A review of Osteopathic approach to patients with symptoms of post-traumatic stress disorder (PTSD)

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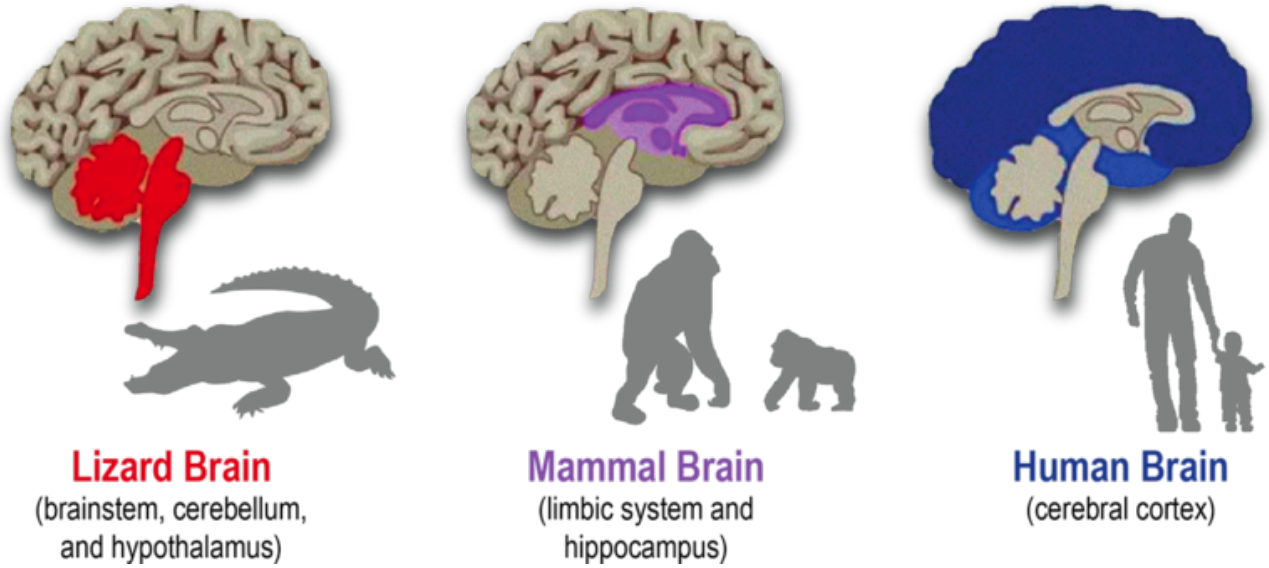
Chapter 1: Introduction

A. Definition of trauma

Trauma can be defined as a deeply distressing and emotionally overpowering event or series of events that overwhelms the individuals coping mechanisms. It can be a threat to life, physical integrity or sanity.

Peter Levine, a bodyworker and author of the book 'Waking the Tiger,' emphasized that understanding trauma isn't just about having a definition but also experiencing how it feels. When someone experiences trauma, their ability to sense their internal body state, known as interoception, and unconsciously detect safety and danger is often disrupted. Interoception is like a sixth sense and plays a crucial role in preventing the long-term effects of post-traumatic stress. Altered interoception has been associated with various conditions such as post-traumatic stress disorders, somatoform disorders, depression, anxiety, dissociative disorders, and chronic pain.

To regain our awareness and ability to sense our internal body state, it's important to create a sense of safety. Our evaluation of safety and danger happens automatically without conscious effort, according to the Polyvagal theory developed by scientist Stephen Porges. This process is called “neuro-ception." When we perceive a threat or danger, our reptilian (brainstem) and mammalian brain (emotional brain or limbic system) react to it. Normally, once the danger is gone, our body returns to a balanced state. However, if the process of restoring balance is disrupted, our natural ability to self-regulate gets thrown off track.



B. Trauma types

Traumatic events can vary in size and include things like accidents, violence, death, witnessing something traumatic, abuse, natural disasters, bullying, or medical procedures.
There are different types of trauma:

- Acute trauma: Exposure to one overwhelming traumatic event
- Complex trauma: Chronic and repeated overwhelming experiences, often involving relationships
- Developmental trauma: Ongoing or repetitive traumatic experiences during infancy, childhood, or adolescence, such as neglect, abuse, witnessing violence, or betrayal. This can affect attachment and development.
- Intergenerational trauma: Coping patterns passed down through generations.
- Vicarious trauma: Therapists experiencing the effects of their patients' traumatic experiences, which can affect their own functioning.

C. Associated symptoms

Trauma triggers four main reactions: being on high alert all the time, feeling disconnected from reality, feeling tight or constricted, and feeling helpless. When we experience stress, our body goes into "fight or flight" mode, activating the sympathetic nervous system and the HPA axis. This floods our body with a surge of energy, making us hyper-alert and ready to either fight or run away. Our body smartly redirects blood flow, reducing it to less vital areas like the digestive system and skin, and increasing it to the lungs, heart, and muscles needed for defence and action. However, if we can't fight or escape, our body's parasympathetic system kicks in, causing us to freeze or become immobilised as a survival strategy. This feeling of helplessness and dissociation happens when we believe we can't get away from the threat.
After experiencing a traumatic event, animals have a natural instinct to physically shake off the built-up energy caused by the threat. However, in humans, trauma occurs when this energy cannot be resolved and turns into a pathology (Levine, 1997). The symptoms of trauma can appear immediately after the event or even months or years later (Mutinga, 2020). The primary symptoms are usually the four core symptoms, but other symptoms may include difficulty controlling emotions, anxiety and panic attacks, physical pain or discomfort, avoiding triggers that remind them of the event, memory loss, feeling emotionally numb, having trouble expressing emotions, sudden changes in mood, outbursts of aggression, sleep problems, difficulty with thinking and memory, and experiencing triggers and flashbacks.

Trauma often shows up in physical symptoms felt in the body, known as somatisation. These symptoms can include dizziness, ringing in the ears, sensitivity to certain sounds and light, digestive problems, headaches, chronic fatigue, neck and back pain, severe premenstrual symptoms, and various immune system issues. Unfortunately, these physical complaints are often ignored or dismissed as purely psychological because their causes may not be obvious.

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), includes trauma-related disorders such as reactive attachment disorder, disinhibited social engagement disorder, acute stress disorder, and adjustment disorders. Dissociative disorders, anxiety disorders, obsessive-compulsive disorders, and related disorders are not specifically categorized as trauma-

related in the DSM-5, but they are closely linked to trauma and can arise from it. It's important to note that the range of mental and physical disorders resulting from trauma may not always fit the exact criteria of the DSM-5 diagnosis. Comorbidity, where individuals experience multiple disorders at the same time, is also common.

D. Definition of Post Traumatic Stress Disorder

Post Traumatic Stress Disorder (PTSD) is a mental health condition that affects individuals who have experienced a traumatic event. It is a debilitating disorder that can impact a person's quality of life and ability to function. The symptoms of PTSD can vary from person to person but can include anxiety, depression, flashbacks, nightmares, and emotional numbness. PTSD can be triggered by a variety of traumatic events such as natural disasters, sexual assault, physical abuse, combat exposure, and other life-threatening experiences.

In recent years, there has been an increase in the awareness of PTSD and its effects on individuals. Healthcare providers, researchers, and the public have recognised the importance of providing effective treatments to those suffering from PTSD. Traditional treatments for PTSD include medications, cognitive-behavioural therapy, and exposure therapy. However, there has been a growing interest in the use of alternative and holistic therapies, such as osteopathic medicine, to treat PTSD.

- DSM-5 Diagnostic Criteria for PTSD[1]

Note: The following criteria apply to adults, adolescents, and children older than 6 years. For children 6 years and younger, see the DSM-5 section titled “Posttraumatic Stress Disorder for Children 6 Years and Younger” (APA, 2013a).

A. Exposure to actual or threatened death, serious injury, or sexual violence in one (or more) of the following ways:

    1. Directly experiencing the traumatic event(s).
    2. Witnessing, in person, the event(s) as it occurred to others.
    3. Learning that the traumatic event(s) occurred to a close family member or close friend. In cases of actual or threatened death of a family member or friend, the event(s) must have been violent or accidental.
    4. Experiencing repeated or extreme exposure to aversive details of the traumatic event(s) (e.g., first responders collecting human remains; police officers repeatedly exposed to de tails of child abuse). Note: Criterion A4 does not apply to exposure through electronic me dia, television, movies, or pictures, unless this exposure is work related.

B. Presence of one (or more) of the following intrusion symptoms associated with the traumatic event(s), beginning after the traumatic event(s) occurred:

    1. Recurrent, involuntary, and intrusive distressing memories of the traumatic event(s). Note: In

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[1] APA, 2013a, pp. 271–272

children older than 6 years, repetitive play may occur in which themes or aspects of the traumatic event(s) are expressed.
2. Recurrent distressing dreams in which the content and/or affect of the dream are related to the traumatic event(s). Note: In children, there may be frightening dreams without recog nizable content.
3. Dissociative reactions (e.g., flashbacks) in which the individual feels or acts as if the traumatic event(s) were recurring. (Such reactions may occur on a continuum, with the most extreme expression being a complete loss of awareness of present surroundings.) Note: In children, trauma-specific reenactment may occur in play.
4. Intense or prolonged psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event(s).
5. Marked physiological reactions to internal or external cues that symbolize or resemble an aspect of the traumatic event(s).

C. Persistent avoidance of stimuli associated with the traumatic event(s), beginning after the trau matic event(s) occurred, as evidenced by one or both of the following:

1. Avoidance of or efforts to avoid distressing memories, thoughts, or feelings about or closely associated with the traumatic event(s).
2. Avoidance of or efforts to avoid external reminders (people, places, conversations, activities,
objects, situations) that arouse distressing memories, thoughts, or feelings about or closely associated with the traumatic event(s).

D. Negative alterations in cognitions and mood associated with the traumatic event(s), beginning or worsening after the traumatic event(s) occurred, as evidenced by two (or more) of the following:

1. Inability to remember an important aspect of the traumatic event(s) (typically due to dis sociative amnesia, and not to other factors such as head injury, alcohol, or drugs).
2. Persistent and exaggerated negative beliefs or expectations about oneself, others, or the world (e.g., “I am bad,” “No one can be trusted,” “The world is completely dangerous,” “My whole nervous system is permanently ruined”).
3. Persistent, distorted cognitions about the cause or consequences of the traumatic event(s) that lead the individual to blame himself/herself or others.
4. Persistent negative emotional state (e.g., fear, horror, anger, guilt, or shame).
5. Markedly diminished interest or participation in significant activities.
6. Feelings of detachment or estrangement from others.
7. Persistent inability to experience positive emotions (e.g., inability to experience happiness, satisfaction, or loving feelings).

E. Marked alterations in arousal and reactivity associated with the traumatic event(s), beginning or worsening after the traumatic event(s) occurred, as evidenced by two (or more) of the following:

1. Irritable behavior and angry outbursts (with little or no provocation), typically expressed as verbal or physical aggression toward people or objects.
2. Reckless or self-destructive behavior.

3. Hypervigilance.
4. Exaggerated startle response.
5. Problems with concentration.
6. Sleep disturbance (e.g., difficulty falling or staying asleep or restless sleep).

Duration of the disturbance (Criteria B, C, D and E) is more than 1 month.

The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

The disturbance is not attributable to the physiological effects of a substance (e.g., medication, alcohol) or another medical condition.

Specify whether:

With dissociative symptoms: The individual's symptoms meet the criteria for posttraumatic stress disorder, and in addition, in response to the stressor, the individual experiences persistent or recurrent symptoms of either of the following:

1. De-personalization: Persistent or recurrent experiences of feeling detached from, and as if one were an outside observer of, one's mental processes or body (e.g., feeling as though one were in a dream; feeling a sense of unreality of self or body or of time moving slowly).
2. De-realization: Persistent or recurrent experiences of unreality of surroundings (e.g., the world around the individual is experienced as unreal, dreamlike, distant, or distorted). Note: To use this subtype, the dissociative symptoms must not be attributable to the physiological effects of a substance (e.g., blackouts, behavior during alcohol intoxication) or another medical condition (e.g., complex partial seizures).

Specify whether:

With delayed expression: If the full diagnostic criteria are not met until at least 6 months after the event (although the onset and expression of some symptoms may be immediate).

E. Trauma therapy and Osteopathy

Somatisation, the manifestation of psychological trauma in physical symptoms, has a long history in the field of somatic psychology. Wilhelm Reich linked bodily tensions to an individual's character structure, or experience-dependant development of personal protection mask. He introduced the concept of "muscle armour," a protective shell of muscle tension developed in response to threat, anxiety, and trauma.

Inspired by other pioneers in body awareness therapy, Reich utilized the body to access and release emotions, allowing for self-healing. Gerda Boyesen further expanded the understanding of congested emotional energy to include the viscera and connective tissue in therapeutic treatment. Other notable approaches within body psychotherapy include the Gendlin focusing method, holotropic breathwork, and Gestalt therapy. These methods integrate the physical and psychological aspects of therapy, offering unique approaches to healing and self-discovery.

These contributions to somatic psychology have paved the way for a deeper exploration of the interplay between the body and mind in the context of trauma recovery. Osteopathic philosophy aligns with the same principles as mentioned, that the body has an innate self- healing, self-regulating capacity. In this paper, we will further look deep into Osteopathic Manipulative treatment for normalising the structural integrity of the body, providing a foundation from which the body and mind can flow freely and reunite from dissociation or awaken from frozen state or being empowered to digest the old past.

Chapter 2: Review of trauma therapy

A. The importance of awareness in treating PTSD

Awareness plays a vital role in the treatment of PTSD, as it allows individuals to understand their bodily sensations and how they interact with the world around them. By becoming physically self-aware, individuals can take the first step in breaking free from the grip of past trauma.
Moving through trauma involves an active and dynamic process of healing and building resilience. The word "emotion" itself originates from the Latin root "e-movere," meaning to move or move out. Emotions, according to Darwin, serve the purpose of setting us in motion to restore safety and balance.

Trauma, both physically and mentally, has the power to propel us. Even though the force may not always be physical, if left unopposed, it can alter the trajectory of our well-being, just as in the laws of physics.

Osteopath Edward Mutinga likens trauma-induced shock to a wave that travels through the body, its path and impact determined by the force it encounters. While this concept is typically applied to mechanical trauma, it also applies to psychological and emotional trauma.
Various forms of trauma therapy exist, but this discussion focuses on the efficiency of somatic-based therapy, particularly osteopathy. Understanding the role of interoception (awareness of internal bodily sensations) and the autonomic nervous system becomes crucial in the treatment of trauma.

By recognizing the significance of awareness and incorporating somatic approaches like osteopathy, individuals can embark on a transformative journey towards healing from trauma.

B. Top-down Approach

(building connection starting from cerebral cortex and arrive at limbic and brainstem)

Effective treatments for PTSD encompass various therapeutic approaches that emphasize both cognitive and somatic aspects of healing. Traditionally, psychotherapy has employed a "top-down" approach, focusing on intentional and conscious processes in the cerebral cortex to enhance communication with the limbic and brainstem structures involved in emotional and physiological responses. However, the effectiveness of treatments extends beyond talk therapy.

Eye Movement Desensitization and Reprocessing (EMDR) emerged as a beneficial alternative in the 1990s, utilizing a combination of cognitive retraining and bilateral stimulation to engage dual attention. While EMDR primarily adopts a "top-down" approach, it also incorporates somatic elements, making it a hybrid method. Its mechanisms are not fully understood, but it has been hypothesized to calm the thalamus and temporarily adapt individuals to their original trauma-induced state.

Studies have demonstrated the effectiveness of EMDR in treating PTSD, surpassing the outcomes of pharmaceutical treatment alone. Participants who completed EMDR therapy exhibited significant

improvement, with many becoming asymptomatic and losing their PTSD diagnosis. EMDR was particularly effective for adult-onset trauma, although it offered less complete remission for child-onset trauma.

Cognitive Behavioral Therapy (CBT) and Prolonged Exposure (PE) are two widely recognized forms of therapy for PTSD. PE involves repeatedly recounting and confronting the traumatic event until the emotional response diminishes, enabling safe recall. While these therapies have shown positive results, their long-term benefits are still under investigation, with some studies indicating mixed outcomes and high dropout rates. Additionally, exposure therapy may desensitize not only the traumatic memory but also other emotions and engagement, potentially numbing positive feelings.
In treating PTSD, it is essential to consider the individual's unique response to trauma and the physiological differences between adults and children. Gender and the type of trauma experienced also influence treatment outcomes. It is crucial to explore and improve treatments specifically tailored to women and trauma.

Despite the proven benefits of psychosocial interventions like CBT and exposure therapy, their implementation in practice remains limited. Factors such as high dropout rates, stringent inclusion criteria that exclude comorbidity, and the complex nature of PTSD contribute to this challenge. More research is needed to evaluate the long-term effectiveness of these therapies and ensure their applicability to the broader population.

While "top-down" therapies offer insight and understanding, trauma processing goes beyond cognition. Trauma is pre-verbal, and the body often expresses what words cannot convey. Talk therapy alone is insufficient. Trauma disrupts the body's neuroception, blurring the lines between danger and safety, present and past. Changing automatic bodily responses is crucial for living in the present, emphasizing the importance of interoception, experience, and action patterns in therapy. Incorporating these recent neuroscientific discoveries into traditional therapies is an ongoing process.

C. Bottom-up Approach

(building connection starting from cerebral cortex and arrive at limbic and brainstem)

In recent years, there has been a growing recognition of the effectiveness of "bottom-up" therapies, which operate by influencing cognitive processes and central neural processing from the periphery to the cerebral cortex. These therapies stimulate chemosensory, visceral, or somatic receptors, resulting in decreased cytokine expression and increased heart rate variability. Despite their potential, traditional therapy forms have largely dominated the research landscape, overshadowing these "bottom-up" approaches.

It wasn't until 1973 when Nico Tinbergen's Nobel Prize speech shed light on the amalgamation of body-oriented therapies with mainstream science, specifically mentioning the Alexander technique, that the tide began to turn. With the advancement neurobiological research, there is now a growing understanding that verbal and cognitive treatments, or pharmaceutical interventions alone may not be sufficient due to the involvement of older brain systems in trauma.

Recent studies, such as a systematic review and meta-analysis have been studying mind-body therapies, Osteopathy, Yoga, Mindfulness breathing, mix both elements of the top-down and bottom-up approach, with emphasis on the integration of the body and the mind. The key is to support, and guide the patient to cultivate greater body awareness, allowing optimalisation of the vagal function, to self-regulate and enhancing resilience of the autonomic nervous system.

Simple words for the key:

Step zero:	awareness of body
Step one:	identify hypersensitivity to external stimuli, (over-active) Or numbing or absence of feeling, (under-active)
Step two:	via various osteopathic techniques to fulfil the body/mind need to arrive at the balance point of the system, the yin and yang, interoception, proprioception, or the parasympathetic and sympathetic.

D. Looking at symptoms

In the great words of Andrew Taylor Still, “to find health should be the object of the doctor. Anyone can find disease” (p.28, Still, 1899).

Our focus is on finding health rather than just treating diseases. Osteopaths view the whole person and aim to restore mobility and motility, the vigour, rather than simply treating disorders. Instead of relying solely on diagnostic terms, osteopaths consider the individual's autonomic state and how they respond to stress to determine the most appropriate therapy. By using approaches like the polyvagal theory, osteopaths observe the person's body language, reactions, and overall physiological state. Different autonomic states can manifest in various ways. For instance, a person in a sympathetic hyper-aroused state may appear restless, vigilant, and have an accelerated heart rate and breath. On the other hand, someone in a dorsal vagal state may exhibit a lack of responsiveness, dissociation, a depressed mood, and physical issues like digestive and immune problems. Trauma responses can vary, and individuals may experience a combination of states as their autonomic state fluctuates. Osteopaths consider these factors to provide personalised treatment and support for individuals with PTSD symptoms.

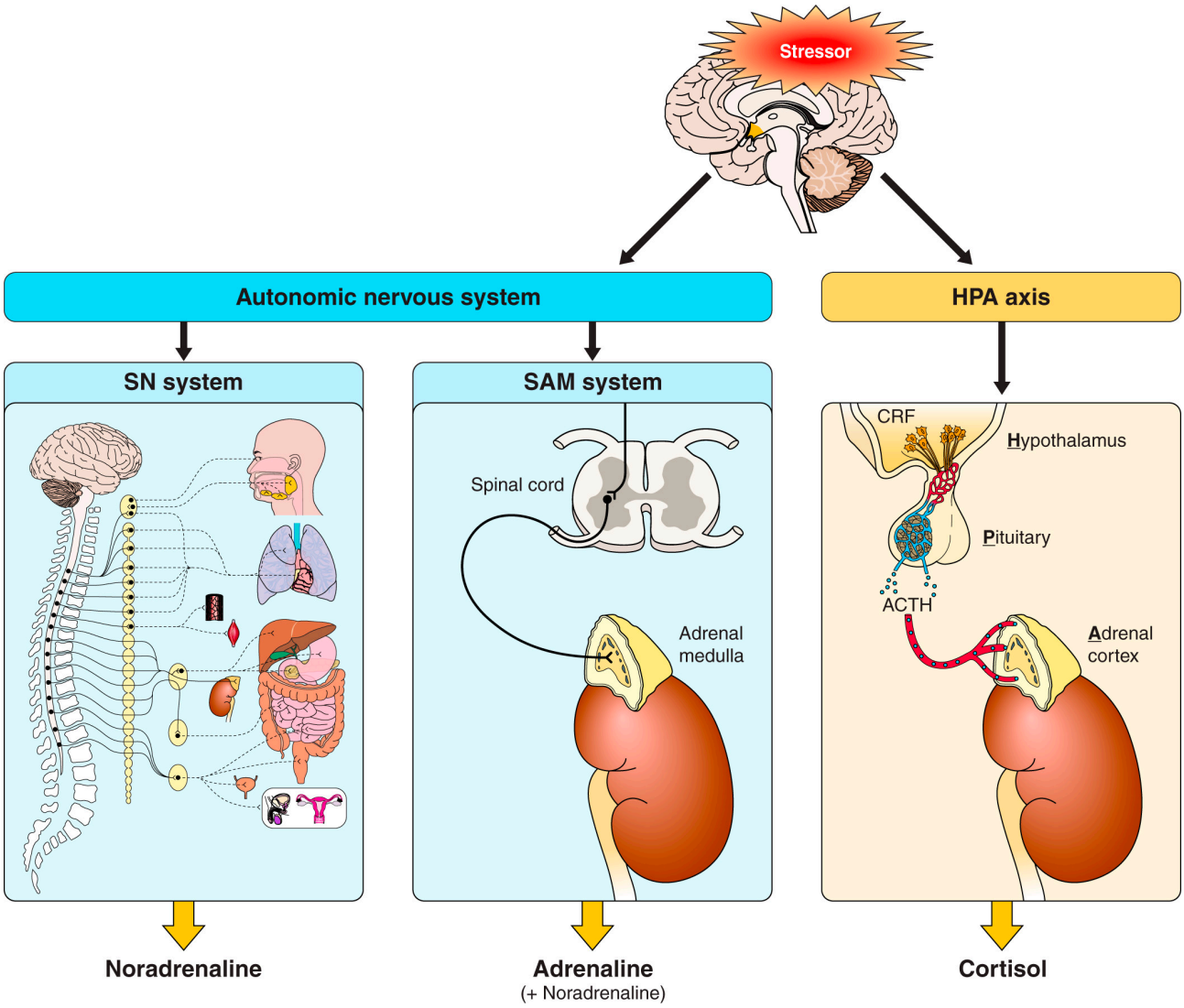
E. Trauma Physiology

Trauma can have profound effects on our body's physiology, particularly on the neurobiological, neuroendocrine, and immune systems. This discussion focuses on the neurobiological responses and the role of the HPA axis. When we experience stress, our body undergoes a series of physiological changes as part of a normal stress reaction. These changes aim to restore balance, or homeostasis, through adaptive processes. However, if the stress is constant or chronic, the regulatory mechanisms like the Hypothalamic-Pituitary-Adrenal (HPA) axis may become dysregulated.

In the case of trauma, it can overwhelm our usual coping mechanisms, disrupting the restoration process and leading to traumatization. When our body senses danger, the autonomic nervous system responds even before our cognitive brain fully comprehends the situation. Psychologist William James and physiologist Carl Lange viewed emotions as a result of physiological reactions. In other words, we experience fear because we are trembling, not the other way around. The initial response is primarily physiological rather than cognitive: we tremble, and that's why we feel afraid.

The body responses to trauma/stress via two pathways:

1. Sympathetic-Adrenal-Medullary (SAM) axis
2. Hypothalamic-Pituitary-Adrenal (HPA) axis



https://journals.physiology.org/doi/full/10.1152/physrev.00042.2017

I. Sympathetic-Adrenal-Medullary (SAM) axis

When we experience stress, our body responds in two ways. The first response happens quickly and unconsciously through the SAM axis. Our senses detect potential threats, and the information travels to the amygdala, which processes emotions and recognises danger. If a threat is perceived, the amygdala sends a distress signal to the hypothalamus, which regulates our stress response. This process prepares our body for immediate action.

II. Hypothalamic-Pituitary-Adrenal (HPA) axis

The second response is slower and involves conscious awareness. Information from the senses goes through the thalamus, hippocampus, and anterior cingulate to the prefrontal lobes, which control emotions, planning, behaviour, and language. The hypothalamus, influenced by incoming signals,

regulates hormones related to balance in the body. It activates the sympathetic nervous system, triggering the release of adrenaline and noradrenaline from the adrenal glands, as well as adrenaline from the sympathetic nerves. These hormones prepare our body for fight or flight by increasing blood flow to muscles, raising blood pressure and sugar levels, stimulating perspiration, and dilating pupils. Both the sympathetic and parasympathetic systems are involved, but the parasympathetic system is suppressed to conserve energy and maintain our connection with the external environment. This imbalance can lead to feelings of stress when our body's internal needs are not met.

After the initial response, the HPA axis pathway is activated. The amygdala influences the hypothalamus, which then stimulates the release of Corticotropin-releasing hormone from the paraventricular nucleus. This hormone prompts the anterior pituitary gland to release ACTH, which triggers the release of cortisol from the adrenal glands. Cortisol plays a crucial role in mediating the stress response. It affects the immune response, serotonin release, blood sugar levels, attention, and metabolism. Cortisol prepares our body for extended fight or flight by providing energy resources. Once the threat or stressor subsides, negative feedback signals are sent to the hypothalamus to stop the cycle. However, in traumatized individuals, without intervention from the parasympathetic system, this cycle can repeat, leading to heightened sensitivity to mild stress and various issues like memory problems, difficulty sleeping, irritability, and chronic health disorders.

Addressing dysregulation in these pathways is crucial for healing and restoring balance. By promoting healthy functioning in the brain regions involved and regulating the HPA axis, individuals can reduce the impact of trauma, improve memory and attention, manage stress effectively, and enhance overall well-being.

Car analogy for HPA/SAM pathway
When a person feels trapped or in a life-threatening situation, it can lead to a traumatic experience. This feeling of helplessness and the body's unsuccessful response to danger can result in a state of freezing or dissociation. This response is often seen in situations of repeated trauma, where the only way to cope is to mentally shut down. In contrast, acute traumas typically trigger the fight-or-flight response, which can develop into a chronic state of heightened alertness. However, there is variability in individual responses.

To better understand this, let's imagine a stress response like driving a car. Chronic stress is like idling the car on minimal fuel without noticing, until it eventually breaks down. On the other hand, trauma-induced hyper-arousal is like flooring the accelerator and driving at high speed through a restricted zone, with abrupt bursts of braking and accelerating. This puts the car and others at risk of damage or burnout. Immobilization in trauma is like pressing both the brake and accelerator simultaneously, leaving the car unable to move but with increasing tension. This is called "tonic immobility."

Immobilization can also lead to complete collapse, where the car's engine fails. It requires manual effort to push the car, as it can no longer generate its own energy.

Stress triggers the release of cortisol in our body to adapt to the demands we face. In the car analogy, cortisol represents the fuel. The more demand we have, the more we fill up our tank (HPA axis). However, if stress becomes chronic, the car and the fuel station eventually run out of fuel.

This results in a decrease in basal cortisol levels due to overcompensation, and a hypersensitive HPA axis system.
Low cortisol levels are associated with acute trauma and stress-related disorders. Individuals with repeated traumatic experiences may have compromised HPA axis function, affecting circuits in the brain like the limbic-medial temporal lobe and the hypothalamus. Dysfunctional HPA axis can be observed in conditions like PTSD, whiplash, irritable bowel syndrome, fibromyalgia, and chronic fatigue.

III. The gut brain axis

The gut brain axis is a two-way communication system between the central and enteric nervous system. Stress can harm the gut barrier, making it more permeable and causing a "leaky gut" that allows substances and microorganisms to pass through. Psychological stress and trauma can also disrupt the balance of gut bacteria, which affects stress vulnerability and resilience, increasing the risk of stress-related disorders. The amygdala, a part of the brain, is sensitive to changes in gut bacteria.

Post-traumatic stress disorder (PTSD) and anxiety disorders have been linked to imbalances in gut bacteria. Therapies that aim to restore a healthy balance of gut bacteria have shown positive effects. Osteopathy, a manual therapy, works with the movement and function of the intestines.

IV. Affected elements of brain and nuclei

Trauma can overwhelm the instinctive and emotional parts of the brain, while suppressing the cognitive part. This can lead to difficulties in accurately assessing risks and making decisions. In individuals with PTSD, certain brain areas like the amygdala and Broca's area show abnormal activation patterns. Traumatic memories can make the brain believe that the event is happening again, affecting language production and comprehension. Retelling traumatic stories can reactivate implicit memories and reinforce the hyper-aroused state, creating dependency on the therapist.

People who have experienced trauma may repeat similar patterns of abuse or victimization due to altered beliefs and faulty perception. Addressing these faulty perceptions and neuro-ception (the brain's perception of safety) is important before working on changing behaviours and thought patterns.
The cognitive brain needs to recognize and understand the dysfunctional patterns of behaviour and undergo retraining. Cognitive reappraisal, a component of cognitive behavioural therapies, helps reframe negative thoughts in a positive way. The prefrontal cortex, responsible for regulation, can be stimulated through cognitive appraisal and mindfulness.

Trauma also affects the hippocampus, which is involved in pain perception. Inflammation and changes in glucocorticoid receptors may contribute to the shrinkage of the hippocampus. PTSD is associated with decreased function in the hippocampus and other brain areas involved in emotion regulation, leading to difficulties in attention and inhibition of fear responses.

The insula and its surrounding structures play a role in resilience, social interaction, empathy, and self-awareness. Cumulative trauma can decrease their activity, while acute trauma can reduce their volume, impacting awareness and perception.

F. The polyvagal theory and trauma

Our ability to sense safety or danger is instinctual and not based on conscious thought. According to the polyvagal theory by Porges (2017), our autonomic nervous system responds to perceived risks in three ways, following a hierarchical order. These responses engage different behaviors, starting with the social engagement system, then the fight or flight response, and finally the immobilization or freeze response.

If social interaction and communication are not enough to handle stress or protect us from harm, the defensive responses may be activated. Our brains have evolved, but the older reptilian brain can sometimes override the rational neocortex, making it difficult to think clearly. Instead, our instinctual and unconscious reactions, such as fighting, fleeing, or freezing, take over. If these responses are successful, our body starts the process of returning to a balanced state, and our rational brain can make sense of what happened.

However, if we are unable to effectively fight, escape, or immobilize, our brain continues to release stress hormones even after the threat has passed. This can create a harmful cycle where the body relives the emotional and physical aspects of the trauma long after it occurred.

The polyvagal theory explains how the vagus nerve, a cranial nerve responsible for motor, sensory, and parasympathetic functions, influences our responses to trauma. The vagus nerve consists of multiple branches, including the ventral and dorsal vagal complexes, which are connected to different physiological and emotional states.

Ventral vagal complex:

- This complex is the most recent evolutionarily and is exclusive to mammals.
- Originates in the nucleus ambiguus, but connects with source nuclei via premotor networks
- It regulates the social engagement system, which involves safety, emotions, motion, communication, and attention.
- It supplies organs above the diaphragm, such as the heart, pharynx, and larynx.
- It acts as a "vagal brake," slowing down the heart rate during normal exhalation and after a threat has subsided.

Dorsal vagal complex:

- This complex is the oldest system, found in both reptiles and mammals.
- Originates from Nucleus dorsalis/Dorsal motor nucleus in the dorsomedial medulla oblongata, dorsal to the nucleus ambiguus and ventral to the base of the fourth ventricle
- It enhances health, growth, and restoration/recovery functions.
- It regulates the subdiaphragmatic viscera and digestive tract.
- In a non-safe environment, it dampens the ventral vagal complex's actions and leads to immobilization/freeze responses.
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These vagal complexes are interconnected with other cranial nerves and nuclei via premotor networks. For example, the nucleus ambiguus directly innervates muscles of the pharynx and larynx, while facial expression is controlled by the facial nerve. These connections enable us to socially engage, interact, and adapt to our environment.

Prosody refers to how we speak, including the way we say words with different tones, rhythms, and stresses. It shows our feelings and intentions when we communicate. Our body's automatic nervous system can sense if a voice sounds safe or dangerous.

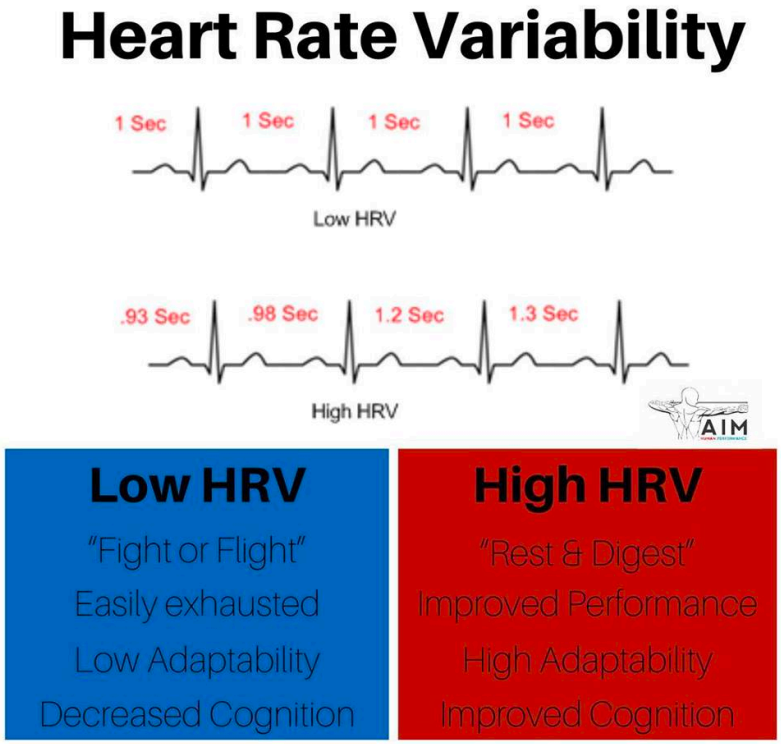
To highlight the cranial nerves, when we talk, we use various cranial nerves:
CN.VIII helps us listen,
CN.V controls the muscles in our mouth,
CN.VII controls the muscles in our face to express what we want to say,
and CN.X helps with breathing, producing sounds, and regulating our body's relaxation response.

Trauma affects the autonomic nervous system, including responses to sound. People with PTSD may experience hypersensitivity to sound or flattened prosody. Therapy aims to bring individuals from states of sympathetic hyper-arousal or dorsal vagal shut down to a safe state of social engagement.

Awareness and knowledge of these physiological systems can help therapists optimize their treatment and support individuals in navigating trauma and building resilience. It is important to note that trauma is a common experience, and the focus should be on moving through it and building resilience rather than viewing it as a disease to be healed.

I. Heart rate variability (HRV)

HRV is a measure used in various fields to assess both mental and physical health. It provides valuable information about the risk of heart problems, diabetes, and PTSD, and is also used to optimize physical performance. In the field of osteopathy, HRV is commonly used to evaluate the effects of techniques or treatment sessions on the autonomic nervous system.



II. Respiratory sinus arrhythmia (RSA)

RSA is a phenomenon where the heart rate changes in sync with respiration. It occurs because the vagal nerve, which influences the heart, inhibits sympathetic activity during exhalation, resulting in a lower heart rate. During inhalation, the vagal influence is reduced, allowing sympathetic activity to increase the heart rate. RSA was first discovered in 1847 and has been linked to the regulation of heart rate during breathing.

There are two types of oscillations associated with HRV: RSA and Traube-Hering-Meyer waves. RSA is related to respiration, while Traube-Hering-Meyer waves represent spontaneous pulsations in blood and lymphatic flow. Both these oscillations, along with HRV, are connected to the balance of the autonomic nervous system.

The vagal nerve plays a crucial role in regulating heart rate. Changes in vagal activity, particularly through the myelinated vagal nerve, contribute to RSA. Emotional states are also influenced by the vagal nerve and related structures in the brain. Traumatic stress can lead to disruptions in vagal tone, resulting in bradycardia and suppression of RSA.

Vagal tone is highest during calm activities and sleep, promoting overall balance and homeostasis in the body. However, during periods of stress, exercise, or intense mental processing, vagal tone is deliberately inhibited. Monitoring vagal tone can provide insights into an individual's homeostatic capabilities and adaptive functioning. Low vagal tone is associated with higher risks for physical and mental health issues.

HRV can be analyzed using different methods, including time-domain and frequency-domain analyses. The fluctuations in heart rhythm can be represented by low frequency (LF) and high frequency (HF) components. HF reflects parasympathetic activity and its connection to respiration, while LF represents a combination of parasympathetic and sympathetic activity. These components can be used to assess the balance of autonomic regulation.

Trauma disrupts the autonomic nervous system and disturbs homeostasis. The sympathetic and parasympathetic systems become imbalanced, hindering restoration and growth. Since the parasympathetic system plays a significant role in maintaining homeostasis, it is most affected by stress.

RSA, RMSSD[2], and HF are closely related and serve as indicators of vagal influence on the heart. A high RSA indicates optimal homeostatic capabilities. HRV, in general, is a non-invasive marker of mental and physical health and resilience. A higher resting HF HRV or cardiac vagal tone signifies a greater sense of safety and emotional adaptability. It is also associated with self-regulation, behavioral flexibility, and regulation of the inflammatory response.

Studies often rely on subjective reports, which can be biased. However, researchers have found that higher variability in HRV indicates better regulation during stressful situations. This means that the stress response is controlled more effectively, preventing excessive activation of stress pathways

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[2] Root mean square of the successive differences – used for a good snapshot of the Autonomic Nervous System's Parasympathetic branch and is the basis of our "HRV Score"

once the stress is over. From these findings, it is suggested that HRV can reflect the resilience of the autonomic, endocrine, and immune systems when faced with challenging and stressful situations.

Research conducted in 2002 by Cohen and colleagues discovered that individuals with PTSD had lower resting HRV and a hyper-aroused state. This indicates a decrease in the activation of the parasympathetic system (which helps us relax) and an increase in sympathetic tone (which activates our "fight-or-flight" response). Another study by Agorastos et al. in 2013 confirmed lower HRV in individuals with PTSD, particularly during the night when symptoms may intensify.

Multiple studies have demonstrated decreased HRV in individuals with PTSD, anxiety disorders, and depressive disorders. However, Stone et al. (2018) found that the severity and diagnosis of psychiatric conditions like depression, anxiety, and PTSD were not significant predictors of reduced HRV. Instead, they discovered that a history of childhood trauma played a more significant role. Their study focused on comparing women with a history of childhood emotional abuse and depression to those with depression alone. The group with both childhood emotional abuse and depression showed lower HRV than the group with depression alone.

These findings suggest that HRV can serve as a physiological marker for the response to trauma and its long-term effects on the autonomic nervous system. HRV may be a more reliable indicator than traditional diagnostic criteria for evaluating the physiological impact of trauma.

HRV, or heart rate variability, can interact with the HPA axis, which is involved in the body's stress response. HRV is also linked to emotional resilience.

When we consciously process our emotions and become aware of them, it can increase vagal tone. Vagal tone helps regulate emotional arousal. Positive reappraisal, which is the ability to see a situation in a more positive light, has been shown to increase vagal tone. This can lead to increased prefrontal activity, decreased amygdala stimulation, and reduced negative emotions.

On the other hand, lower vagal HRV before experiencing emotional stress can negatively affect the intensity and duration of disturbing memories afterward. This suggests that a less flexible autonomic nervous system may impact how we respond to stress and the development of troubling memories.

Having high HRV can positively affect the regulation of the HPA axis. Anticipating a stressful task with higher HRV has been associated with a lower increase in cortisol (a stress hormone) during the task. This indicates better regulation of stress-related cortisol, which is beneficial for overall health.
In a study of men, those with higher HRV before and during a mental stressor had better recovery of cardiovascular, immune, and endocrine markers after the stressor. Conversely, individuals with lower HRV before the stressor showed little change in HRV during the stressor, and their recovery of cortisol, diastolic blood pressure, and pro-inflammatory cytokine TNF-a was hindered.
These findings suggest that HRV can influence how our body responds to stress and plays a role in emotional resilience. By improving our HRV, we may be able to better regulate our stress response and promote overall well-being.

Chapter 3: Osteopathic Approach and Techniques

A. Fascia system & unwinding techniques

Fascial unwinding, a technique used for trauma release, involves gentle touch and stretching of the fascia to activate mechanoreceptors. This stimulation triggers the parasympathetic nervous system, promoting relaxation, and influences the central nervous system associated with movement and muscle tone. The therapist receives constant feedback from the patient's body, responding to sensations of movement to guide the unwinding process.

According to Upledger (1987) and Minansy (2009), fascia may store memories independently of the nervous system. While the exact mechanisms of unwinding are not fully understood, it is clear that the technique aims to enhance the body's natural physiological balance in the way that the part of the body that is being treated is supported so that the sensation of gravity and reactive proprioceptive tone are reduced, facilitating relaxation so that the body can move guided by stretching sensation to find areas of ease.

Minansy (2009) suggests that unwinding operates through ideomotor movements, involuntary muscle reflexes, which generate tissue responses and provide feedback to the central nervous system. Touch during unwinding can trigger memories, and state-dependent memory suggests that returning to a previous state helps recall specific memories.

Emotional release, along with physiological responses like shivering, sweating, and eructation, may occur during unwinding, particularly in cases of trauma. The effectiveness of fascial unwinding depends on the therapist's intention and the patient's openness to the process, as emphasized by Upledger (1987, cited in Minansy, 2009).

I. To retain interoceptive homeostasis

The act of touch, both receiving and giving, plays a significant role in our embodiment. Gentle and loving touch triggers a cascade of hormones, such as dopamine, oxytocin, and vasopressin, which promote feelings of safety, reduce pain and anxiety, and enhance cognitive awareness. This effect can be observed in studies of rodents, where maternal licking and grooming of pups positively influence their stress reactions later in life.

Our sensory systems, including exteroception (external stimuli), proprioception (body position), and interoception (internal sensations), allow us to sense and process the effects of touch. The fascia, our connective tissue, acts as an organ of innerness and is considered the largest sensory organ in our bodies. It develops between two outer layers during embryogenesis and has the potential to hold memories. Emotional trauma can alter the structure of collagen in fascia, resulting in "emotional scars." The release of Substance P, primarily stimulated by the hypothalamus, plays a role in this process.

During osteopathic treatments, techniques such as high velocity thrusts and vibration stimulate specific mechanoreceptors in the fascia. Pacini corpuscles, which respond to light touch with rapid variations and vibration, can be influenced by these techniques. Ruffini capsules, on the other hand, are activated by slow impulses and steady pressure, making myofascial techniques effective in

stimulating them. By stimulating these receptors, proprioceptive attention increases, and sympathetic activity decreases. Mechanical tension and pressure also activate free nerve endings, known as interstitial muscle receptors.

Myofascial therapy specifically targets intrafascial mechanoreceptors, which relay proprioceptive information to the central nervous system. This information then modulates the regulation of muscle tension. Receptors such as Ruffini endings and interoceptive receptors, as well as others like spindle receptors and intrafascial Golgi receptors, may be involved in this process. Activation of these receptors can influence the autonomic nervous system, leading to reduced sympathetic tone and vasodilation.

Interoceptive receptors are nerve endings found in our skin, fascia, and organs. They send information to the insula, a part of our brain, through specific pathways. These receptors play a vital role in sensing pressure, tension, and deformation in our bodies. In musculoskeletal tissue, around 80% of the nerve endings are interoceptive. Visceral interoceptive receptors are found in specific locations and influence our sympathetic tone and vascular pressure.

The pathway for interoception differs from other sensory pathways. It involves the spinal cord, brainstem, thalamus, and insula. There are two possible pathways, one indirect and the other more direct. The direct pathway bypasses certain brain structures and goes straight to the thalamus and insula. The insula plays a central role in creating our awareness of internal sensations and integrating emotions. Mindfulness practice strengthens the medial prefrontal cortex, which is an important part of trauma recovery (D'argembeau et al., 2007; Farb et al., 2007; Holzel et al., 2008, cited in p.96, Van der Kolk, 2014). The medial prefrontal cortex is the part of the brain that observes these sensations sent from the insula, and processes them emotionally (p.95, Van der Kolk, 2014)

II. Muscle Energy Treatment: Lower Thoracic Cage Release (Diaphragm)

Objective: Release the tensions of diaphragmatic musculature

Effect: re-launch the respiratory function, restore correct inter-cavitary pressure and increase venous and lymphatic return. To breathe freely allows calming of nervous system.

III. Counterstrain Treatment: Muscle Psoas

Objective: releasing the iliac-psoas

Effect: reduce pelvic pain through the lumbar plexus; release the tension acting on adrenal gland and the kidney. Sometimes after the incident, the muscles contract so hard that it gets stuck but could not bounce back to normal length. This get-stuck muscle contraction will keep sending stimuli to the adrenal glands thus affecting the hormonal system. Releasing the iliac-psoas muscle so that the kidney can glide freely on the muscle and the glands can function back to normal.

B. Cranio-sacral system & Cranio-sacral therapy

The patient experienced symptoms of nausea along with their pain, which could be a result of a vagal reaction to the pain or a crowding of the vagus nerve at the jugular foramen. This could be influenced by restrictions in the occipitomastoid suture and the muscles of the suboccipital triangle.

During osteopathic treatment for PTSD, specific attention is given to the sympathetic innervation in the middle thoracic to segments (T5-T10) and the collateral sympathetic ganglia, including the celiac, upper, and superior mesenteric ganglia. The therapist addresses tension in the cranial base and sub-occipital area (C0) to relieve pressure on the vagus nerve as it passes through the jugular foramen. Assessment then moves to the mid-cervical spine (C3, C4, C5) where the phrenic nerve originates, supplying the thoracic diaphragm.

I. Frontal Lift

Objective: Rebalancing the dysfunctions of the frontal bones with an action at a sutural level (fronto-parietal, front nasal suture) and relaxation of the dura mater.

Effect: frontal bones as well as the dynamic of cranial bones can be rebalanced to neutral and the cranial rhythm could be evaluated.

II. Interparietal Sutural Opening

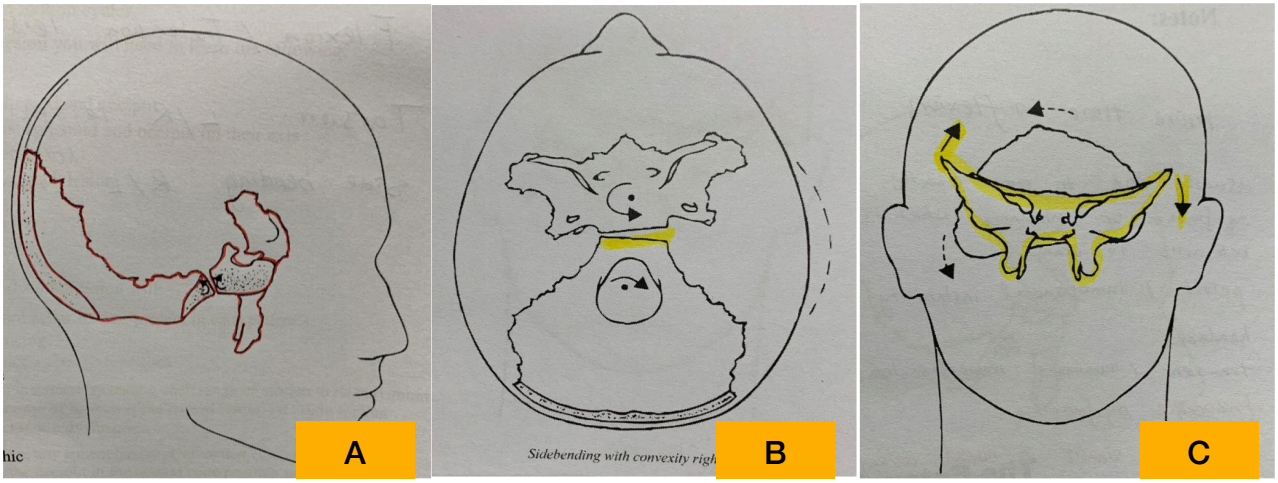
Objective: To restore the motion of the sagittal suture

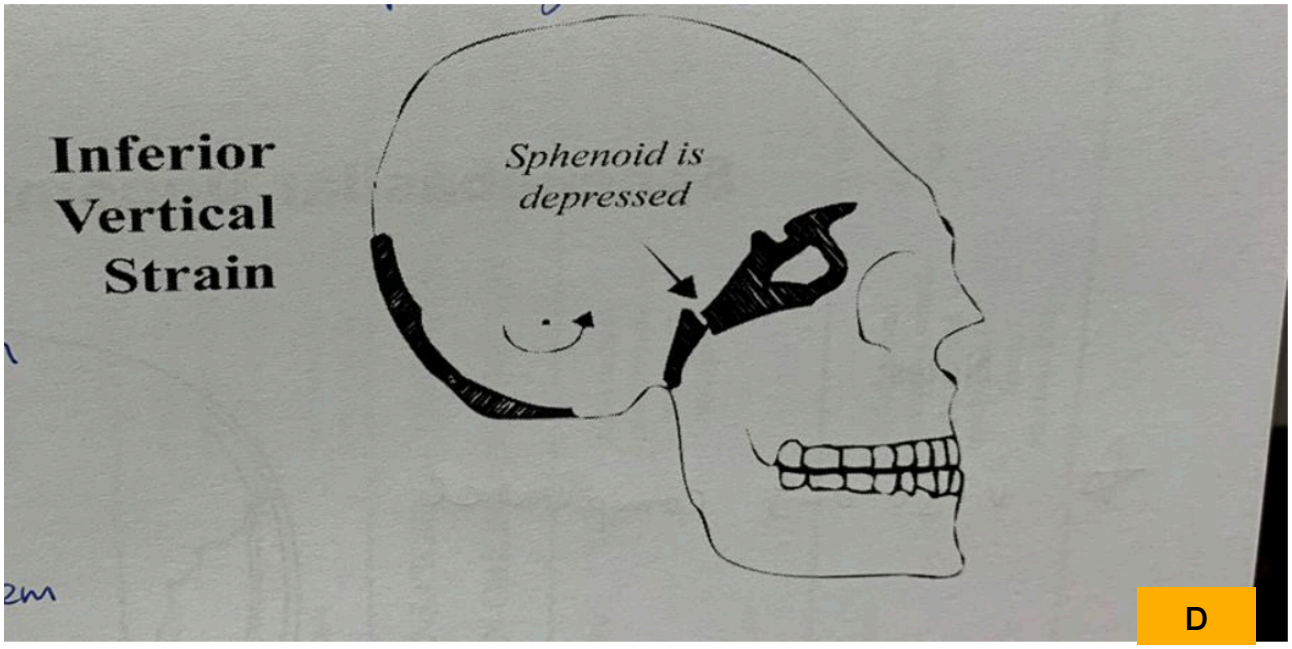
Effect: increasing the drainage of the upper sagittal sinus and re-launching the fluctuation of the cerebrospinal fluid through the stimulus on the granulation of Pacchioni.

III. Adjusting misalignment conditions at sphenobasilar joint (SBJ)

A. Normal alignment and orientation
B. Side bending of the joint
C. Torsion (left / right) at the joint
D. Vertical strain (up / downward) at the joint

Effect: SBJ is the attachment point for tentorium and falx cerebri which are components for Cranio-Sacral rhythm, in other words, the structure governs the function of the primary respiratory mechanism. Once the fundamental structural component SBJ is in alignment, the therapist will be effective in palpating the deeper fluctuations motions of cerebrospinal fluid, hence tuning in and facilitating the reset of its qualities, its strength, its tendencies, and its patterns.





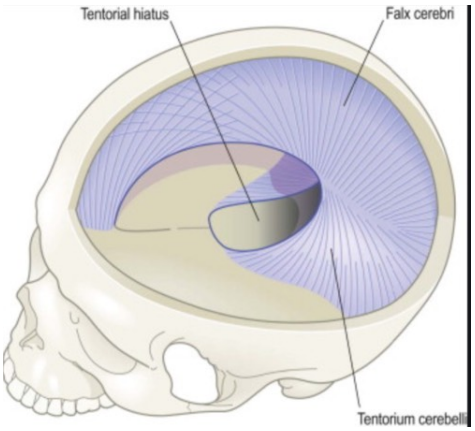
IV. The membrane systems

The membrane system in the cranial system plays an important role. One of its functions is to support the structures of the limbic system and thalamic nuclei, which are involved in interpreting experiences and emotional responses. In cases of post-traumatic cervical strain, such as whiplash, there may be neural reflexes affecting vision that involve this area.

Furthermore, there are biomechanical relationships in the injury pattern, specifically in the "core-link," which refers to the linear relationship between the dura (a protective membrane) below the cranial cavity and the sacrum. This relationship extends to the spinal nerves and their associated vertebrae and ribs. In the lower thoracic area, the involvement of the thoracoabdominal diaphragm, which plays a role in trauma shock, adds complexity. In this case, the flexion-extension whiplash injury was compounded by the folding of the thoracic cage over the seatbelt.

When there is a sheer force or shock impact during some incidents, the force cannot be transmitted through fluid, any impact pressure applied to the cranium is immediately broadly distributed. components involved in this protection mechanism includes, 1)the cranial bone helps in deflection,

while 2) sutures between the bones, 3) the elasticity of reciprocal tension membrane also help in absorption. And 4) cerebrospinal fluid helps in dissemination.



In severe trauma, such as a strong blow to the head, the forces can be too much for the membrane to handle, leading to tearing and bleeding. The force can travel through the skull, interacting with bones, fluids, and the dura meter, causing various effects.

In some cases, a condition called "compression head" can occur, where the sphenoid bone is compressed against the occiput bone (or other types of misalignment) after an injury. This severely limits the movement of the cranial waves, or quality (stability) of the cranial rhythm, or sometimes stops them completely. Adhesions may also form in the reciprocal tension membrane and core link system after severe trauma, which can lead to recurring neck and head pain even years later.

Interestingly, our emotional state and overall health can affect the movement and tension in the reciprocal tension membrane. Emotional trauma and dental anesthesia can have an impact, causing restriction in blood vessels, membrane tissue damage, and loss of elasticity. Even certain illnesses, like a severe case of influenza, or violent vomiting, or daily sinus blockage, the respiratory diaphragm and the nose contract so bluntly and powerfully that pressure waves hitting the cranial base cause an energetic reciprocity with the domed tentorium, causing the tentorium to feel as if it has been over-stretched and agitated.

In cases of multiple personality disorder, the membrane system undergoes noticeable changes as the individual transitions between different subpersonalities. These changes can be detected through shifts in bone movement and neural energetic intensity. Even the eyes can reveal the shift, as they take on different expressions with each subpersonality. It's quite remarkable how the different physiologies of the subpersonalities can even affect the focal length of the eyes, leading some individuals to keep multiple pairs of glasses.

Overall, the reciprocal tension membrane system is a complex and dynamic part of our head that plays a crucial role in protecting the brain, responding to trauma, and even reflecting our emotional and physiological states.

C. Digestive and respiratory system & Visceral Manipulation

The respiratory diaphragm is a crucial structure in the body. It plays a significant role in movement and is located at a key transition point for potential movement restrictions. It is connected to various structures, including the psoas muscles, peritoneum, ribs, abdominal wall, pleura, mediastinum, and pericardium. The interaction with the pericardium is particularly important in craniosacral work, as it can influence the motion and electrical status of the diaphragm.

The diaphragm's connection to the trunk and the spinal dura affects its pull and the motion of the entire body. Andrew Still, the founder of osteopathy, was particularly fascinated by the diaphragm and dedicated significant time to working with it.

It's important to consider the torsional forces exerted on the sacrum and cranial base by other transverse diaphragms, especially when there is dysfunction. Monitoring and responding to releases in other areas can have an impact on the movement pattern. Additionally, monitoring hepatic and gastrointestinal changes, borborygmus (stomach rumbling), and the relaxation of the solar plexus are also important factors to consider in treatment.

1. Domed Diaphragms:
   - Calvaria (top of the head)
   - Tentorium (a structure in the brain)
   - Hard palate (roof of the mouth)
   - Respiratory diaphragm
   - Apex of the top of the lungs

2. "Bowls":
   - Cranial base
   - Pelvic floor
   - Soles of the feet

I. Esophageal Release

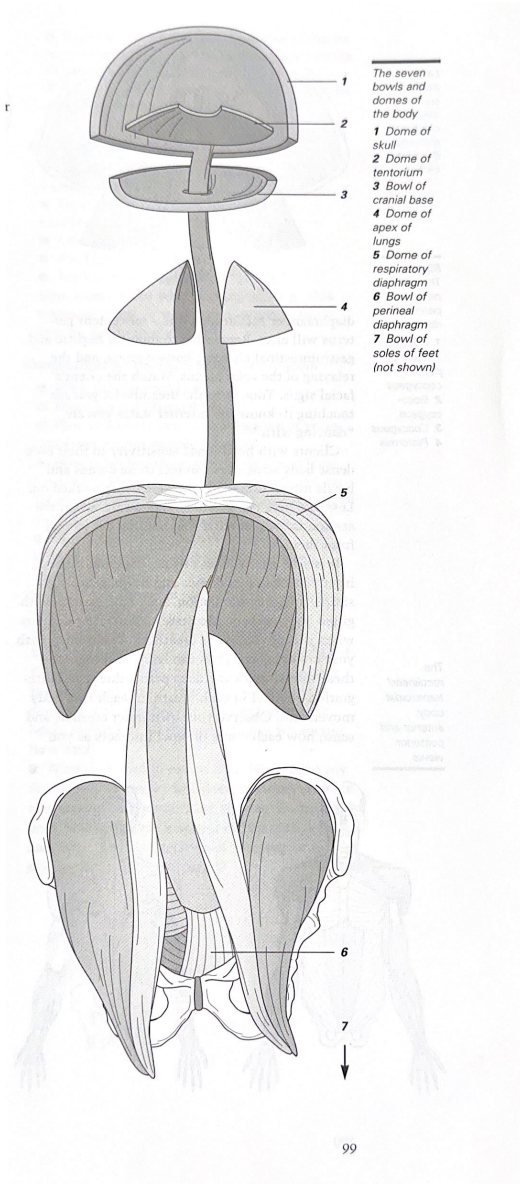
Objective: To decrease the tensions along the course of the esophagus by modulating the vagal stimulation.

Effect: reduce tension in the thoracic and abdominal regions, facilitating lymphatic and venous drainage and aiming to decrease any congestive state.
to reduce tension in the lumbar spine and its plexus, thereby enhancing the anti-inflammatory function of the vagal nerve.

II. Mesenteric Lift

Objective: to release the tension stored in mesenteric root which sits in the middle of the line between the navel and the ASIS.

Effect: To reduce the congestion of the abdominal region, facilitating lymphatic and venous drainage, to reduce the tension of the lumbar spine and relative plexus.



The seven bowls and domes of the body
1 *Dome of skull*
2 *Dome of tentorium*
3 *Bowl of cranial base*
4 *Dome of apex of lungs*
5 *Dome of respiratory diaphragm*
6 *Bowl of perineal diaphragm*
7 *Bowl of soles of feet (not shown)*

D. Nervous system & Lymphatic Drainage Therapy

The lymphatic system, consisting of lymph nodes, lymph vessels, and lymphoid organs, plays a vital role in maintaining the body's fluid balance, immune function, and waste removal. Lymph Drainage Therapy (LDT), a manual technique, aims to activate lymphatic function and circulation, which can have various therapeutic effects. Understanding the main documented functions of the lymphatic system and the specific elements affected by LDT can shed light on how this therapy can help relieve symptoms of PTSD.

I. Crucial functions of lymphatic system

1. Absorbing excess fluid, macromolecules (proteins), electrolytes, toxins, and foreign substances (debris) from the interstitial compartments (tissue space around the cells). This cleansing process helps maintain optimal functioning and integrity of the connective tissue.
2. Recovering and returning substances to the blood circulation that have escaped from the blood compartment into the tissues, usually after passing through and being processed by one or more lymph nodes.
3. Regulating fluid volume and pressure in the tissues.
4. Transporting immunocompetent cells (lymphocytes) and other substances, including hormones, throughout the body. It may also play a role in localizing infection within the body.
5. Carrying fatty acids absorbed from the small intestines to the blood circulation.

II. Effects of LDT to the body

1. Activating lymph function and circulation in the liquid/blood, which indirectly stimulates the overall circulation of the body, including the dilation of blood capillaries and enhancement of reabsorption, as well as activation of venous circulation. Lymph drainage reduces edemas through these effects.
2. Stimulating the immune system through the passage of lymph into the lymph nodes, which affects both humoral and cellular immunity. LDT can increase the amplitude and frequency of lymphangion (lymph vessel segment) contractions, thus enhancing lymphatic flow and carrying more antigens to the lymph nodes, increasing antibody/antigen contact.
3. Modulating the nervous system by decreasing the sympathetic response (sympathicolytic action) and stimulating the parasympathetic tone. LDT's constant gentle stimulation of C-fiber mechano-receptors can have antispasmodic effects, induce relaxation, and provide analgesic (anti-pain) actions.
4. Affecting the fluid system by activating fluid circulation, increasing reabsorption, and detoxification. LDT can increase the capacity of lymph collectors, reroute lymph, relax precapillary sphincters, and improve filtration and reabsorption in the blood circulatory system.
5. Enhancing the immune system by stimulating lymph flow, carrying more antigens to the lymph nodes, and aiding in the prevention of illnesses. LDT has been found to assist in chronic and subacute inflammatory processes, such as chronic fatigue syndrome, autoimmune disease, arthritis, bronchitis, sinusitis, tonsillitis, laryngitis, acne, and eczema.
6. Regulating the autonomic nervous system (ANS) by increasing parasympathetic response and decreasing sympathetic response. LDT promotes general relaxation, reduces spasticity, and can have analgesic effects, all of which can be beneficial in managing stress, depression, and sleep disorders.

7. Impacting the visceral system by providing a sympathicolytic effect and improving fluid movement to and from the tissues. LDT can aid in reducing muscle spasms, constipation, and other related conditions.

III. Benefits of LDT to individuals with PTSD

1. Activating fluid circulation and rerouting stagnant fluid, which can help alleviate edema and promote tissue regeneration.
2. Stimulating the immune system by increasing lymph flow, enhancing antibody/antigen contact, and potentially aiding in the prevention of illnesses.
3. Enhancing parasympathetic function and reducing sympathetic tone, which can be therapeutic in managing stress, depression, and sleep disorders.
4. Alleviating pain by addressing tissue-fluid stagnation and inhibiting pain-triggering receptors.
5. Reducing muscle spasms and addressing conditions like constipation.

While LDT shows promise in its potential benefits for PTSD, further research and clinical evidence are needed to establish its effectiveness as a standalone or complementary.

E. Integration of nervous, cranio-sacral, brain nuclei system & Brain therapy

Presented by Chilly Health Institute, therapists offer a cutting-edge technique called Brain Therapy that explores the intricate workings of the brain, spinal cord, and their associated structures. This advanced-level therapy focuses on key brain tissue restrictions that often go unnoticed but significantly impact the body's alignment and function.

Brain Therapy takes a unique approach by working extensively with the brain's grey and white matter, as well as the cranial and spinal structures. Unlike traditional therapies that mainly concentrate on cranial bones and membranes, Brain Therapy delves into the deeper layers of the brain parenchyma, addressing the root causes of dysfunctions.

For individuals with PTSD in a hypo-arousal state, their ability to employ complex adaptive strategies may diminish, leading to the development of habitual behaviors that gradually become chronic. These individuals may exhibit dissociated behavior, resembling procrastination, as they find comfort in avoiding dealing with or healing their trauma. To initiate the healing process, Brain Therapy first addresses the "cellular fear" embedded in the brain tissue, which governs mechanical dysfunction.

One of the key aspects of Brain Therapy is addressing disturbed sensory-motor elements associated with autonomic nervous system dysregulation. These elements involve both sympathetic arousal and down-regulation components. The sympathetic arousal elements include the reticular formation, locus ceruleus, amygdala, hippocampus, orbitofrontal cortex, cingulate gyrus, and the hypothalamic-pituitary-adrenal (HPA) axis. The sympathetic down-regulation elements involve the prefrontal cortex, heart, hippocampus (amygdala), anterior cingulate gyrus (linked to maternal behavior), and the posterior pituitary.

Through Brain Therapy, therapists can guide clients in completing the trauma process. This involves gently bringing the client's awareness to their experiences and allowing the physiological cycle to unfold. As described by Peter Levine in his book "Waking the Tiger: Healing Trauma," individuals exposed to trauma must "complete the freezing response by discharging energy."
During therapy sessions, the therapist identifies initial physical signs such as trembling, tremors, shaking, muscular tension, hyper-vigilance, perspiration, deep breathing, tachycardia, and changes in dilation of the nostrils or pupils. The patient is encouraged to amplify these sensations, paying close attention to their inner feelings and micro-movements. With the therapist's soft and reassuring voice, gentle touch, and guidance, the patient maintains focus on the cycles of discharge waves.

Brain Therapy encompasses various elements that are addressed using an incubation-like touch. Some of the areas covered include cranial bones (intraosseous and interosseous lesions), cranial membranes in all anatomical directions, and the fluid dynamics within the brain's distinct compartments: subarachnoid spaces and cerebral cisterns, brain parenchyma and the glymphatic system, and the ventricles. The therapy also encompasses the complexities of grey matter, including the three and six-layered cortex and brain nuclei, the organization of white matter, and the electromagnetic field of the brain.

Additionally, Brain Therapy regulates the main components of the body's reticular alarm system (RAS) through techniques targeting the median, medial, and lateral columns of the RAS. The

median column includes upper Raphe nuclei active during deep sleep and lower Raphe nuclei that suppress conscious awareness of pain. The medial column consists of large reticular neurons that regulate motor function and are active throughout all states of wakefulness and sleep. The lateral column includes small to intermediate neurons responsible for feeding, expiration, and the regulation of heart rate and blood pressure.

The therapy also focuses on releasing specific mechanical restrictions in the ventricular system, including inter- and intra-ventricular dysfunctions, as well as addressing the 3rd and 4th ventricles. Techniques are applied to the locus ceruleus, which produces norepinephrine, regulates the wake/ sleep cycle, and plays a role in blood flow regulation and blood pressure reduction. Dysfunctions in the layers of the dura, arachnoid, and pia mater are also addressed during Brain Therapy sessions.

By employing Brain Therapy, individuals with PTSD can be supported to access first three depths of stillness directly relate to the general dynamics of the autonomic nervous system, the lambic system and the cerebral cortex, which will then embark on a path towards resolving their trauma and regaining control of their lives. The comprehensive approach of this therapy, encompassing the intricate elements of the brain and its interconnected structures, offers hope for healing and restoration.

When considering a highly effective technique that initially produces immediate positive effects on the system, it is often observed that these effects gradually diminish, and the symptoms resurface within a week. Moreover, when attempting to reapply the technique, its effectiveness may not be as pronounced as before, and the duration of symptom relapse may decrease accordingly. It is important to explore the underlying reasons. One plausible explanation, from an osteopathic perspective, is that the body does not fully embrace the changes brought about by the technique during the treatment. While the body may respond well to the treatment process, it may not fully integrate the changes and sustain them over time.

As a holistic approach, osteopathy places great emphasis on identifying the key criteria for the body to undergo permanent change and recovery. One crucial aspect is engaging the body's active participation in the healing process. Osteopaths rely on their listening skills to discern the body's needs and support its innate self-healing mechanisms. By establishing a deep connection and understanding with the body, osteopaths can initiate small changes that eventually lead to recovery.

Brain Therapy, in particular, underscores the significance of matching and listening skills to facilitate the harmonization of different brain regions. This therapy employs a gentle manual touch that neither forcefully imposes change nor remains passive. Instead, it creates a neutral space for the body to choose its own path in activating or deactivating signals for the homeostatic processes. Respecting the wisdom of the body and approaching it with humility are fundamental qualities of this therapy, allowing for the integration of body, emotions, and consciousness to restore health.

F. Somatic Movement

In addition to Brain Therapy, which takes a proactive approach to support the body's healing process, Somatic movements such as Feldenkrais's method provide another avenue for body empowerment. The primary goal of somatic practice is embodiment, focusing on the awareness of sensations within the body rather than solely emphasizing strength or flexibility.

Step 1. Slow down
Step 2. Feel inside the body
Step 3. Bring the feeling to surface, and breathe
Step 4. Allow body flow and move freely according to forms or creativity

By connecting with our internal sensations and bringing them to the surface, we can transform them into movement or the sensation/emotion will be converted as energy to drive various forms of movement.

Somatic practices do not aim to improve reaction time or speed, but rather sharpen our sensitivity to internal sensation and emotions. This heightened awareness allows us to transmute sensations such as tension, twists, density, powerlessness, or heaviness into different new sensory experience. In this way, the individual will be made aware of the interplay among trauma, resistance, stillness and healing resources, they can experience the unity of body-emotion-consciousness to bring back health and balance.

Similar to Brain Therapy, somatic practices do not adhere to rigid routines that the body must strictly follow; instead, they encourage the creative expression of the body's wisdom, unlocking transformative potential.

Chapter 4: Conclusion

Osteopathy offers a comprehensive approach to address the effects of PTSD on the body. By targeting various body systems, including musculoskeletal, neurological, visceral, and emotional, osteopathic treatments aim to alleviate the burden of allostatic overload. This guide serves as a promising starting point for exploring complementary strategies to support individuals with PTSD.

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