About the Physiology Involved in Healing Trauma [1]

1. We Can Heal from Trauma – Our Bodies Hold the Guide

First, a bit of physiology about different brain functions and how they respond to threat and danger, and how they work with the rest of our body to keep us safe.

The **Reptilian Braid** consists of the brainstem and cerebellum (lower regions of the brain) and is mostly responsible for basic instinctual survival responses, including eating, sleeping, waking or arousal, heart rate and breathing.

The **Mammalian Brain** consists of the limbic system (the internal middle section of the brain). This part of the brain is involved in monitoring danger, non-verbal memory, and emotion (identification of pleasure, safety, threat, excitement, pain, and desire).

The **Emotional Brain** consists of both the Reptilian and the Mammalian Brain. These brain functions occur (almost entirely) outside of conscious awareness.

The **Thinking Brain** consists of the frontal cortex (outer areas of the brain that surrounds the limbic system). This part of the brain is required for conscious thought and self-awareness, problem-solving, verbal expression, and memory for facts and events.

1a: Brain Areas Impacted by Trauma

(i) The **Amygdala** is a 1-inch, almond-shaped area of the brain, considered as the "fire alarm". Once it senses danger, the amygdala is the part that kicks one into the fight-or-flight mode. In long-term traumatic situations, the amygdala is continually turned on and doesn't recognise the difference between a threat then and a threat now.

(ii) The **Cingulate Cortex**, which contains the Anterior Cingulate Cortex (ACC) which is responsible for emotional regulation. The ACC is within conscious awareness and allows us to hold two emotions at once, assisting with decision-making (e.g., "I feel scared, but I also know I am safe here.")

(iii) The **Thalamus** receives and relays sensory information to the rest of the brain as fast as possible. Information is sent to the amygdala (where it arrives first) and also to the frontal cortex.

(iv) The **Medial Prefrontal Cortex** (mPFC) is located in the front of one's brain, sometimes known as 'The Watchtower', which assesses, *"How bad is the threat? Is action required?"*. It is the centre of self-awareness that processes risk and fear and makes important decisions about how to respond. It is able to inhibit emotional responses and maintains self-control. In cases of trauma, it less active, which can slow down the learning of new information that can help control fear. If the amygdala is over-active, the pre-frontal cortex can have a harder time over-riding the fight, flight or freeze response. This may mean that you have a hard time controlling your fear response or struggle with logical thinking.

(v) The **Insula** detects physiological senses / states within the body and allows us to be aware of internal experiences. It is critical for emotional awareness. The amygdala is – effectively – the alarm bell. It assesses whether a situation is dangerous, *"Will it kill me?"*

(vi) The **Hippocampus**, situated in the back of the brain, is the 'learning' centre involved in learning and memory. It assists with consolidating short-term memory to long-term memory (storing explicit, declarative, and autobiographical memory for recall in the future). It pays attention to

[1] Adapted from: www.openheartassets.com/collections/therapy-post-it-notes/products/we-can-heal-from-trauma-our-bodies-hold-the-guide and a number of other sources. Thus, this is an amalgam of information and not an original work.

highly emotional information ('triggers' can be stored here). It is smaller and less active in people who've experienced trauma, which can create issues around memory and problem-solving, which (in turn) can make it hard to distinguish between the past and present, keeping one in a constant state of hypervigilance or strong emotional reactivity.

(vii) Finally, the **Hypothalamus** enacts the will of the amygdala and regulates autonomic functions. If the amygdala says "DANGER", the hypothalamus will fire the HPA axis (more on this soon).

(viii) If the **Autonomic Nervous System** is constantly in overdrive with PTSD, it can shrink your window of tolerance, that is the amount of stress you can handle before it becomes unmanageable.

2. Our Brain and Body Usually Work Together to Keep Us Safe

Before considering what happens in our brain and body during a traumatic event, let us consider how our brain and body typically respond when a threat is detected. This is a simple example designed to cover some important concepts and key brain/body functions. We will consider other (more complex) reactions later.

In the mid-brain, there are a number of different structures that react to stimuli coming from outside. A part of the brain called the **thalamus** detects a loud sound, a threat, or something a sight that seems scary (an input 'out of the normal') and sends the information out to other parts of the brain. This information reaches the **amygdala** first. The amygdala fires off a "Danger" signal. Next, the **hypothalamus** acts on the message from the amygdala, instructing the **pituitary and adrenal glands** to release cortisol and adrenaline.

These stress hormones 'trigger' – in their turn – various physiological reactions in different parts of the body, ready for 'fight or flight' activity: the pupils of the eyes sharpen (dilate) – ready to see better what might be happening; the hearing becomes more acute; the heart speeds up – to speed up the blood flowing to areas of your body that might need more oxygen and nutrients to help you to get out of danger; peripheral arteries and blood vessels contract, so as to make more blood more available to the skeletal muscles, which also tense up – preparing themselves for action; the digestive system shuts down, so as not to waste energy digesting food; the sweat glands secrete fluid – to aid cooling during extreme activity; the bronchi (in the lungs) dilate for more oxygen exchange; etc.

Thus, the sympathetic half of the autonomic nervous system prepares itself for a 'whole-body' response to cope with a potentially dangerous event. We are now ready to 'fight' or 'flee' to keep ourselves safe. Several microseconds later, information has travelled "the long way" round from the thalamus, via the **hippocampus** and **anterior cingulate** to the **medial prefrontal cortex** (mPFC). The 'Watch Tower' (or thinking, conscious brain) evaluates the situation and organises the appropriate response required. Thus, we respond to the threat ('fight or flight'*).

3. What is Trauma?

Trauma refers to the emotional, psychological, and physiological effects that remain after exposure to an incident (or series of incidents) that are emotionally disturbing or life-threatening. Trauma symptoms can disrupt one's coping abilities and impact everyday functioning.

There are two types of trauma: **Simple Trauma** typically refers to a single traumatic incident and may result in a diagnosis of PTSD; **Complex Trauma** is usually caused by long-lasting trauma that continues or repeats over months or even years.

Frequently referred to as 'Complex PTSD' (CPTSD) and often results because of childhood trauma. The traumatic stress field has adopted the term "complex trauma" to describe the experience of multiple, chronic and prolonged, developmentally adverse traumatic events, most often of an

interpersonal nature (e.g., sexual or physical abuse, war, community violence) and early-life onset. These exposures often occur within the child's caregiving system and include physical, emotional, and educational neglect and child maltreatment beginning in early childhood. Although the development of simple versus complex trauma is different, the impact on ones' brain and body is similar.

3a: So, What Happens When We Experience Trauma?

Above, we looked at how the amygdala (or brain alarm) fires in response to a threat. Even before we are consciously aware of the threat, our bodies are – almost instantly – prepared to 'fight or flight' and are pumped full of cortisol and adrenaline. This response is automatic, instinctual: it is below the level of conscious thought. It is a breathing body response.

Traumatic events require us to act quickly, without much thought – for ourselves, for others, for the long term. Trauma responses are limited: we do not have the ability to slow down and be mindful of the bigger picture. Everything happens – almost all at once.

It is not until our frontal cortex (or self-aware 'Watch-tower') signals to our unconscious emotional brain that it is now safe to relax, will our bodies begin to ease and unwind. This may take some time and needs to happen in a 'safe' environment. But what if it's not yet safe to relax?

This is where an initial threat can develop into a trauma. What if we are forced to remain in a state of "fight or flight" for a prolonged period, or worse, forced into freeze, collapse, or even immobilisation due to feelings of helplessness and terror of the situation? It then becomes much harder to recover: we can get 'stuck' in the trauma reaction.

When confronted with terror, our brain's alarm system (situated in the amygdala) will – in effect – hijack the rest of the brain, causing the person/animal's body to secrete inordinate amounts of adrenaline and cortisol. These two chemicals do a number of different things to different parts of our bodies. This 'startle reflex' or 'fear' response almost instantaneously floods these chemicals throughout our whole system; every part of the body is now directed purely towards the emergency situation, and normal communication between the different brain areas (or with other people/animals) breaks down.

The unconscious emotional brain is now in charge and operating at 100% and has (almost instantaneously) activated a number of physiological changes in different areas of our bodies: **a)** emotional arousal; **b)** body's physiology; **c)** tunnel vision; **d)** heart rate; **e)** respiration rate; **f)** inhibited digestion; **g)** bladder regulation, and **h)** muscular activation.

3b: Physiological & Psychological (Brain) Effects of Trauma

The **frontal lobe** shuts down, including the areas required to express feelings with words. The **thalamus**, responsible for integrating sensations (such as sounds, sights, and touch) into an integrated autobiographical memory goes offline. The **hippocampus**, needed for the correct storage of memory from short-term to long-term, becomes inaccessible. Communication between the various (different) brain structures (as above) becomes blocked and the traumatic experiences are therefore being absorbed as incoherent fragments of sounds, visions, physical sensations, and smells. There is no 'sense' to be made of these impressions. It is pointless – at this point – to try to make any sense of what is happening. We just react to the traumatic event in various possible ways.

4. Various Instinctive Responses to Trauma?

As shown above, the emotional brain will override the person/animal's whole system, causing an activation of arousal (via the autonomic nervous system) throughout the whole body. However, not everybody will respond the same way when experiencing a traumatic event. People will either move

into a survival/protection state of 'fight' or 'flight' (mobilisation) or 'freeze' (immobilisation). We cannot choose our response! Interestingly, the response we typically resort to during a traumatic event is a strategy or behaviour we may have learned during childhood (e.g., a child copes with her father's verbal abuse by blanking out her mind versus another child who leans to defend himself from his brother's attacks by fleeing or fighting back.) People who have experienced childhood trauma are more likely to 'freeze'.

4a: **<u>The 'Fight' Trauma response</u>**

- Temper that is very explosive and unpredictable
- Taunts, mocks, insults or shames
- "My way or the highway" tendency to need the final say and ignore others perspectives
- Yells, slams doors, screams, becomes aggressive
- Easily becomes reactive (can confuse people with their 'big' emotions)
- Always feels as tough they're being threatened, will protect themselves at any cost
- Often feels shameful/remorseful post outburst
- 'Talking back' to authority figures

4b: ***<u>The 'Flight' Trauma response</u>***

- Chronic rushing or 'always going'
- Feels uncomfortable (or even panic) when still
- Energy spent micromanaging people and situations around them
- Has a history of abruptly ending relationships or phobic of commitment
- Feels trapped easily
- Makes plans to avoid any downtime or throws themselves in to work/achievement
- Often presents as anxiety or panic attacks
- Being intentionally or unintentionally distracted

4c: ***<u>The 'Freeze' Trauma response</u>***

- Feeling completely numb, life is 'pointless'
- Shutdown (silent treatment, complete avoidance)
- Hiding out from the world
- Procrastination or inability to make even small decisions
- Endless social media scrolling/binge TV watching
- Confusion over what is real or unreal (or actually happening)
- Often confused/misdiagnosed with depression
- Giving up quickly

The fourth response – 'Fawn' – refers to when someone actually moves closer to the source of their trauma and tries to placate or win over their aggressor and may manifest itself in the following ways:

4d: ***<u>The 'Fawn' Trauma response</u>***

- People-pleasing
- Going along with another person's perspective, belief's or values without connecting with your own
- Dissociating (leaving the body), 'spacing out'
- Allows other people make decisions
- Avoids and situation that could lead to conflict
- Fears saying 'no'
- Overly polite and agreeable
- Hyper aware of other people's emotions and needs while betraying your own
- Relying on others to help solve problems

These are all perfectly natural instinctive reactions triggered by different parts of our brain. In fact, we share this instinctive behaviour with nearly all other animal life! Any creature responds quickly

to potential danger either by fighting back, running away, or becoming totally still. Or, so as to diffuse a potential (future) danger of death, they may roll over on their back (surrender), or cower down (presenting no obvious threat), or form an attachment to their aggressor (the 'Fawn' response – which is known in kidnapping cases as the "Stockholm Syndrome" [2]).

There is another – less common – trauma response (similar to the freeze response), which is called the 'Flop' response. This is where the person (or animal) just gives up or passes out or is overwhelmed.

4e: <u>The 'Flop' Trauma response</u>

- Total bodily collapse (which might involve blacking out or loss of consciousness)
- Loss of control over bodily functions
- Total disorientation
- Appearing disengaged
- Showing a lack of emotions
- Complete submission

All of these responses are automatic, instinctual, natural – you don't really have a choice; your brain (and body) just reacts, almost immediately, without any conscious thought. You can be trained, or conditioned, to react differently – but usually this means 'over-riding' the immediate, instinctual response. Only soldiers, armed services, police, paramedics, and similar 'first responders', etc. receive such training.

Healing from trauma involves a different 'learning' pattern as you have – unfortunately – become traumatised and your body is malfunctioning in that you now cannot get back to what was "normal". You will have to learn how to do this: but it is not an academic learning (like Maths or French), it is an experiential learning (like how to swim or ride a bike).

5. Normal Memory versus Trauma Memory

A fundamental concern relating to trauma is memory, remembering too much (repeatedly hijacked by the overwhelming arousal of the incident endured), and remembering too little (fragmented memory and missing pieces). When our system is hijacked by the emotional brain, communication between different areas of the brain is interrupted, stopping the integration of sensations, thoughts, and emotions experienced during a traumatic event. This is referred to as dissociation. So, let us examine the difference between normal and traumatic memory.

Our brains love to store memories of events that have high emotional arousal. Provided our systems are not overwhelmed, the hippocampus and other areas of the brain (such as time, place, sequence, thoughts, emotions, sounds, and smells) and stores it in long-term memory as a coherent narrative. Normal memories have a beginning, a middle, and an end. These memories are 'time-stamped' as having taken part in the past. The event is over.

6. Traumatic Memory

When the amygdala hijacks the system and various brain functions shut down, the different sensations that enter the brain at the time of the trauma are dissociated and not properly assembled into a story. There is no beginning, middle, or end. The trauma information has been blocked from reaching the hippocampus (consolidates short-term memory to long-term memory). The information does not pass by the dorso-lateral prefrontal cortex, the area of the brain responsible for putting a 'time stamp' on a memory, allowing us to recognise that an event has passed and is now over. So, what happens

[2] Stockholm syndrome: www.my.clevelandclinic.org/health/diseases/22387-stockholm-syndrome

to the disorganised fragments of trauma that circulate in our system? The answer to this question is where trauma healing begins.

*6a: The Ongoing Impact of Trauma and Dissocia*tion

When traumatic memory remains dissociated (and not integrated into a comprehensive whole), trauma victims can become unsuspectingly overcome with terrifying flashbacks. Flashbacks refer to the reexperiencing of traumatic sensations and emotions as if the traumatic event were reoccurring right now. The terror and fear experienced are equivalent to that which was experienced during the initial event. Anything that may resemble a trauma memory, such as a familiar sound or sensation can 'trigger' a flashback.

For example, every time a war veteran sees rubbish on the road, they may automatically assume a bomb. Or someone who has been in a car crash may fear loud bangs. Potential triggers then become feared and avoided.

7. Trauma Leads Us to Be Frightened of Our Bodies

When our amygdala becomes overactive and 'on guard' – ready to sound the "danger alarm" in our brains at any moment, which would cause our bodies to become flooded with adrenaline and cortisol, we quickly come to fear the remnants of trauma, as they can become terrifying. Unfortunately, it is our bodies that we no longer feel safe to reside within. Any physiological sensation then becomes scary, a reminder that the past is alive within us.

As a result, people who have experienced trauma become experts at trying to ignore what is happening inside. From ignoring gut feelings, excessive avoidance, or using alcohol or drugs to numb the senses, people who have experienced singular or complex trauma almost always attempt to shut down their internal experiences one way or another.

7a: Ignoring our Bodies: But at What Cost?

Below is a group of common problems associated with excessive avoidance of our internal experience:

- Ignoring – or being fearful of – our body's messages can leave us without an internal compass to detect what is truly dangerous or harmful for us, in addition to what is safe and really nourishing for us.
- For some, particularly those with CPTSD, somatic symptoms such as: digestive problems, fibromyalgia, migraines, chronic fatigue, and chronic neck or back pain, etc. may be 'substituted' for the body's repressed internal cries for help. Sleep problems are also extremely common.
- Misplaced anger or re-enacting our trauma: Without accessing our trauma within, events can continue to "trigger" split-off fragments of the trauma. Without an integrated story, the re-enactments are frozen in time and often serve no useful purpose. The pain being expressed was for something that occurred in the past, however, without the appropriate care, this will remain out of our awareness.
- Addictive behaviours (including substance misuse, excessive exercise, over-working) can lead to a range of health and relationship problems.
- Trying to avoid or ignore our internal experience, unfortunately only leads to increased anxiety (or amplified 'numbness' for those who are chronically shut down). Alternatively, some people will find that they have become stuck in hyper-vigilance, frightened of fear itself, and may suffer from panic and other forms of anxiety.

- When we block our internal experience, we also block our access to the present moment and the joy, vibrancy, and vitality available to us.
- Some people who remain excessively shut down find themselves resorting to dangerous sensation seeking, such as gambling or self-harm to try and feel alive or experience any form of sensation.

7b: Our Survival Response: Thwarted and Trapped Within

Interoception refers to our awareness of body-based feelings. With the help of our mPFC (our 'Watchtower'), we can observe what is going on inside of us and observe what is happening in our environment, to make choices, managing how we feel. The greater the awareness, the greater the control over our lives. This is called agency – the ability to take control, make something happen, and shape our environment or circumstance.

Agency is the very thing that sufferers of trauma were unable to do during their traumatic event/s. So how do we restore a sense of agency? How do trauma victims relinquish self-blame, understand that what happened to them was not their fault, and learn to tolerate the sensations and emotions they experience without being overwhelmed by them?

8: Befriending Your Body and Restoring Balance

Renowned somatic therapists, Peter Levine and Pat Ogden, postulate that the 'fight or flight' response becomes blocked or frozen meaning that the intended response (to run, fight, yell or do whatever it takes to survive and protect oneself) is not discharged and instead becomes stuck in the body. They assist clients to befriend (rather than suppress) the energies that were released by the traumatic experience, helping people to complete or act out the self-preserving physical actions that were thwarted or trapped by terror. In doing so, people can restore a sense of agency and resolve frozen trauma responses.

Screaming, pushing, running, and fighting are some examples of survival responses that may have become stuck in one's body during a traumatic event. What energies do you think the man and the woman in our case study (the car accident) may have stuck in their bodies? The urgency to grip and tear open the crumpled vehicle freeing his friend (energy held in his arms and chest); ferocious rage and the need to scream (and fight/protect oneself) from the situation in which someone's reckless behaviour (speeding) could have endangered the woman's life.

Restoring our internal balance and regaining a sense of control over our automatic responses involves learning to 'befriend' our internal experiences. Healing from trauma involves regulating our brains' overactive 'alarm' system (the amygdala) and building up our underactive 'watchtower' in our prefrontal cortex by allowing feelings in our body to settle. In other words, we need to regain balance between our emotional and rational brains. Let us return to our original slide looking at the brain, detailing specific impacts observed as the result of trauma, and consider treatment options.

Brain Area	Function	Impact of Trauma	Treatment Goal	Possible Strategy
Amygdala	Threat Detector	Overactive	Decrease activation	Calming of Stress Response: Diaphragmatic Breathing Progressive Muscle Relaxation Connections with others Therapeutic Massage
Insula	Feelings in the body	Overactive in those with hyperarousal	Decrease activation	Yoga / Tai Chi (learn how to be in your body safely) Mindfulness
Insula	Feelings in the body	Underactive in those with chronic 'numbing' dissociation	Increase activation	Yoga / Tai Chi (learn how to be in body safely) Mindfulness

				Body Scan
Prefrontal Cortex (including OFC & DLPFC)		Underactive	Increase activation	Mindfulness Talk Therapy and other Top-down Processing Therapies (once PFC is back online)
mPFC 'Watchtower'		Underactive	Increase activation	Mindfulness Talk Therapy (integration of adaptive information)
Cingulate Cortex and ACC	Emotional Regulation	Underactive	Increase activation	Meditation Meaning Making of Experience
Hippocampus	Consolidates memory	Underactive	Increase activation	Meditation Exercise Mindfulness

The above is not an exhaustive list, by any means. It does, however, give an indication of the areas of the brain that have become overactive because of trauma and those that have become underactive or that have shut down a bit as a result of trauma.

8a: The Goal of Therapy

The goal of therapy is – as always – to regain a healthy balance within the body. This is achieved via interventions that primarily access the autonomic nervous system and its allied functions through the body and some higher-order functions via thought: cognitive work alone will not touch the body-oriented aspects. For example, you cannot calm down your amygdala just by thinking nice thoughts; you need to (re-)create a bodily feeling – the experience – of being at peace and in safety. This is done by a combination of diaphragmatic breathing, progressive relaxation, connections with other people, and therapeutic massage. Yoga and Tai Chi (body-based interventions) can also help to (re-)experience feelings of pleasure and safety in the body.

9. Healing from Trauma

The primary objective of trauma treatment is learning to feel safe (again) in your body. Once this is achieved, people can then begin to decode (and put into words) the traumatic memories that were previously too overwhelming to recount or discuss. Learning to tolerate the imprinted physical sensations stored within the body's structures and muscle groups may take some time, patience, and plenty of self-compassion. This last is because we often (unjustly) blame ourselves for being traumatised or for not functioning very well: in reality, the trauma happened to us! We couldn't cope: it was overwhelming. It wasn't our fault!

Understanding that we were not to blame is a large part of the healing process. But it must not precede the somatic undoing. It is a later realisation.

Pendulation and titration techniques [3] allow clients to (re-)experience small amounts of distress from the traumatic events – at a particular time and in a particular (safe) way – as in a therapy session, so that the stored energy in the body can be released safely and so that the autonomic nervous system can return to balance without the person being overwhelmed.

If improper attention is paid to the client's somatic process, there is a risk of them being overwhelmed and – in effect – being re-traumatised. Over-emphasis on emotional expression ("getting it all out") can also be overwhelming. There is a **Window of Tolerance** within which recalling the trauma, emotional expression, and cognitive understanding can happen without being re-traumatised, or staying traumatised.

[3] **Pendulation** introduces "resourced" states into our awareness to help us develop confidence in the ability of our nervous systems to move between different (sometimes inverse) states. We can then practice moving back and forth between more and less resourced states.
Titration: "Less is more!", "Slower is better!" are basic principles in trauma work.

9a: The Window of Tolerance

Daniel Siegel devised the concept of the "Window of Tolerance" to help people understand whether their level of arousal was appropriate to the environment or task at hand. The 'Window of Tolerance' is a fantastic tool when working with an individual who may have faced trauma and – as a result – find themselves dysregulating on a frequent basis.

When we are in our 'Window of Tolerance', life feels comfortable. Our body is in an optimal state and we can access both reason and emotion. We are calm, but not tired. We are aware and alert, but not anxious. We engage with our environment well. Working with a therapist can help you expand your Window of Tolerance, so that you are less easily 'triggered' and have improved abilities to cope, soothe and self-regulate when challenged.

When we experience trauma, our Window of Tolerance becomes reduced. When we experience traumatic life events, we may develop beliefs that the world is unsafe and unpredictable. Unconsciously (or consciously) certain factors in our environment can alarm us. Certain physiological sensations, sounds, smells, memories, situations, feelings, or thoughts may 'trigger' us, altering our level of arousal. Our triggers can put us either higher into hyper-arousal, or lower into hypo-arousal.

Above the 'normal' Window of Tolerance, the client can start to feel irritable, anxious, agitated, or feel uncomfortable. Above this area of dysregulation is the area of hyper-arousal, the "fight-or-flight" area, where clients can experience: intense anger, or be overwhelmed, feel threatened, out of control, experience sleeplessness, with an increased heart rate, reactive outbursts, digestive problems, poor concentration, unable to relax: i.e., hypervigilant. They might even feel panic, chaos, rage, highly anxious, or have addictions.

Below the Window of Tolerance, the client can: start shutting down; feel uncomfortable, out of sorts; lose track of time; or have poor concentration. Below this area of dysregulation, is the area of hypo-arousal, the "freeze" area, where clients experience depression, numbness, and poor digestion, and are disconnected, shut down, or detached. They have little or no energy.

It is imperative that people can begin to access the emotional response (or affect) that is attached to the memories (e.g., sadness, rage, fear, etc.) throughout their treatment process, so as to discharge fully the energetic reaction to the traumatic events. This may require some talking therapy techniques, in addition to the somatic work. These two approaches can work well together – as long as proper attention is paid to the affected somatic aspects of the trauma. Below is a summary of techniques that have been found to be beneficial in accessing your body safely and in (re-)learning to trust (and enjoy) its internal messages (feelings) and wisdom. Your body knows! Enjoy!

9b: Breathwork and Mindfulness: Learning how to enter the body safely

In order to calm hyper-arousal and an over-active alarm system, we need to practice – on a regular basis – techniques that allow us to 'watch' our bodies' physiological feelings and sensations, consciously and curiously, without being overwhelmed. Breathwork and practices like mindfulness have been proven to re-train our arousal system directly. Learning to focus on, and notice what is going on, inside our bodies teaches us that physiological sensations have a beginning, middle, and end. Internal sensations cannot harm us, although they may be uncomfortable at times.

Building interoceptive skills (i.e., noticing and feeling what we are doing, becoming more aware of inner states), being in the present and being more aware of one's body, restores the balance in our emotional brain and re-activates our 'Watchtower', enhancing our brain's ability to calm rationally our emotional brain: *"Oh, it was just the dog knocking over the dustbin!"* We thereby re-establish emotional regulation (Price & Hooven, 2018).

9c: Therapeutic Massage and Touch

Touch helps traumatised bodies begin to re-locate within the boundaries of their skin. (Think of an animal licking its young.). Chronically shutdown people can rediscover and 'wake up' areas of their body through applied pressure and touch. Held-in tensions can be discovered and released, allowing room for feelings to be uncovered and expressed. For people who hold an immense degree of tension, therapeutic massage can assist them to breathe and move more freely, which might be a necessary first step in their therapy.

9d: Yoga, Martial Arts and Exercise

Yoga and exercise have been shown to improve our ability to regulate ourselves significantly. Accessing our bodies and improving our heart rate variability also assists with sleep and energy levels. Moreover, particularly with yoga, deeply feeling into our body with conscious breathing practices and totally surrendering into certain body positions is incredibly beneficial for those recovering from trauma who struggle to fully relax. This solidifies a vital connection and awareness to one's body.

9e: Reciprocity, Rhythm and Synchronicity

Working with others towards a unified goal, playing with others, and feeling physically attuned to others, helps us to feel a sense of connection and joy. People who are traumatised and shut down have lost their sense of connection. Dance, chanting, choir, or joining a basketball team can help 'spark' sensory integration. Simply throwing a ball back and forward can open a reciprocal connection between two that is non-invasive and yet surprisingly soothing and relaxing.

9f: Connections

Social engagement is our greatest resource to combat stress. Feeling seen by a safe and comforting 'other' causes our autonomic nervous system to relax automatically. Having a good support network is imperative for healing and restoring a sense of safety, whether this be a mixture of family, friends, a community support group, or a trusted professional.

10: Plotting the Healing Work

Below is a summary of some of the trauma symptoms commonly experienced by those with Post Traumatic Stress Disorder (PTSD). There is an indication of treatment possibilities according to the symptom cluster.

Although not yet formally acknowledged, there is much conjecture and research advocating for the inclusion of a Developmental Trauma Disorder (van der Kolk [4]) which suggests a similar profile of trauma symptoms for those exposed to repeated trauma over time (such as childhood neglect, emotional abuse, sexual abuse, and/or domestic violence).

Symptom Cluster	**Symptoms (All those related to the trauma incident/s)** * Not all symptoms need to be endorsed to indicate PTSD or trauma	**Yes/No**
Re-Experiencing	Intrusive/unwanted thoughts and memories regarding the trauma	
	Nightmares	
	Feelings of distress when thoughts/memories or reminders occur	
	Flashbacks or suddenly feeling as if the trauma is re-occurring	
Avoidance	Attempts to avoid memories, thoughts, or feelings related to the trauma	
	Avoid places, people, conversations, activities, situations that remind one	
Thought/Mood Changes	Experiencing blame or guilt regarding the trauma ('stuck points')	
	Loss of memory for parts of the trauma or trouble remembering	
	Experiencing strong negative feelings such as fear, horror, anger, shame	
	Loss of interest in previously enjoyed activities	

[4] www.traumaticstressinstitute.org/wp-content/files_mf/1276541701VanderKolkDvptTraumaDis.pdf

	Disconnection from others or feeling distant	
Arousal & Reactivity	Sleep and Concentration difficulties	
	Irritability, agitation, or even aggression	
	Hyper-arousal, being 'super alert', easily startled, watchful or jumpy	

10a: Planning Action: Learning to Befriend My Body and Beginning to Regain Balance

The healing of trauma is best done in conjunction with a qualified trauma therapist. The therapy should be a mixture of both body work (as indicated above) with some talking therapy. The talking aspects of the therapy should allow sufficient time/space for the client describing/re-telling details of their trauma(s) and about the feelings that arose and about how these can be/are being integrated. The pace of the therapy needs to be guided by how the client's autonomic nervous system responds, which needs to be closely monitored by the therapist. There needs to be a process of 'normalisation' whereby the client re-establishes the 'normal' physical and social aspects of their life.

Breathwork and Mindfulness – Noticing the Body

- What do I need? (Information, accountability, someone to teach me?)
- When Can I Do This?
- How Often Will I Do This?
- What Is My Goal?

Touch Massage – Discovering the Body

- What do I need? (Information, guidance, reassurance?)
- When Can I Do This?
- How Often Will I Do This?
- What Is My Goal?

Working <u>with</u> The Body (Yoga/Exercise/ Martial Art) – Leaning into the Body

- What do I need? (Information, guidance, reassurance, a companion?)
- When Can I Do This?
- How Often Will I Do This?
- What Is My Goal? (e.g., enjoying feeling my muscles stretch)

Sensory Integration – Reciprocity and Rhythm (Dance, choir, drumming, team sports)

- What do I need? (Information, guidance, encouragement?)
- When Can I Do This?
- How Often Will I Do This?
- What Is My Goal?

Connection – Social Engagement and Relaxing with Others (Turn on the Vagus Nerve)

- What do I need? (Information, assistance?)
- When Can I Do This?
- How Often Will I Do This?
- What Is My Goal?

11: The Polyvagal Theory – The Body Brain Connection and Trauma

The polyvagal theory suggests that the autonomic nervous system (ANS) regulates three essential physiological states: Social engagement, 'fight' or 'flight' and 'freeze or collapse'. These autonomic responses seek to meet the biological needs for connection and the drive to survive. The three states are in a hierarchy such that is a lower level (more primitive response) is triggered, any state above it is hijacked and offline.

11a: Social Engagement System or Ventral Vagal: Mammalian Response (200 million years old)

The Ventral Vagal Complex (VVG) activates the muscles in the face, throat, middle ear, and voice box. It also sends signals to our heart and lungs, slowing our heart rate and deepening our breath. If

distress is detected, it will alter our heart rate and deepening our breath. If distress is detected, it will alter our facial expression (upset face) and change our tone of voice (change pitch and pace) so we can call for others to assist us.

11b: Sympathetic Nervous System: Fight or Flight (400 million years old)

The Sympathetic Nervous System takes over if the threat increases. It activates the heart to beat faster and prepares our lungs for mobilisation (fight or run). Adrenaline and cortisol will be released, digestion will be interrupted, and blood will flow to our larger muscles. Thought is disrupted.

11c: Dorsal Vagal or Freeze/Collapse: Reptilian Brain (500 million years old)

The Dorsal Vagal Complex (DVC) activates in the ultimate emergency where mobilisation (escape) is not possible. The DVC slows the heart rate, decreases the breathing rate, and drastically slows digestion. It reaches the stomach, kidneys, and intestines, and is often associated with diarrhoea and nausea. Essentially the DVC response 'feigns' death to conserve energy when escape appears impossible. Senses are numbed.

Our nervous system makes decisions for us and instinctively enacts the state it perceives is required. This occurs out of conscious awareness! Trauma can cause us to become stuck in 'fight or flight' or chronic shut-down (freeze). In this case, we need to activate the social engagement system and calm the physical tensions held in the body. Only when the social engagement system (ventral vagal state) is switched on, can the brain and body work together.

11d: Top-Down Processing

Interventions addressing traumatic recollections and thoughts are only effective when the social engagement system is online.

11e: Bottom-Up Processing

'Fight or flight' and 'freeze' states require interventions that assist the body to re'-balance the self-regulation process.

12: Neuroception – Detecting (of Safety or Danger) Without Awareness

Stephen Porges coined the term 'neuroception' to describe how our autonomic nervous system (ANS) unconsciously sends and searches for cues of safety or danger in others. Working below our level of awareness, the ANS constantly listens to messages from our body.

Mirror neurones in our brain scan the face of the person we are looking at and give our body important information about the internal experience of the other person. The ANS detects whether it is safe to connect with the other person and thus we can co-regulate.

Tiny emotional shifts can be detected, such as a change in the tension of one's brow, the wrinkles around the eye, lip movements, and even the angle of the neck. Our bodies will adjust, based on what we detect. When we receive safety signals indicating that 'this person is safe', we can relax.

Our ANS is shaped in early relationships and continues to be influenced by life experiences. So, what happens when our ANS has been shaped in an unsafe environment (e.g., neglect or abuse in childhood, or prolonged exposure to domestic violence), or where consistent and safe connections to another is not available.

However, if the person's ANS detects aggression and threatening cues from the other person causing their body to react with an increased heart rate and muscle tension, as their body prepares for safety actions.

Our ANS will choose safety and survival over connection. If connection with others is consistently overridden by the 'fight or flight' state or 'freeze/collapse' state and co-regulation with a safe other is not available, then our ANS will learn to remain habitually in a state of safety seeking.

There are two options: 1) Protection over Connection: when we are stuck in 'fight or flight', as we are more likely to perceive hostility in others when it is not there; 2) Disconnection over Connection: when we get stuck in 'freeze' or collapse, we may be so numb that danger cues get missed.

13: Three Survival Responses (Drive to Survive)

The ANS is responsible for activating and regulating three physiological states. The state which is enacted depends on the level of perceived safety. When we detect threat, we instinctively turn to the first level, **social engagement**. If the danger remains, or we are unable to seek comfort and safety from those around us, we move to the next level, **fight or flight**, and so we prepare to mobilise. If ineffective, the final survival state is **freeze or collapse**.

13a: Social Engagement *(parasympathetic and ventral vagal switched on)*

- We connect to others, and the world around us.
- We engage with others, seeking support and comfort.
- We acknowledge our distress and consider options.
- We regulate (self-regulate and co-regulate).
- We restore and heal.

We feel calm.
Our heart rate slows.
Our breath deepens.
Our digestion resumes.
Our body restores.

Bringing Awareness to the Social Engagement: (Ventral Vagal: "I feel connected and safe")
Think of a time when you were in this autonomic state: What was Happening in Your Body?
What did you notice? - Warm, hot, cold, light, heavy, moving, still, hollow, empty, sharp, tense, tinkling, pressure, close to the skin, etc.
What do you do? How do you feel? What do you think? How do you sleep? Are there changes in your appetite? Do you use alcohol or other substances?

13b: Fight or Flight *(sympathetic nervous system override)*

- We mobilise to survive
- We fight the threat or run away from it
- We are alarmed, anxious and hypervigilant to danger cues

Our cognition shuts down
Our heart rate increases
Adrenaline and cortisol released
Our digestion slows down / stops.
Blood goes to the main muscles groups to mobilise the body

Bringing Awareness to the Fight or Flight: (sympathetic nervous response: "I'm in danger, I need to run or fight back".
Think of a time when you were in this autonomic state: What was Happening in Your Body?
What did you notice? - Warm, hot, cold, light, heavy, moving, still, hollow, empty, sharp, tense, tinkling, pressure, close to the skin, etc.
What do you do? How do you feel? What do you think? How do you sleep? Are there changes in your appetite? Do you use alcohol or other substances?

13c: Freeze or Collapse

- Shut down and disconnect from self, others, and the outside world
- Immobilise to save energy
- Feel numb, lost, abandoned and invisible

We zone out and dissociate
Our heart rate drops
Shallow breathing ensues
Digestive problems – gut stops working or empties

Bringing Awareness to the Freeze/Collapse: Dorsal Vagal system: "I can't cope: I'm collapsed and/or shut down".

Think of a time when you were in this autonomic state: What was Happening in Your Body?

What did you notice? - Warm, hot, cold, light, heavy, moving, still, hollow, empty, sharp, tense, tinkling, pressure, close to the skin, etc.

What do you do? How do you feel? What do you think? How do you sleep? Are there changes in your appetite? Do you use alcohol or other substances?

14: How these changes can affect your daily life?

Living with trauma is challenging: there are many changes taking place in one's brain, along with all the stress hormones circulating through your system on a regular basis, you may experience several systems of PTSD. Some of these include: rage, anxiety, irritability, flashbacks, nightmares, panic attacks, memory issues, troubles in making decisions, difficulties in thinking, concentrating, or learning, a lack of motivation. Also, if your brain is on high-alert for threats, it may be hard to pick up accurately on how others feel, think, or understand their motives. This means communication challenges may arise, and close relationships could become strained.

15: Healing from PTSD

There are a number of different therapeutic approaches that are effective for people with PTSD: some of these are talk-therapies, like Cognitive Behaviour Therapy (CBT), which can help identify and interrupt negative thought patterns, which can lead to changes in behaviour; Cognitive Processing Therapy (CPT), which can help you restructure the beliefs you took away from the traumatic event; Prolonged Exposure Therapy (PET), which can help you to learn distress tolerance and self-soothing techniques as one works through triggers in a safe environment; and eye-movement desensitization and reprocessing (EMDR), which uses tones and taps to revisit a traumatic experience through a different lens and form new beliefs around it. Some doctors recommend serotonin reuptake inhibitors (SSRIs) for anxiety, depression, and sleep disturbances associated with PTSD. There are also a lot of self-care strategies, including eating a nutrient-dense diet, sleeping 7-9 hours a night, getting moderate exercise 5 times a week and developing a routine of mindfulness practice and/or meditation.

15a: Learning how to Heal from Trauma:

The brain is incredibly resilient and plastic, growing and evolving throughout one's lifetime. It possesses the ability to repair itself through the process of neuroplasticity. Trauma survivors can capitalise on this plasticity so as to heal: but the brain has to learn which of these methods work for that particular person and then apply those techniques as a set of new habits.

A traumatized brain tends to experience excessive activation in areas related to fear and reduced activation in "thinking" areas (which is why cognitive therapies don't work so well with healing trauma). Body-oriented therapies and mindfulness practice can reduce activation in the fear centre. That gives space for healthy emotional expression and this then releases further tension and allows more changes to happen. With increased awareness, one can seek treatment to address one's symptoms and learn skills that could actually rewire one's brain for recovery.

Additionally, knowing what's going on can be immensely helpful because it may help you realize that you're not crazy, irreversibly damaged, or a bad person. Instead, you can think of a traumatized brain as one that functions differently – as a result of traumatic events (a bit like limping because you've hurt your leg). And just as your brain changed in response to your past experiences

with the world, it can also change now in response to your future – more beneficial – experiences. In other words, the brain is "plastic," and therefore you can change it.

Traumatized brains look different from non-traumatized brains, mainly in three predictable ways: **(i)** the Thinking Centre is under-activated; **(ii)** the Emotional Regulation Centre is under-activated; and **(iii)** the Fear Centre is over-activated.

What these activations indicate is that, often, a traumatized brain is "bottom-heavy," meaning that activations of lower, more primitive areas, including the fear centre, are high, while higher areas of the brain (also known as cortical areas) are under-activated. In other words, if you are traumatized, you may experience chronic stress, vigilance, fear, and irritation. You may also have a hard time feeling safe, calming down, or sleeping. These symptoms are all the result of a hyperactive amygdala.

Finally, survivors of trauma will sometimes complain that they feel incapable of managing their emotions. For example, if someone spooks them as a prank, they may experience a rapid heart rate long after the joke is up, or may have a hard time "just letting go" of minor annoyances. Even when they want to calm down and feel better, they just can't. This is in large part due to a weakened emotion regulation centre. They need to feel safe first, before they can heal.

Changing the brain takes effort, repetition, and time – similar to physiotherapy to get back bodily movement after a period of dysfunction. One of the more successful methods is by using body-based methods (like diaphragmatic breathing, autogenic training and/or body psychotherapy) and/or mindfulness-based techniques in order to calm down the fear centre. The fear reaction is stored in the body and – until the whole body can relax and let go some of its holding patterns – one cannot properly heal from trauma. This is a vital first step, as when we are able to do this, we are better able to work on strengthening and re-activating the thinking centre and the emotion regulation centre. Practice these calming and relaxing techniques regularly – for short periods of time, several times a day – whilst working in conjunction with a type of body psychotherapy or with a therapist who specialises in trauma and PTSD. All of these work, but you need to discover what works for you.

Healing from trauma is not an instantaneous process, not is it automatic: it takes time, energy, effort, and commitment. Because of the whole-body approach, there are a number of points to consider: Regular physical (aerobic) activity is important: as it 'burns off' stress hormones (adrenaline & cortisol). Getting regular sleep at night and periods of rest during the day is also important, as the body needs to become more parasympathetic. Avoid alcohol, drugs and caffeine. Stay hydrated by drinking plenty of water. Eat regular meals and try relaxing for about 20 minutes before each meal. Eat brain-healthy foods, like leafy, green vegetables (rich in vitamin K and other minerals, like spinach); beets (contain vitamin B); fatty fish (rich in omega-3, like salmon, tuna, mackerel and sardines); berries (with flavonoids, like blueberries); bananas (containing vitamin B6); and nuts and seeds (rich in omega-3, like walnuts); avocados (rich in monounsaturated fatty acids); and other brain-healthy foods, like Greek yoghurt; oatmeal; etc. Take care of your body – as you might do after a bad accident: use body lotion, saunas, hot tubs, jacuzzis, gentle massage, etc.

15b: Learning how to Heal from Trauma: TED-Talks

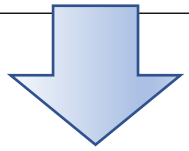
- The effect of trauma on the brain and how it affects behaviors: Dr. John Rigg (here)
- Understanding PTSD's effects on Brain, Body and Emotions: Janet Seahorn (here)
- The Body Keeps the Score: Brain, Mind, and Body in the Healing of Trauma: Bessel van der Kolk (here)
- Understanding Men and their Trauma: Dr Gabor Maté (here)
- 6 ways to heal trauma without medication: Bessel van der Kolk (here)
- What trauma taught me about resilience: Charles Hunt (here)
- The paradox of trauma-informed care: Vicky Kelly (here)

16: Learning How to Self-Regulate (Start with freeze state and move your way up to social engagement state)

16a: Freeze/Collapse: *What triggers this state?*

- *A person/people?*
- *A situation?*
- *A physiological sensation?*
- *A feeling?*
- *A thought?*
- *A behaviour?*
- **What helps you move out of this state?**

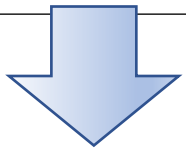
Are you stuck in 'freeze? When you notice sensations that differ from your normal state, do you automatically fall back to the state that is familiar to you?



16b: Fight or Flight: *What triggers this state?*

- *A person/people?*
- *A situation?*
- *A physiological sensation?*
- *A feeling?*
- *A thought?*
- *A behaviour?*
- **What helps you move out of this state?**

Are you stuck in 'fight or flight? When you notice sensations that differ from your normal state, do you automatically fall back to the state that is familiar to you?



16c: Social Engagement: *What triggers this state?*

- *A person/people?*
- *A situation?*
- *A physiological sensation?*
- *A feeling?*
- *A thought?*
- *A behaviour?*
- **What helps you move out of this state?**

References

Akiki, T.J., *et al.* (2017). The association of PTSD symptom severity with localized hippocampus and amygdala abnormalities. *Chronic Stress, 1:2470547017724069.*

Euston, D.R., Gruber, A.J. & McNaughton, B.L. (2012). The Role of Medial Prefrontal Cortex in Memory and Decision Making. *Neuron, 76 (6), 1057-1070.*

Kerr, L.K. (2015). *Live within your window of tolerance: A quick guide to regulating emotions, calming your body & reducing anxiety.* San Francisco, CA: Private Publication.

Price, C.J. & Hooven, C. (2018). Interoceptive Awareness Skills for Emotional Regulation: Theory and Approach of Mindful Awareness in Body-Oriented Therapy (MABT). *Frontiers in Psychology, 9, 798.*

Sweeton, J. (2017). How to Heal the Traumatized Brain: An inside look at the traumatized brain and how you can start to heal. *Psychology Today.*

Walling, C. (2017). Psychotherapy for your Body: The role of somatic psychology today. *Good Therapy Blog: www.goodtherapy.org/blog/psychotherapy-for-your-body-role-of-somatic-psychology-today-0605174*

PTSD-UK: www.ptsduk.org/its-so-much-more-than-just-fight-or-flight/