reactions and quirks, becoming aware and grounding yourself when needed, breathing optimally, exercising regularly, eating well and carefully releasing the muscular tension caused by daily life and emotional triggers can have as much of a positive effect on preventing and improving depression, stress and anxiety.

What is the Autonomic Nervous System?

(for a more in-depth scientific explanation please see the end of the workbook) Our nervous system is deeply complex, this is a quick look at the elements relevant to the course.

The Autonomic Nervous System (ANS) has three main components but we're going to be focusing on two of them

1. **Sympathetic Nervous System:** Often referred to as the "fight or flight" system, it prepares the body for stressful situations. When activated, it increases heart rate, dilates the pupils, slows digestion, and redirects blood flow to muscles, among other effects.
2. **Parasympathetic Nervous System:** Known as the "rest and digest" system, it works to counterbalance the sympathetic system. It helps the body return to a state of calm after a stressful situation, slowing the heart rate, promoting digestion, and conserving energy.

The Vagus Nerve

This is the main nerve of the parasympathetic nervous system. When the Vagus nerve is active (high vagal tone) it can improve various functions within the body.

- Better stress resilience
- Lower heart rate

- Improved digestion
- Better emotional regulation

That should be all you need to know for now, we'll be looking more into these systems later. But if you'd like to understand in more depth please read the Expanded section at the end of the work book where there are links to more information.

How muscles work in relation to the nervous system

(for a more in-depth scientific explanation please see the end of the workbook)

Anxiety triggers our nervous system into fight and flight, (The Sympathetic side) this creates tension throughout our body as we prepare for danger. However in this case the brain is reacting to thoughts of fear not a direct physical threat and so we're bracing our muscles for a moment that is not going to happen.

Your body thinks it needs to act, to jump out of the way, to prepare for a punch or to flee. However the actual action never happens, you just experienced it chemically, simply from a thought that crept in. You've been blasted with this rush of energy and hormones, but where does this energy go now? Because the physical action isn't completed the bodies natural release of adrenaline and cortisol doesn't happen, so how does the brain know the danger has passed...

It doesn't, it stays in this heightened state, your muscles remain tight and your keep producing the stress hormones.

This has many, many side effects including but not limited to::

- The digestive system taking a back seat, which can cause mild to severe stomach issues.
- The immune system being put on pause, creating higher chances of illness..

- Decline of quality and quantity of sleep, possibly leading to insomnia.
- Tight Muscles, particularly of the face, neck, shoulders, chest, stomach and hips.

At first these muscles may simply feel stiff or achey, but if the contraction continues for prolonged periods it can become very painful and create a build up of lactic acid. The body breaks this waste product down in to component parts and the lactate is transported through the blood stream for reuse. However recent studies have shown that a build up of lactate is linked to anxiety. We know people who suffer from anxiety have increased tension in their resting muscles, therefore more lactate in their blood. But this can go both ways, we can make ourselves anxious by injecting lactate into our blood stream. This shows that although anxiety can cause muscle tension, excessive muscle tension can also cause anxiety, creating a cycle of stress and pain.

Another side effect of muscle tension, particularly around the chest and stomach, is that the lungs can struggle to fully exhale. This can cause breathing patterns to change, becoming shorter, shallower, or held for too long. The shortness of breath can increase the heart rate, causing the heart to pump more oxygen into the blood to compensate.

The good news is that we can counteract these effects by coaxing the body back into the relaxed calm side of the nervous system (The parasympathetic side)

Bringing your attention into your body and learning to listen to the signals it's constantly sending you is key to mastering the physical side of anxiety, once you're aware of when you've slipped into stressful patterns you can quickly respond to counteract the negative effects.

We'll going to use a multitude of techniques to release muscular tension in key areas, self stimulate the vagus nerve (This is very effective in restoring you to the parasympathetic side), open up the lungs with targeted breathing techniques and learn to self sooth at times of intense stress.

But before we get to the regulation you need to know when these techniques are needed, so let's learn to reconnect.

At this point you've probably spent years at a constant low level of anxiety and it's become the new normal, only dramatic spikes are noticeable and by that point it's pure overwhelm.

You've been ignoring your body's signals and now it can only get your attention by screaming. Learning to listen will probably be uncomfortable at times, especially if you have sensory issues (we have special techniques to help with this).

But when you've tuned into the frequency and you're working with your body rather than against it, it becomes a beautiful symbiosis of support. Which brings us to the techniques we're going to use....

Reconnecting

Using body Scans/physical mediations to build interoception.

Interoception is the ability to sense and understand what's happening inside your own body. For example, feeling hunger, thirst, a full bladder, or knowing when your heart is beating faster are all ways your body tells you about its internal state. The big ones are usually pretty obvious, but there's a lot more to discover when you learn to listen. Understanding your bodies warning signals can help you adjust conditions and self regulate before you reach overwhelm or reactive emotional responses.

A body scan is a mindfulness meditation practice that involves sequentially directing your conscious awareness through different parts of the body. Observing physical sensations, such as tension, warmth, tingles numbness etc..

The purpose is to cultivate somatic awareness, promote relaxation, and enhance the ability to observe bodily experiences non-reactively. Practising body scans can facilitate a deeper connection between mind and body, reduce stress and improve interoception

An important reminder is that body scans are to be performed without judgment, try and separate yourself from good and bad feelings and simply observe what and where the sensation is.

(The exception is if it's causing new pain, then you should change it or simply stop)

What Is A Pandiculation... & Why Is It Better Than Stretching At Releasing Muscle Tension ?

Also What's It Got To Do With Cats...

The relevance of muscle memory

When the brain learns a new movement you have to think really hard to get it right, remember learning to ride a bike? Or performing delicate movements like knitting or tying your shoes? The first few times you tried the focus needed was extreme, the prefrontal cortex of your brain works really hard to best achieve this new goal. Then as time passes and you practise, it becomes smother, easier and requires less thought. This is because when you repeat a movement many times your nervous system adapts, it likes to be as efficient as possible because making quick decisions is good for survival. This creates what we know as muscle memory, the movement becomes automatic and control of it shifts to lower parts of the brain. This allows you to focus on new things that require your attention, you no longer need to think about balancing on the bike, controlling your needles or the tension in the knot of your favourite trainers.

Research shows that you can practice motor skills and improve learned movement patterns without actually moving. By visualising yourself performing these movements the brain reacts as if you are physically performing the action, incredible right?!?

Now what do you think happens when a unhealthy or damaging pattern of movement becomes subconscious? Let's say someone's desk wasn't set up very well and they had to hunch over a little to use the keyboard and see the

screen well. Day after day they sit with their chin tucked down and shoulders hunched over, repeating the motion time and time again, the nervous system adapts and continues carrying out the motion without them realising it's happening. The neck and shoulders are now held in this new position, constantly creating a steady low level of tension. No matter how hard they try they cannot relax it consciously as the posture is now the muscles new normal. This is called Sensory Muscle amnesia and it's responsible for the stiffness and aches that we write off as ageing.

Releasing Muscle Tension

When we're in pain we try to relieve it, often by stretching, massage, heat therapy or rest. These might offer some short term relief but we'll probably be back feeling stiff and sore fairly quickly. Why don't these approaches work? Because they don't address the messages that your brain is sending to your muscles to stay tight.

Let's take a little look at how muscles and the nervous system function, because when we understand something we can practise it so much better.

The root of movement is sensation, you reflexively sneeze when you sense dust in your nostrils, you feel thirsty so you get up to fetch a drink, or you move a hand to scratch exactly where it itches. Even movements unrelated to what's going on inside your body rely on it, when reaching for the remote you're dependent on sensation to tell you where and how to move, to correctly detect where the object is in relation to your hand. We all have nerve endings that tell us what's happening inside our bodies, it's position, temperature, where it is in gravity and space and others that process pain, tastes, sights, sounds and smells.

There is a continual feedback loop between your sensory and motor nerves, one feeling what's happening in your body and the world around it and the other moving your muscles accordingly. Some sensory nerves send information all the way to your brain, these you can process and respond consciously too. Others only send the information as far as the spinal cord or brain stem, triggering automatic reflexes like sneezing, jumping at a loud noise, pulling away from something hot etc...

It's one of these reflexes that can make stretching tight muscles ineffective, it's triggered by muscle spindles, their job is to stop you from damaging your muscles by over stretching. When a spindle detects that a muscle is stretching too far it sends a signal to the spinal cord triggering a reflex response that contracts the muscle to prevent tearing. So when you're on your yoga mat trying oh so hard to improve your flexibility your own body is actually working against you.

Depending on your technique you may find some short term relief from tense muscles through stretching but usually they will quickly revert to their previous state because your muscle tonus is high. So then how do we relax tight muscles if stretching isn't working as well as we thought?

You cannot consciously relax a muscle, what you can do is tense a muscle and then release the tension. This is the other half of the stretch reflex, it's controlled by the opposite of the muscle spindle, the Golgi tendon organ, it monitors tension levels in muscles and sends a message to release before it causes damage. However the difference is that this message travels all the way up to the brain, allowing us to choose whether to tighten further or release.

This is where the alpha-gamma loop fits in. This is a sensorimotor feedback loop in the nervous system responsible for automatically regulating tension in our muscles. When the brain repeatedly signals a muscle to contract, it increases the baseline of tension the gamma loop controls. So when we contract a muscle over and over again it begins to retain excess tension. This causes a build up of acids (a byproduct of Anaerobic energy production) making the muscle sore and stiff. This may not be noticeable at a low level, the muscles adapt and we feel pretty normal, but over time if the tension grows then we can end up with severely restricted movement and in acute pain.

The Solution Is Conscious Pandiculation.

A general definition of pandiculation is the action of yawning and stretching, particularly after waking or a sedentary period. It's a natural way that humans, and vertebrate animals, nervous systems stimulate the sensory-motor system to prepare for movement. If you've ever seen a cat or dog

arching their spine after rising then you've seen the inherent pandicular response.

Another incredibly important function of pandiculation is that it helps prevent a build up of chronic muscular tension by sending biofeedback to the brain about the level of contraction in our muscles. It contracts and releases muscles in such a way that the gamma feedback loop, the one that regulates muscle tension, is naturally reset. This resetting reduces muscular tension and restores conscious, voluntary control over the muscles.

When we perform our somatic practise, muscles throughout the body are carefully contracted and slowly relaxed to imitate the body's natural Pandicular response. We perform movements to target areas where tension commonly builds up.

You focus totally on your inner experience as you move. Like when you were learning to ride a bike, conscious attention is key to success, we can't learn something new if we aren't aware of what we're doing.

Definitions

Muscle Tonus, also known as muscle tone or residual muscle tension, refers to the continuous and passive partial contraction of muscles maintained by the nervous system, even in a state of rest. It results from the baseline activity of stretch receptors, primarily muscle spindles, which relay information to the central nervous system to sustain a state of readiness. This involuntary tension provides the muscle with a certain level of firmness, allowing for quick responses to stimuli and maintaining posture and joint stability. The regulation of muscle tonus involves complex interactions between afferent neural inputs, central motor pathways, and reflex arcs, balancing the necessary readiness against fatigue and overextension. Alterations in tonus can manifest as hypertonia, characterised by excessive tension, or hypotonia, indicative of diminished muscular resistance, often reflecting neurological dysfunctions.

A Muscle Spindle is a tiny sensor inside your muscle that detects how stretched or contracted the muscle is. It helps your body know if a muscle is

lengthening or shortening, so it can adjust movements quickly to prevent overstretching or injury. When it registers a excessive stretch it sends a signal to the central nervous system in the spine which creates a reflex response (like a sneeze) to tense the muscle to prevent damage.

A Golgi Tendon Organ is another tiny sensor located where the muscle connects to the bone through a tendon. It monitors the tension or force being applied to the muscle-tendon connection. If the tension gets too high, it sends a signal to the relax the muscle to avoid damage or tearing

The alpha-gamma feedback loop is a process in your muscles that helps control how tense your muscles are. When your muscles stretch or move, sensors inside them send signals to your brain and spinal cord. These signals tell your muscles to tighten or loosen appropriately. The loop involves two types of muscle fibers: alpha motor neurons, which cause the muscle to contract, and gamma motor neurons, which adjust the sensitivity of the sensors inside the muscle fibers. This system works together so that your muscles respond smoothly and accurately to movements and maintain proper muscle tone, preventing them from being too loose or too stiff.

Regulation Techniques

And how they work

Breath Work

Short

Breathing helps control the nervous system by influencing how calm or alert you feel. When you breathe slowly and deeply, it signals to your body to relax, reducing stress and calming your mind. Rapid or shallow breathing can make you feel more anxious or tense. Basically, your breathing pattern sends messages to your brain that tell it whether to stay in a state of relaxation or alertness.

Expanded

Breathing exerts a modulatory influence on the nervous system primarily through its interactions with the autonomic regulation centres, particularly within the brainstem. The act of respiration encompasses both involuntary and voluntary components, which collectively activate afferent pathways, such as the vagus nerve and mechanoreceptors in the respiratory musculature, that project to nuclei like the nucleus tractus solitarius (NTS). These afferent signals influence the dorsal motor nucleus of the vagus, the parabrachial nucleus, and other autonomic control centres, thereby affecting sympathetic and parasympathetic outflows.

Moreover, rhythmic breathing patterns can induce oscillatory activity in neural circuits that display resonance properties, aligning neural oscillations linked to arousal, attention, and emotional states. Slow, controlled breathing—such as in practices like pranayama or diaphragmatic breathing—augments parasympathetic tone via enhanced vagal activity, leading to decreased heart rate, lowered blood pressure, and reduced stress hormone secretion. Conversely, rapid or hyper-ventilatory breathing can shift autonomic balance toward sympathetic dominance, eliciting alertness or stress responses.

Neurochemically, breathing influences the limbic system and hypothalamic regions, which are integral to emotional regulation. The modulation of neuroendocrine pathways through respiration signifies a bidirectional communication whereby breathing rhythms can entrain neural activity, adjust cortical excitability, and stabilise emotional and physiological homeostasis. This dynamic interplay underscores breathing's role as a fundamental regulator of autonomic, limbic, and central nervous system functions.

Grounding

Short

Grounding helps calm and balance the nervous system. When you connect physically to the earth, like walking barefoot or touching natural surfaces, it can reduce stress, lower inflammation, and help your body feel more relaxed. This process helps stabilise your body's signals, making you less tense and more centred.

Expanded

Grounding, also known as earthing, influences the nervous system primarily through its modulation of autonomic balance and neurophysiological homeostasis. By establishing direct contact with the Earth's surface—often via barefoot standing or conductive materials—grounding facilitates the transfer of electrons, which can serve as antioxidants neutralising free radicals and reducing systemic inflammation. This electrical interaction is thought to stabilise the electrical environment of excitable tissues, such as neurons, thereby mitigating excessive sympathetic activity and promoting parasympathetic dominance. Consequently, grounding may attenuate hyperarousal states, enhance vagal tone, and normalise neural oscillations, leading to improved neural regulation and resilience of the nervous system.

Havening

Short

Havening is a technique that helps calm and balance the nervous system. It involves gentle touch or movements on specific parts of the body to send calming signals to your brain. This helps reduce anxiety, stress, and negative feelings, making you feel more relaxed and in control. Essentially, it tricks your brain into calming down by activating its natural relaxation responses.

Expanded

Havening, also known as psychosensory therapy, is predicated on the premise of functional modulation of the autonomic nervous system (ANS) through specific tactile stimulation sequences. It operates by activating sensory pathways that influence neural circuits associated with stress and trauma response, thereby promoting parasympathetic dominance and attenuating sympathetic hyperactivity.

The mechanism involves stimulating dermal receptors via gentle touch and specific hand movements, which are believed to facilitate neuroplastic changes in limbic and prefrontal regions,

including the amygdala and hippocampus. This sensory input is hypothesised to induce a relaxation response through the activation of GABAergic and parasympathetic pathways, diminishing the hyperarousal characteristic of stress-related dysregulation.

In summary, havening leverages targeted sensory input to recalibrate the neural circuitry governing emotional regulation and stress resilience, promoting a balanced autonomic state conducive to recovery from trauma and anxiety-related conditions.

Tapping

Short

Tapping, often called emotional freedom technique or EFT, involves gently tapping on specific spots on the body, usually on the face and hands. This process is thought to help the nervous system feel calmer. When you tap, it can send signals to the brain and nervous system that reduce feelings of stress, anxiety, or discomfort. Tapping helps balance your body's natural stress responses, making you feel more relaxed and centred.

Expanded

Tapping, is believed to modulate the nervous system primarily through stimulation of acupoint meridians that correspond to specific energetic pathways. This tactile stimulation may influence the autonomic nervous system (ANS), specifically shifting the balance between sympathetic (fight-or-flight) and parasympathetic (rest-and-digest) activity. By tapping on these points, it is hypothesised that neural pathways are activated, leading to a reduction in cortisol levels and amygdala activity associated with stress responses. Additionally, engaging these points may promote neuroplasticity, facilitating the reprogramming of maladaptive neural circuits involved in emotional processing. This process could enhance parasympathetic activation and decrease sympathetic dominance, contributing to a calmer physiological state.

Stimming

Short

Stimming refers to repetitive behaviours or actions, like rocking, hand-flapping, or repeating sounds. These actions help the nervous system stay balanced or calm. When a person feels overwhelmed, anxious, or excited, their nervous system can become too active or too quiet. Stimming helps signal to the brain and body to slow down or speed up, making feelings more manageable. Essentially, it acts like a way to "self-soothe" and keep the body's responses in a comfortable range.

Expanded

Stimming behaviours, repetitive motor actions or vocalisations, serve as self-regulatory mechanisms that modulate arousal levels within the nervous system. Through controlled sensory input, these behaviours can help recalibrate neural excitability, providing a means to attenuate overstimulation or stimulate under-stimulation. This process often involves engagement of specific neural circuits, such as those in the somatosensory cortex, basal ganglia, and limbic regions, which process sensory feedback and influence autonomic responses. By generating predictable, rhythmic sensory stimuli, stimming can facilitate endogenous modulation of the hypothalamic-pituitary-adrenal (HPA) axis and autonomic nervous system, thereby maintaining homeostasis and emotional equilibrium. In essence, these behaviours serve as intrinsic feedback loops that assist in maintaining optimal neural and physiological functioning amidst fluctuating external or internal stimuli.

Cultivating Curiosity

Short

Curiosity affects how our nervous system works by making us more alert and eager to learn. When you're curious about something, your brain becomes active, releasing chemicals that help you pay attention and remember new information. This process helps you explore and understand the world around you. So, curiosity controls the nervous system by encouraging you to focus and stay interested, which keeps your brain engaged and ready to respond.

Expanded

Curiosity functions as a cognitive and affective mechanism that modulates emotional responses, notably anxiety, by redirecting attentional resources and fostering a sense of mastery over unknown stimuli. When curiosity is activated, it engages neural circuits involving dopaminergic pathways, particularly the ventral tegmental area and nucleus accumbens, that reinforce exploratory behaviour and reward anticipation. This dopaminergic activity not only enhances motivation to acquire new information but also attenuates the amygdala's response to perceived threats or uncertainty, thereby diminishing anxiety levels. Additionally, curiosity promotes a shift from threat-focused appraisal to inquisitive engagement, reducing hyper-vigilance and physiological arousal associated with anxiety. This dynamic facilitates a constructive reframe of unfamiliar or ambiguous situations, transforming them from sources of stress into opportunities for learning and growth, ultimately leading to a down-regulation of anxiety-related neural activity.

Glimmers

Short

Glimmers, first introduced by social worker Deb Dana¹ as a part of Polyvagal Theory, are micro-moments of joy that make us feel happy, hopeful, and safe. They bring a sense of connection and regulation to the body, cueing the nervous system to move into the parasympathetic state which allows us to feel calm and open.

Expanded

Glimmers are the opposite of stress triggers.

Stress triggers are specific stimuli or circumstances that provoke a physiological or psychological stress response. They can be external, such as environmental challenges, interpersonal conflicts, or workload demands, or internal, including thoughts, memories, or perceptions of threat. These triggers activate the body's stress response system—primarily the hypothalamic-pituitary-adrenal (HPA) axis and sympathetic nervous system—leading to the release of stress hormones like cortisol and adrenaline. This activation prepares the organism for a 'fight-or-flight' reaction but, when persistent or excessive, can contribute to various health issues, including anxiety, cardiovascular problems, and immune dysregulation. Recognising and managing stress triggers is crucial in stress management protocols to mitigate adverse outcomes.

Glimmers are moments of micro-joy. Joy activates the parasympathetic branch of the autonomic nervous system, promoting relaxation and restorative processes. It stimulates the release of neurochemicals such as dopamine, serotonin, and endorphins, which modulate neural circuits associated with reward, mood regulation, and stress alleviation. This neurochemical cascade enhances cortical plasticity, reduces activity in the amygdala responsible for fear and stress responses, and facilitates positive emotional states. Consequently, experienced joy leads to physiological conditions conducive to homeostasis, resilience, and optimal neural functioning.

Poly Vagal Theory

Whilst some of the neuroscience details are still being verified, the theory has a sound base and is incredibly helpful in giving us a framework to understand how we react to situations.

Within the Nervous System Dr. Stephen Porges (developer of the poly vagal theory) proposes a higherarchial system, this changes the thought process from an ON/OFF switch to stressful situations to a three tier system, it's helpful if you consider it a ladder.

At the top

1. The Social connection system - Linked to the ventral branch of the vagus nerve, it is the most recent evolutionary development, it fosters calm, trust and intimacy, enabling you to build meaningful relationships.
2. Mobilisation System - Linked to the sympathetic nervous system and prepares the person for action in the face of challenge or threat
3. Immobilisation System- Associated with the dorsal branch of the vagus nerve it's the most archaic and induces freezing or collapse responses to extreme threats.

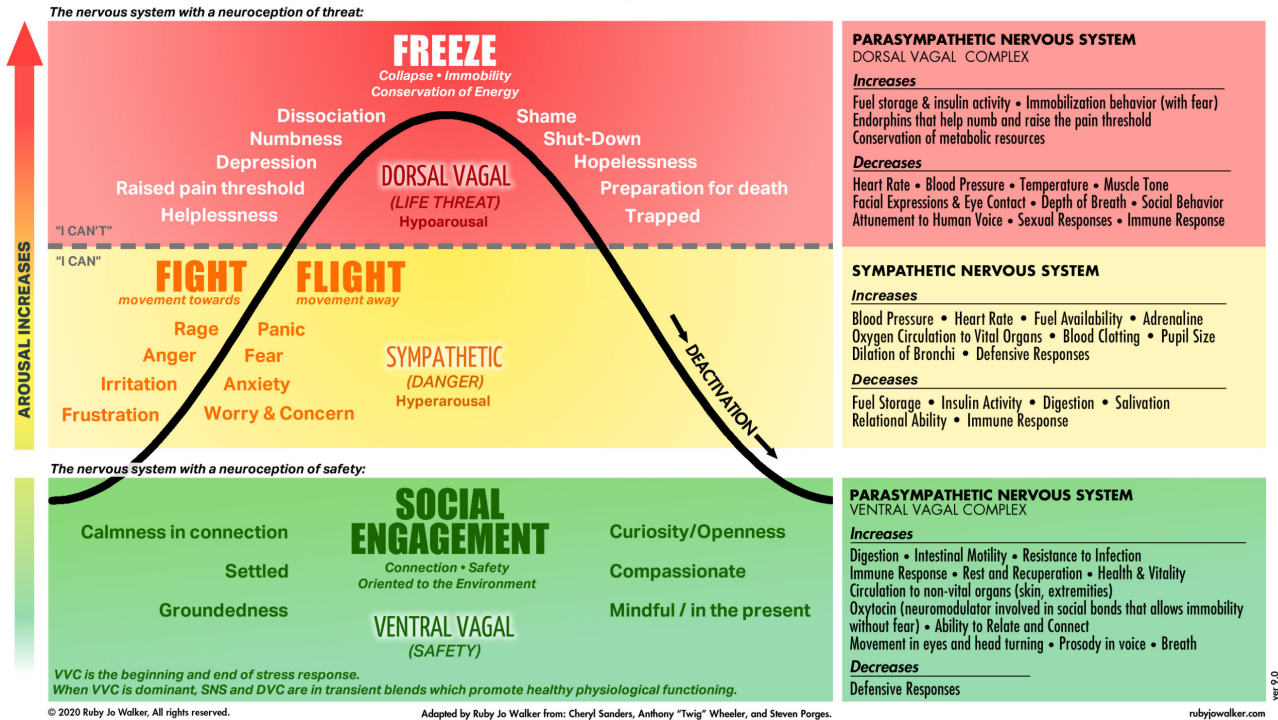
At the bottom

The systems are dictated by **Neuroception**, a subconscious process by which the ANS continually evaluates the environment to detect safety, danger or life-threatening signals.

When functioning correctly it will send signals of safety when somebody smiles kindly or danger signals at sudden noises or threatening expressions, triggering the mobilisation or immobilisation systems.

It's designed to keep you safe but it operates outside of conscious thought and can lead to inappropriate reactions when it misinterprets environmental signals, these misinterpretations are common in trauma survivors and neurodivergent people.

POLYVAGAL CHART



FIGHT

Hyperarousal

FREEZE

Hypo-arousal

FLIGHT

Hyperarousal

FAWN

Hyper and hypo Arousal

Hyperarousal Elements (High Stimulation)

- **Hyper-vigilance:** Constantly reading other people's moods, body language, and micro-expressions.
- **Active appeasement:** Rushing to serve, please, or manage an aggressor's emotional state to maintain safety.
- **Sympathetic activation:** Keeping the body alert, engaged, and outwardly busy rather than running away or fighting.

Hypoarousal Elements (Low Stimulation)

- **Self-abandonment:** Numbing or disconnecting from your own feelings, needs, and anger.
- **Dissociation:** Spacing out or leaving your physical body while still interacting on autopilot.
- **Shutdown of agency:** Surrendering personal power and boundary control to the other person.

Optional in-depth explain actions of how the nervous system works, the relevance of the vagus nerve and how our muscles get tense.

What is the Nervous system?

The greater system is subdivided into the central nervous system (CNS), comprising the brain and spinal cord, and the peripheral nervous system (PNS), which includes sensory pathways and motor pathways.

We'll be focusing on the **autonomic nervous system (ANS)** which is part of the peripheral nervous system, it regulates involuntary bodily functions, like heart rate, digestion, respiratory rate, and other essential functions that occur automatically without conscious effort. It controls the functions of internal organs and glands, maintaining homeostasis (balance) in the body. This system is controlled by centres in the brain, primarily the **hypothalamus**, but it also involves a feedback loop that integrates sensory input from the body to maintain balance and react to changes in the internal and external environment. The environmental reactions that the ANS monitors are an integral part of our survival and have been for millennia, helping us respond quickly and efficiently during times of danger.

The ANS has three main components:

1. **Sympathetic Nervous System:** Often referred to as the "fight or flight" system, it prepares the body for stressful situations. When activated, it increases heart rate, dilates the pupils, slows digestion, and redirects blood flow to muscles, among other effects.
2. **Parasympathetic Nervous System:** Known as the "rest and digest" system, it works to counterbalance the sympathetic system. It helps the body return to a state of calm after a stressful situation, slowing the heart rate, promoting digestion, and conserving energy.
3. **Enteric Nervous System:** Sometimes referred to as the "second brain," it is a complex network of neurons embedded in the lining of the gastrointestinal system. It regulates digestive processes and can function independently of the brain and spinal cord, although it communicates with them.

What is the Vagus Nerve?

For our purposes the other key part of your physiology is the vagus nerve, it is the 10th cranial nerve (Cranial Nerve X) and one of the most important nerves in the body. It extends from the brainstem through the neck and chest and down into the abdomen, connecting to many organs.

It is the main nerve of the parasympathetic nervous system, which controls "rest and digest" functions.

Sensory and motor functions

- It sends information from organs to the brain (like gut signals).
- It sends commands from the brain to organs to regulate autonomic functions.

Role in the “gut–brain connection”

About 80–90% of the vagus nerve’s fibres are sensory, meaning it constantly reports information from the gut and other organs back to the brain. This is why the vagus nerve is important in mental health, stress, and digestion.

Vagal tone

This refers to how active the vagus nerve is. Higher vagal tone is linked to:

- Better stress resilience
- Lower heart rate
- Improved digestion
- Better emotional regulation

How Muscles Make Movement

Let's look at how we contract a muscle and why that might cause it to ache.

When a muscle is contracted it uses something called ATP (adenosine triphosphate) a small amount of this is stored in the muscle itself and can give us about 3 seconds of strong movement, once this is depleted and if we decide to keep moving then the the body needs to make more and quickly.

For high-intensity, short duration activities, such as an explosive jump, or opening a heavy door, ATP re synthesis needs to occur very quickly. For this we use the CP system (Creatine Phosphate). It uses CP stores with in the muscles in to rejuvenate the ATP for reuse. This chemical reaction is very rapid, but CP stores are limited so they are depleted in a maximum of 10-12 seconds.

If we want to move for longer periods of time at a low to moderate intensity such as walking or light jogging then the Aerobic system kicks in. Aerobic metabolism occurs when the liver converts stored glycogen into glucose and sends it to the required area of the body via the blood stream, this combines with oxygen to create much more ATP. The waste produces of this are heat, water and carbon dioxide, which is why we get hot, sweaty and breath more heavily when exercising. This process can keep our body moving for almost a limitless length of time as long as there is fuel to burn, but does have its limits.

If we move into a higher intensity of exercise than the aerobic system can cope such as running or climbing stairs quickly the Anaerobic metabolism kicks in. It makes ATP from glucose without any oxygen, a less efficient and complicated process involving 12 chemical reactions which results in a combination of acids and other waste products. The body quickly and efficiently breaks these down into components and either stores them for later use or removes them from the body. But if we're exercising so hard that the recycling system can't keep up, then we feel the negative effects of an increase in acidity levels, causing our muscles to burn, ache and fatigue making it difficult for muscle fibres to function properly. If we stop contracting the muscle and rest, give the body's systems a chance to catch up, then full function is restored and the pain slowly fades, this can take anywhere between 20 minutes and over 2 hours.

Please note that sore muscles during exercise and any pain you may feel 12-48 hours after are different, this after effect is known as DOMS (Delayed onset of Muscle soreness) and research suggests that it is a result of structural cell damage, take it easy as your body repairs itself and return to exercise only when you feel fully recovered.

Back to why tight muscles ache. At their core muscles are a simple mechanism designed to contract and release, contract and release again and again and again. When they are in their resting state the body removes the waste products and with it the pain and restricted movement.

But what happens when they are in constant contraction? The waste removal system can't function efficiently, the range of movement remains constricted, the build up of acid isn't broken down and recycled, causing constant stiffness and pain.

Another side effect of this build up is how the body processes lactic acid, one of the byproducts of the Anaerobic System, during the recycling process the body breaks lactic acid down into lactate and hydrogen ions. The body takes care of the hydrogen ions by converting them into water and carbon dioxide. When the recycling system can't keep up the build up of hydrogen, contributes to the imbalance of the muscles pH levels causing burning sensations and aches. The lactate is carried by the blood back to the liver, where it is converted into glucose and either consumed as energy or stored as glycogen for future use. However recent studies have shown that a build up of lactate is linked to anxiety. Unsurprisingly people who suffer from anxiety have increased tension in their resting muscles, therefore more lactate in their blood. But this can go both ways, we can make ourselves anxious by injecting lactate into our blood stream. This shows that although anxiety can cause muscle tension, excessive muscle tension can also cause anxiety, creating a cycle of stress and pain.

But if we retrain the nervous system to reset our contracted muscles, keeping them in a resting state until needed, the body's systems can keep our pH levels balanced and us calm and pain free.