The Intersection of Polyvagal Theory, Trauma, and Kundalini Yoga

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Abstract

Kundalini Yoga is a prospective approach to treat post-traumatic stress. Traumatic events are highly prevalent globally, necessitating a range of therapeutic interventions. Yoga is a mind-body intervention used in therapeutic settings and as an adjunctive healing method. Polyvagal theory offers a bio-psycho-social framework to understand the impacts of post-traumatic stress through evolutionary adaptations, unconscious perception of environmental cues, and mechanisms for social bonding. Kundalini Yoga is a branch of yoga that uses breathwork, meditation, movement, sound, and pressure points to restore mind-body balance. Some practices in Kundalini Yoga include ethical and moral behavioural teachings that should be considered when applied to clinical practice. This paper aims to assess the potential for using Kundalini Yoga as a therapeutic intervention for post-traumatic stress by connecting the neurophysiological correlates of Kundalini Yoga and polyvagal theory and addressing the ethical and cultural considerations unique to Kundalini Yoga. Kundalini Yoga was found to align with the tenets of polyvagal theory, with both frameworks supporting bodily homeostasis. Kundalini Yoga and its associated practices have proved to be beneficial in treating post-traumatic stress and its symptoms, albeit there were notable gaps in the methodological processes of evaluating Kundalini Yoga. To integrate Kundalini Yoga ethically into therapeutic settings, additional training, personal practice, self-reflection, and consultation are required to navigate ethical and cultural complexities.

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Ancient traditions, combined with modern theories of neurophysiology, could provide a comprehensive framework to understand and treat trauma-based stress. Traumatic events and their associated post-traumatic stress responses are widespread globally (Benjet et al., 2016; Kessler et al., 2017; Ogle et al., 2014; Statistics Canada, 2022). Considering that trauma responses can manifest both physically and mentally (Kearney & Lanius, 2022; Porges, 2009; van der Kolk, 2014), therapies that address both the mind and body concurrently prove to be beneficial interventions when working with individuals who have experienced trauma (Donald et al., 2019).

Mindfulness, movement, and mind-body practices such as yoga can effectively mitigate traumatic stress (Spence, 2021). Engaging in yoga practices demonstrably enhances well-being and facilitates positive personal development, even for durations as short as 10 minutes (e.g., Jindani et al., 2015; Martinez et al., 2021; Taghavi & Kia-Keating, 2024; Tan et al., 2014; West et al., 2017). Some yoga practices appear to synergistically align with the vagal systems of polyvagal theory (PVT), a neurophysiological framework that describes the bio-psycho-social effects of trauma (Jindani & Khalsa, 2015; Loizzo, 2018; Porges, 2021; Sullivan, Erb, et al., 2018). A physiological framework is crucial to address the physiological impacts and symptoms of trauma in order to connect them with psychological factors (Brown & Gerbarg, 2005; Loizzo, 2016; Lucas et al., 2016; Pant et al., 2022). A comprehensive framework could aid in accurate diagnoses and targeted interventions for trauma-related stress; this understanding could also inform better mental health policies and public education.

Kundalini Yoga (KY) is a branch of yoga with practices that are accessible and adaptable for individuals of varying abilities (Gabriel et al., 2018; Kundalini Research Institute, n.d.). KY

practices promote embodied awareness through a blend of breathing, meditation, postures, sound, and hand gestures, which can bring relaxation and self-healing (Kundalini Research Institute, n.d. About Kundalini section). The earliest texts on KY speak to the neurophysiological underpinnings of KY practices (Madhvacharya, 2007; Mallinson & Singleton, 2017; Saraswati, 1996). Both KY and PVT purport that the nervous system imbalances autonomic homeostasis, impedes well-being, and has detrimental bio-psycho-social impacts (Jindani & Khalsa, 2015; Loizzo, 2016; Morrison & Dwarika, 2022).

The Current Study

Given the widespread prevalence of trauma, the established efficacy of mind-body trauma interventions, and the congruence of yoga principles with essential components of PVT, exploring how KY practices align with elements of PVT could offer valuable insights for trauma interventions, both within and outside of therapeutic contexts. This paper aims to answer the following questions:

1. Do KY practices align with tenets of PVT?
2. Are KY practices effective for treating post-traumatic stress?
3. Can KY practices be ethically incorporated into therapeutic settings?

Given the increasing recognition of trauma's pervasive impact and the proven success of mind-body therapies, examining the alignment of KY practices with PVT principles has the potential to uncover new therapeutic avenues. Researching KY through the lens of PVT could enhance the understanding of effective trauma interventions. This investigation seeks to clarify how KY may alleviate post-traumatic stress, thereby enriching both clinical and nonclinical approaches to trauma. Furthermore, insights gained from this research could guide the integration of other ancient modalities into modern frameworks.

The instinctual need for safety and social connectedness aligns with human evolutionary history on a neural level (Porges, 2022). The beneficial impacts of yoga have been framed by PVT before (Brown & Gerbarg, 2005; Schmalzl et al., 2015; Sullivan, Erb, et al., 2018). KY practices, through the lens of PVT, demonstrate congruent insights into the functioning of the nervous system (Jindani & Khalsa, 2015; Loizzo, 2018; Morrison & Dwarika, 2022). Understanding the impact of KY practices on the vagal systems may influence future understandings and recovery interventions for people who have experienced trauma. Exploring a complementary approach could inform future theories, interventions, and self-help approaches to recovering from post-traumatic stress and be a foundation for more remarkable societal change to address trauma.

Preliminary Ethical Considerations

Several cultural aspects must be considered when incorporating ancient traditions from other religious, ethnoracial, or geographical contexts into a present-day, Westernized, and scientific context. Evolution, transformation, and alterations of yoga practices are persistent even in the earliest texts (Mallinson & Singleton, 2017). It can be challenging to balance preserving cultural concepts' original meanings and embracing their inevitable adaptation. Understanding my own cultural and experiential milieu allows me to predict potential biases that may arise and influence how I present information. I will present my leanings and preferences transparently whenever possible while remaining open to outcomes that do not align with my hypotheses and predispositions.

Yoga in Western Culture

The most significant challenge I anticipate while completing this capstone project will be navigating the cultural and ethical complexities of marrying ancient practices into Westernized

modern psychology ethically. Language, cultural appropriation, and secularization are salient factors that pose ethical hurdles to utilizing KY in a therapeutic environment.

Sanskrit words with philosophically complex meanings cannot always be translated neatly into English. Other words, like *karma*, have become part of the English lexicon but may have lost part of their intended meaning (Mallinson & Singleton, 2017). Furthermore, the biases and worldviews of the translator cannot be separated from the translations themselves (Madhvacharya, 2007). As English is my only language, I recognize that any sources I use to report on KY will have been translated from their original language and be interpreted through my Westernized lens in this paper. I will attempt to provide an understanding of yoga traditions within their cultural contexts, citing sources from people who live within these contexts. Furthermore, I have cross-examined sources from reputable and self-reflective translators who also cross-examined different sources and other translations when presenting their work.

Many aspects of KY are borrowed from other cultural contexts, where Westernized practitioners are unaware of the contributions of the people and traditions from which they derived (Hawley, 2012). There are varying schools of thought on who should be allowed to teach KY practices. Stephen (2010) argues that KY has sometimes been racially coveted despite KY being shown to promote well-being across various cultural backgrounds, making access to training and practice more difficult for outsiders. Some believe that only people originating from South Asian ethnocultural descent, while others purport that anyone who can trace their teacher lineage from respected gurus can pass down practices to an aspiring teacher (Hawley, 2012). The original translations of yoga texts describe KY as the *householder's yoga* (Mallinson & Singleton, 2017), suggesting that it is not solely intended for those who devote their lives to yoga but for people with families, jobs, and everyday responsibilities.

Most yoga practiced today solely focuses on physical postures derived from one part of the Hatha Yoga traditions (Mallinson & Singleton, 2017). Utilizing yoga primarily for physical fitness has been criticized as an unhealthy preoccupation and attachment to one's bodily image (Godrej, 2017; Stoeber, 2017). This approach overlooks the central tenets of several yogic traditions that prioritize breathing and meditative practices above physical abilities (Mallinson & Singleton, 2017).

Religious Aspects of Yoga

Yoga has roots in Hindu, Sikh, and Buddhist religions (Mallinson & Singleton, 2017). The process of decontextualizing and secularizing imported practices persists as traditional yoga practices are picked apart and repackaged as separate concepts. For example, mindfulness, visualization, and physical postures are presented as separate interventions and then incorporated into clinical interventions (Mallinson & Singleton, 2017; Millner et al., 2021).

Separating yoga from religion has been criticized as cultural appropriation, where components of yoga have been cherry-picked by Westerners and perceived as improper by South Asian practitioners (Stoeber, 2017). Conversely, Stoeber also points out that others have argued that yoga practices can ethically be separated from the religious components to promote well-being and allow practitioners to remain true to their faith. Furthermore, one of the more salient concerns for people of other faiths is doctrinal incompatibilities with KY's more spiritual or religious elements. Ethical and cultural reflections, including the religious aspects of yoga, will be reviewed at the end of this paper.

Reflexive Practice

As a White, 36-year-old, able-bodied, cisgender woman living in my country of origin and of Western European descent, I acknowledge several privileges embedded within my

intersectional identities. As a woman identified with a nonconforming sexual orientation, I have experienced challenges, including exposure to traumatic events with symptoms of post-traumatic stress in my lifetime. To cope with trauma-related stress, I have sought both modern psychotherapeutic and traditional yogic forms of healing. I recognize that my unique position and chosen methods to mitigate the impacts of trauma are not representative of others' experiences.

I have practiced different forms and aspects of yoga intermittently throughout my life. I have attended kundalini-based yoga events and experienced significant benefits to my well-being in bio-psycho-social domains. I have had an interest and desire to practice KY for several years, believing that regular practice could mitigate personal struggles toward living a more balanced and connected life. Furthermore, as long as I can remember, I have been partial to yogic philosophies, with an underlying opinion that empirical scientific methods have yet to uncover the spiritual phenomena described by practitioners. Due to my experiences and beliefs, I hope to find concise connections between modern neuropsychology and KY, leading to inherent bias in favour of the benefits of KY practices.

To temper my biases, I will attempt to provide counterarguments, investigate journal reputations and biases, and be careful not to discount statistically insignificant findings. I will transparently present the empirical challenges of observing intangible and unquantifiable aspects of yoga practices. I may ask myself, "If I believed yoga practices had no benefit, how would I interpret this information?" I may also seek the perspectives of those who have not practiced yoga or hold opposing views. Maintaining an open yet critical mindset will allow me to follow an evidence-based approach.

Trauma

There is no unified definition of nonphysical trauma, as its interpretation varies depending on the specific discipline or context in which it occurs or is investigated. The term *psychological trauma* typically refers to mental injuries stemming from three components: an event or series of events, the experiences of those events, and the effect of those events (Isobel et al., 2019). For the purpose of this review, psychological trauma will be referred to simply as *trauma*, characterized by a persistent emotional reaction stemming from a distressing event or events which fundamentally shifts an individual's sense of safety, self, and worldview (Centre for Addiction and Mental Health [CAMH], n.d.). These effects endure beyond the cessation of the event or events, profoundly influencing emotional regulation and interpersonal relationships over an extended period (CAMH, n.d.; Isobel et al., 2019). Studies consistently show that over 70% of people encounter at least one traumatic event in their lifetime (Møller et al., 2020; Statistics Canada, 2022). Understanding the prevalence and nature of trauma facilitates a deeper understanding of how to identify and treat post-traumatic stress.

Impacts of Trauma

Experiences of trauma and the aftereffects of the events differ between individuals depending on contextual and sociodemographic factors (Kessler et al., 2017). Regardless of whether or not an individual meets the diagnostic criteria for post-traumatic stress disorder (PTSD), post-traumatic stress has the potential to become deeply embedded in the nervous system (Kearney & Lanius, 2022; Mathersul et al., 2022; Porges, 2022; Ryland et al., 2022; van der Kolk, 2014). Post-traumatic stress disrupts the nervous system, dysregulating neurosensory perception, which can lead to disembodiment or hypervigilance (Kearney & Lanius, 2022; van der Kolk, 2014). Disembodiment refers to the experience of feeling disconnected or detached

from one's own body, a sense of being out of touch with one's emotions, senses, and physical presence in the world (Martin et al., 2016; van der Kolk, 2014). Coping with the aftereffects of traumatic experiences has the potential to disrupt neurological systems in the brain and body (Pant et al., 2022; Williamson et al., 2015). These disruptions have interconnected impacts on bio-psycho-social well-being, such as high blood pressure, autoimmune problems, memory or attention difficulties, emotional instability, and strained relationships (Williamson et al., 2015).

The bio-psycho-social impacts of post-traumatic stress can be summarized into four categories:

- cognitive functioning, such as compromised attention, memory, and bodily perception (e.g., Crum et al., 2021; Esterman et al., 2019; Kube et al., 2023; Wendt et al., 2022);
- emotional dysregulation and mood disruption, such as anxiety, depression, anger, hypervigilance, dissociation, and reactivity (e.g., Barboza, 2018; Subramanyam et al., 2020; Thompson et al., 2020);
- physical health, such as impairments in cardiovascular, digestive, respiratory, chronic pain, and immune functions (e.g., Damis & Hamilton, 2020; Kolacz et al., 2020; Williamson et al., 2015); and
- sociality, including impairments in perceived or actual social support, empathy and compassion that facilitate social bonding, the ability to form and maintain social connections (e.g., Isobel et al., 2019; Lee, 2019; Ray et al., 2020; Zhao et al., 2020).

Psychological and physiological dysregulation disrupts the ability to cope effectively. Intense emotional turmoil can lead to coping by withdrawal, avoidance, or isolation, resulting in disconnection from self, others, or spirituality. As these struggles deepen, emotions become ingrained in the body as impairments in physical or mental health. Those affected by post-

traumatic stress may be left feeling overwhelmed and fragmented, complicating their efforts to re-establish a sense of self and engage meaningfully with the world.

Trauma Interventions

The *Casebook to the APA Clinical Practice Guideline for the Treatment of PTSD* by the American Psychological Association proposes several effective treatments for trauma, such as cognitive behavioural therapy (CBT), eye movement desensitization reprocessing (EMDR) techniques, narrative therapy, and pharmacological treatments (Johnson & Ceroni, 2020).

Therapies and interventions focused on mindfulness and somatic processing are increasingly gaining traction and are often used with the abovementioned treatments. Across various populations, meta-analyses consistently reveal the positive impact of mindfulness-based interventions, reducing depressive symptoms, trauma symptoms, and psychological distress (e.g., Brinsley et al., 2021; Donald et al., 2019; Dunning et al., 2019; Han, 2022; Hofmann et al., 2016; Taylor et al., 2020; Yang et al., 2023). CBT and mindfulness-based interventions are top-down therapies, meaning they attempt to change the brain to change the bodily experiences of distress, such as heart rate or tension (Johnson & Ceroni, 2020). Pharmacological treatments change the physiological experiences of distress to change the mind (Johnson & Ceroni, 2020); often, treatments are complementary and used concurrently.

A growing body of evidence supports mind-body interventions that connect mindfulness with movement simultaneously to treat mental health concerns (e.g., Colace, 2017; Lauffenburger, 2020; Lucas et al., 2016; Martin et al., 2016; Sullivan, Erb, et al., 2018). Flexible and adaptive cognitive processing that is both bottom-up and top-down promotes emotional regulation (Kearney & Lanius, 2022; Loizzo, 2016; Park & Thayer, 2014). PVT is a framework

utilized to understand the neurophysiological mechanisms behind the benefits of mind-body practices (Loizzo, 2016; Lucas et al., 2016).

Yoga is a mind-body intervention that has been incorporated into clinical settings (Spence, 2021). Yoga therapy, as differentiated from yoga, is “the professional application of the principles and practices of yoga to promote health and well-being within a therapeutic relationship that includes personalized assessment, goal setting, lifestyle management, and yoga practices for individuals or small groups” (International Association of Yoga Therapists, n.d., Line Yoga Therapy is...). Yoga can be incorporated into therapeutic settings in various ways, utilizing both top-down and bottom-up strategies, making it an adaptable and versatile option. Yoga therapy research improved well-being (Spence, 2021; West et al., 2017) and is also one of the most common adjunctive methods for enhancing well-being (Clarke et al., 2018; Yang et al., 2023). Yoga serves as a versatile tool suitable to address traumatic stress for individuals of all ages and abilities (Braun et al., 2021; Nemeroff et al., 2024; Spence, 2021; Taghavi & Kia-Keating, 2024).

Measuring Trauma Interventions

Post-traumatic stress and the efficacy of trauma interventions can be challenging to measure. Subjective experiences can sometimes be measured using valid and reliable questionnaires measuring global improvements in functioning, such as the Post-Traumatic Growth Inventory (Tedeschi et al., 2017), well-being scales (Ryff & Keyes, 1995; Tennant et al., 2007), resilience scales such as Wagnild's (2009) 25-Item Resilience Scale, and quality of life scales. Some studies measure decreases in post-traumatic stress using scales such as the PTSD Checklist (Weathers et al., 1993) or the Perceived Stress Scale (Ribeiro Santiago et al., 2020). Other studies use scales to measure specific symptoms, and many use a combination of scales.

For example, Jindani et al. (2015) used the following: the PTSD Checklist (PCL-17; Weathers et al., 1993), the 25-Item Resilience Scale (RS; Wagnild, 2009), The Positive and Negative Affect Schedule for mood (PANAS; Watson et al., 1988), the Five-Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006), the Insomnia Severity Index (ISI; Bastien et al., 2001), the Perceived Stress Scale (PSS; Cohen et al., 1983), and the Depression, Anxiety, and Stress Scale (DASS2; Lovibond & Lovibond, 1995).

Trauma interventions can also be measured more objectively by noting physiological changes in cardiac, respiratory, brain functioning, or hormonal responses, such as pulse, breathing rate, electroencephalography (EEG), or cortisol levels in saliva (Cahn et al., 2017; García-Sesnich et al., 2017; Granath et al., 2006). Additionally, skin conductance can be monitored to evaluate physiological arousal related to emotional and stress reactions (Arambula et al., 2001; Bhaskar et al., 2017; Li et al., 2013). These physiological measures can provide valuable insights into the effectiveness of trauma interventions by revealing underlying physiological responses to trauma.

PVT

The traditional definition of the nervous system divides the nervous system according to its functions and anatomy (Ju, 2018). As represented in Figure 1, Ju (2018) describes these divisions and their functions. The first division of the nervous system can be divided into the central and peripheral systems. The central nervous system consists of the brain and spinal cord, while the peripheral consists of nerves and ganglia that connect the central nervous system to the rest of the body. The peripheral nervous system can be divided into the somatic and the autonomic nervous systems. Much of the somatic nervous system is under voluntary control and manages sensory input and motor output, whereas the autonomic nervous system is primarily

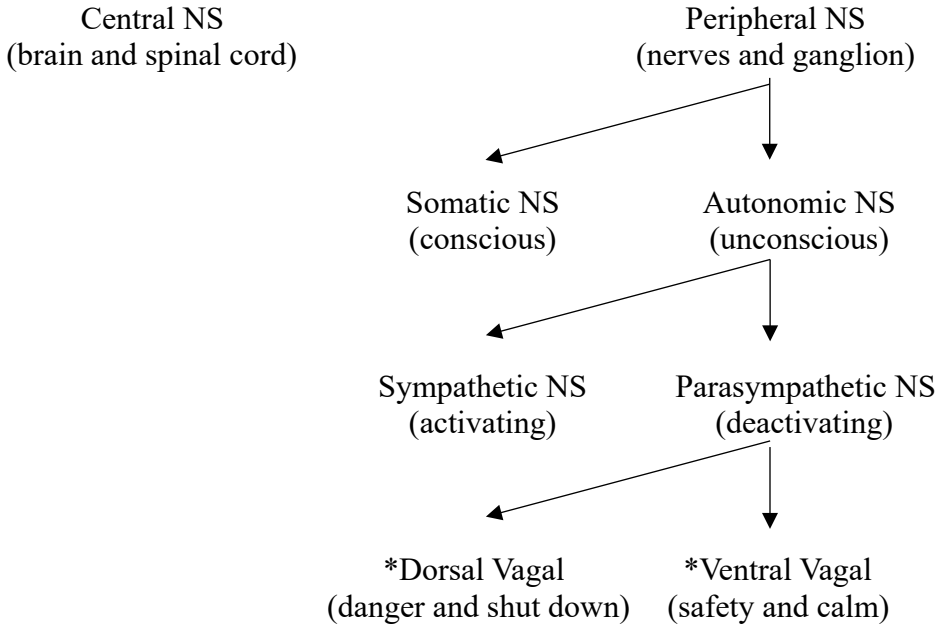
responsible for involuntary visceral functions. Heart rate, respiratory rate, digestion, perspiration, salivation, and sexual arousal are prominent visceral functions. The autonomic nervous system can be further divided into the sympathetic and parasympathetic nervous systems. Ju describes that the sympathetic nervous system prepares the visceral functions to take action. For example, when faced with a threat, the sympathetic nervous system releases adrenaline, deprioritizes digestion, and increases heart rate, mobilizing the body to "fight or flight." In contrast, the parasympathetic nervous system has a demobilizing effect, preparing the visceral functions to "rest and digest" (Ju, 2018).

PVT, formulated by Porges (1995), deviates from the traditional binary understanding of the autonomic nervous system and proposes more nuanced functions within the parasympathetic nervous system (see Figure 1). PVT emphasizes the function of the vagus nerve, further dividing the parasympathetic branch into the dorsal vagal complex and ventral vagal complex (Porges, 2003). *Vagus* is a Latin word meaning wandering, and the vagus nerve is considered the "wandering nerve" because it extends throughout several structures in the body, interconnecting several bodily processes that impact bio-psycho-social functioning (Clancy et al., 2013). The vagal nerve fibres run bidirectionally between the brain and the lower torso, with 80% running upward and 20% running downward from the brain (Porges, 2003). The dorsal vagal complex functions as an immobilizing response to life-threatening events; the ventral vagal complex is responsible for calm states and social engagement (Porges, 2003). Humans are physiologically driven to feel safe; PVT suggests that cues of safety are scanned from the environment, subjectively interpreted from internal bodily processes, and communicated to the brain through the vagal systems (Porges, 2022). PVT operates under three primary assumptions (Polyvagal Institute, n.d.):

1. There is a phylogenetic hierarchy of the autonomic nervous system.
2. Neuroception is an unconscious process of detecting risk in the environment.
3. Co-regulation is a mutual process of regulating emotional states between individuals.

Figure 1

The Nervous System



Note. This graph depicts the divisions of the nervous system. "Nervous system" is shortened to NS.
*The traditional divisions of the nervous system, according to Ju (2018) are represented by the first three divisions. The dorsal and ventral vagal divisions are where PVT deviates from the traditional binary understanding of the autonomic nervous system (Porges, 1995).

Phylogenetic Hierarchy of the Autonomic Nervous System

The evolutionary organization of the autonomic nervous system provides key insights into the adaptive and behavioural responses to environmental challenges (D. S. Goldstein & Kopin, 2017; Porges, 2003). PVT focuses on three particular developmental stages in phylogenetic order: the dorsal vagal complex, the sympathetic nervous system, and the ventral

vagal complex. The order in which these neural subsystems evolved represents a response hierarchy in mammals, with the most recent neural circuit activating first; each subsystem regulates different neurophysiological states and behavioural responses to environmental stress (Porges, 2003).

The most recent subsystem is the ventral vagal complex, which consists of myelinated nerve fibres that innervate the heart and muscles and are associated with facial expression and vocalization (Porges, 2022). According to Porges (2022), the ventral vagal complex is only found in mammals, particularly primates, and facilitates social bonding, communication, and calm states. Porges purports that it is an evolutionarily adaptive response that fosters cooperation as a primary survival strategy. When safety is not interpreted from the environment, the body shifts into a sympathetic state to prepare for danger.

The second oldest subsystem is the sympathetic nervous system, which is comprised of nerve fibres originating in the spinal cord and mobilizes the body for action (Porges, 2003). This subsystem is an adaptive response to danger, rapidly releasing hormones into the bloodstream, providing a surge of energy and triggering the well-known fight or flight response. During times of stress, when fight or flight is unavailable, the autonomic nervous system opts for a dorsal vagal response (Porges, 2003).

The evolutionarily oldest subsystem is the dorsal vagal complex, which consists of unmyelinated nerve fibres (Porges, 2003). Porges (2003) describes this subsystem as present in primitive vertebrates and notes that it is responsible for the immobilizing “freeze” response to extreme environmental threats. This defence strategy, often referred to as a feigning death strategy, is characterized by a dramatic decrease in heart rate, blood pressure, and metabolic activity (Porges, 2003).

Neuroception

Neuroception is a PVT-specific term developed by Porges (2022) to describe the continuous neural process that operates below conscious awareness, evaluating environmental and internal cues to differentiate between safety, danger, or life-threatening situations. All vertebrates share a propensity to detect threats, leading to instantaneous visceral changes communicated by the autonomic to the central nervous system (Porges, 2022). However, mammals have evolved to have an expanded propensity for neuroception, specifically to lower defensive strategies and perpetuate social bonding with others of their species. Neuroception involves bottom-up and top-down processes where visceral cues inform the higher cognitive functions. In humans, top-down processes also play a crucial role, allowing the interpretation of others' intentions by decoding cues such as facial expressions, vocal tones, gestures, and hand movements (Porges, 2022).

Interoception is the bottom-up process that allows individuals to become consciously aware of their internal physiology (Quadt et al., 2018). Quadt et al. (2018) explain that interpretations of risk and safety are influenced by an individual's experiences and the present context, and these interpretations are then communicated to the visceral organs through autonomic pathways. Visceral cues, such as changes in heart rate or breathing, are subsequently interpreted by the brain and can become consciously available (Quadt et al., 2018).

Co-Regulation

PVT posits that social connectedness is a biological imperative for humans, and survival depends on our ability to feel safe and trust others (Porges, 2022). *Co-regulation* is a reciprocal neuroceptive exchange of social cues of safety between individuals that regulate one another's autonomic states, as described by Porges (2022). Individuals with synchronized states can create

a sense of shared safety, promoting communication, bonding, and cooperation. Co-regulation is a process moderated by the ventral vagal complex. Cranial nerves control head and face muscles to coordinate with the ventral vagal complex, inhibiting threat responses and enhancing feelings of safety (Porges, 2022).

PVT and Trauma

PVT offers a comprehensive bio-psycho-social framework for comprehending the repercussions of traumatic experiences (Porges, 2022). According to Porges (2022), both the sympathetic and the parasympathetic nervous systems may become activated in response to stimuli that are not necessarily threatening. Sympathetic activation could manifest as anxiety or hypervigilance, while dorsal vagal parasympathetic deactivation could present as depression or dissociation in some individuals who have experienced trauma (van der Kolk, 2014). Additionally, individuals who have experienced traumatic events may exhibit reduced vagal control (i.e., vagal tone), resulting in diminished perceptions of safety and connectedness (Porges, 2022; van der Kolk, 2014). Overall, vagal control refers to the complex interplay between the parasympathetic and sympathetic branches of the autonomic nervous system, orchestrated by the vagus nerve, to maintain physiological homeostasis and respond to environmental stimuli (Porges, 2021). PVT provides a neurophysiological explanation of the four main impacts of post-traumatic stress: cognitive, emotional, physical, and social impairments.

Based on Porges' (2021) and van der Kolk's (2014) body of work, my understanding is that autonomic activation and deactivation are adaptive and protective responses to extreme events. Repeated exposure to traumatic events can disrupt autonomic functioning. Evolutionarily speaking, older neurological processes may take precedence and inhibit newer, higher cognitive processes, which can weaken vagal control, disrupting neuroceptive or interoceptive processes.

Inhibited cognitive and weakened vagal control limits the ability to enter the optimal ventral vagal state that facilitates emotional regulation and social bonding. Furthermore, cardiovascular, digestive, respiratory, and immune functions can also be disrupted because the autonomic nervous system is connected via bidirectional vagal systems integrated into the visceral structures in the body. Post-traumatic stress responses are adaptive mechanisms functioning in overdrive, preventing the body from returning to an optimal balanced state. Although adaptive for facing dangerous situations, staying in overdrive has deleterious impacts on bio-psycho-social well-being.

Measuring PVT

Heart rate variability (HRV) is a quantifiable measurement of autonomic functioning used in PVT. Respiratory sinus arrhythmia (RSA) and blood pressure can predict HRV patterns (Porges, 2007). Afferent vagal fibres transmit information back to the brain from visceral organs, such as the heart, lungs, and gut, which helps the brain monitor the body's internal environment and respond accordingly (Porges, 2007). Higher resting HRV is correlated with increased autonomic control, whereas lower resting HRV is correlated with stress responses and less vagal control (Park & Thayer, 2014).

As mentioned in the previous section, scales measuring emotional regulation and social connection can also be used. A new scale specifically for PVT, the Neuroception of Psychological Safety Scale, is being developed, but it is not yet fully reliable or valid (Morton et al., 2022).

KY

There are numerous, ever-evolving definitions of yoga. The word *yoga* stems from a Sanskrit word whose rough English translation may resemble “to join” and “to harness”

(Mallinson & Singleton, 2017). Yoga can be defined as both the practice and the goal. There are an inestimable number of branches of yoga, all highlighting different practices and goals. However, despite the nuanced divisions, yoga can be summarized by Mallinson and Singleton (2017) as attaining a state of union within oneself and all the associated practices. Breathing exercises, meditations, and physical postures are among the most common practices across several branches of yoga (Mallinson & Singleton, 2017).

KY, known as the "yoga of awareness," is described in the original translations of yoga texts as a practice intended not just for those who devote their lives to its study but also for individuals with families, jobs, and everyday responsibilities, making it more universally accessible (Kundalini Research Institute, n.d.). According to this definition, the term *kundalini* refers to the energy and awareness present within each person that can be harnessed to integrate individual experiences and reconnect oneself with a broader sense of unity. Introduced to North America in 1969 by Yogi Bhajan, KY is a comprehensive tradition integrating breathwork, meditation, physical postures, sound, and hand gestures (Kundalini Research Institute, n.d.). KY is a practical approach to enhance bio-psycho-social well-being and improve overall life quality (Kundalini Research Institute, n.d.). The primary practices of KY are (3HO International, n.d.-c; Madhvacharya, 2007; Mallinson & Singleton, 2017; Saraswati, 1996):

- praṇayamas, which are specific and focused breathing exercises;
- asanas, which are physical postures and poses;
- dhyanas, which encompasses a wide range of meditative exercises;
- mantras, which are repetitive sounds or sentences; and
- mudras, which are specific hand gestures.

Embedded within KY are *kriyas,* which are specifically ordered sequences or sets of KY practices (3HO International, n.d.-c). Kriya sets stimulate and direct the flow of prana energy throughout the body and mind and were designed to achieve distinct goals by targeting specific areas or issues (3HO International, n.d.-c).

Neurophysiological Correlates of KY

Modern physiological frameworks have replaced traditional metaphorical interpretations of bodily processes and functions (Loizzo, 2016; Mallinson & Singleton, 2017). In yoga, the *subtle body* refers to the unconscious physiology within the body (Madhvacharya, 2007). Madhvacharya (2007) interprets the goal of KY as a mastery of the fear within the subtle body; the fear of death and the desire to live are default bodily mechanisms, and overcoming these deeply rooted urges promotes balance and liberation. Similarly, PVT interventions for trauma focus on regaining control of the autonomic nervous system, explicitly shifting threat responses into a calmer state that promotes homeostasis, which allows for enhanced sociality (Porges, 2021). These different yet complementary approaches can facilitate conceptualizing and addressing the impacts of trauma on the nervous system.

The Kundalini system is consistently associated with physiological correlates of the nervous system in the translations and interpretations of the old yogic traditions (Madhvacharya, 2007; Mallinson & Singleton, 2017) and the new (3HO International, n.d.-a; Loizzo, 2016; Saraswati, 1996; Venkatraman et al., 2019). KY practices are centred around the spinal regions of the body in order to balance activating and deactivating forces (Loizzo, 2016; Madhvacharya, 2007; Saraswati, 1996). Although several descriptions of KY may sound obscure, its practices are intricately tied to physiology:

> Kundalini yoga is not abstract. It considers this very physical body as the basis. For a kundalini yogi, the supreme consciousness represents the highest possible manifestation of physical matter in this body. The matter of this physical body is being transformed into subtle forces - such as feeling, thinking, reasoning, remembering, postulating and doubting, in the gradual process of evolution. (Saraswati, 1996, p. 16)

The subtle body is also called the chakra system (Loizzo, 2018). *Chakras* (spinning vortices) are connected by *naḍis* (channels) and draw *prana* (life force energy) throughout the body (Loizzo, 2016; Mallinson & Singleton, 2017; Manik, 2023; Saraswati, 1996). Chakras are energy centres situated just outside the spinal column, starting at the base of the spine and extending to the top of the head; chakras are associated with specific bodily functions, emotions, and regions, corresponding to particular glands, organs, nerve plexuses, and their functions (see Table 1; Chase, 2018; Khedikar et al., 2016; Loizzo, 2016; Manik, 2023; Maxwell, 2009; Saraswati, 1996). Analogously, the vagal system extends beyond the lowest point in the spinal cord into the anatomy of the pelvic regions, sending messages directly to the brain (Komisaruk et al., 2004; Populin et al., 2021). The vagal nerves and ganglia are extensively distributed throughout the body and innervate glands, organs, and nerve plexuses (Clancy et al., 2013; Ju, 2018). The ganglia emanating from the vagus nerve are not just connected to organs but are incorporated into the organ's structure via postganglionic fibres (Ju, 2018).

Nadis are frequently associated with nerves, particularly within the autonomic nervous system (Khedikar et al., 2016; Manik, 2023; Saraswati, 1996; Venkatraman et al., 2019). Although not considered a direct correlate, the *sushumna* nadi is associated with the spinal column and allows prana energy to flow to the brain (Manik, 2023; Saraswati, 1996). Neural and glial gap junctions, which form linked compartments in the spine and brain, could create a

channel resembling the concept of the sushumna nadi (Maxwell, 2009). *Ida* and *pingala* nadis are channels running alongside the spinal cord and function as activating and deactivating forces, respectively (Khedikar et al., 2016; Venkatraman et al., 2019).

Prana energy is visualized as moving bidirectionally through the torso and head through nadis and could correspond to the electrophysiological or chemical processes of synaptic transmission (Manik, 2023; Maxwell, 2009; Saraswati, 1996). The afferent vagal pathways create a bidirectional feedback system that provides information about the visceral organs to regions in the brain (D. S. Goldstein & Kopin, 2017; Porges, 2007).

Table 1

Chakra Correlates

Chakra	Position	Attributes	Organ/Gland	Nerve Plexus
Muladhara (Root)	Lower pelvic region	Survival Safety Physical needs	Adrenal glands Kidneys Bladder Large intestine	Pelvic Coccygeal Lumbar
Swadhisthana (Sacral)	Lowest point of the spinal cord	Balance emotion Sexuality	Testes/ovaries Reproductive	Sacral Lumbar
Manipura (Solar Plexus)	Naval area	Personal power Self-will	Pancreas Stomach Liver Small intestine	Solar Hypogastric
Anahata (Heart)	Center of the chest	Love Compassion	Thymus gland Heart Lungs Diaphragm	Cardiac Celiac
Vishuddha (Throat)	Throat	Communication Self-expression	Thyroid gland Vocal cords Upper palate Epiglottis	Cervical Pharyngeal
Ajna (Third Eye)	Midline of the brain, between the eyes	Intuition Wisdom	Pineal gland Pituitary gland Hypothalamus	Carotid Medulla
Sahasrara (Crown)	Top and above the head	Spirituality Creativity	Pineal gland Cerebral cortex	Carotid Cerebral

Note. (Chase, 2018; Khedikar et al., 2016; Loizzo, 2016; Manik, 2023; Maxwell, 2009)

KY Practices Cross-Examined With PVT

PVT provides a framework for understanding some of the practices and concepts in KY. While one is rooted in neurophysiology and the other in ancient wisdom, both parallel mind-body methods to enhance physical, mental, and social well-being through autonomic regulation

(e.g., Loizzo, 2018; Sullivan, Erb, et al., 2018; Tyagi & Cohen, 2016; van Aalst et al., 2020; Venkatraman et al., 2019).

Both PVT and KY share a hierarchical understanding of human functioning. In KY's chakra system, older circuits are geared toward survival, while newer circuits support higher-level functioning (Kirby et al., 2017; Loizzo, 2016; Maxwell, 2009; Porges, 2003; Quadt et al., 2018). Similarly, PVT describes a hierarchy within the autonomic nervous system, with the vagal nerve playing a key role in regulating responses to safety and threat. Imbalances in the chakras are linked to various bio-psycho-social issues (Saraswati, 1996), much like disruptions in the nervous system through vagal connections.

Both polyvagal-informed interventions and kundalini-informed practices aim to regulate the autonomic nervous system. KY aims to balance the chakras (Loizzo, 2016), while PVT emphasizes the ventral vagal state for maintaining homeostasis and optimal functioning (Porges, 2022). Although the autonomic system typically functions without conscious control, recognizing the current autonomic state (e.g., sympathetic, ventral vagal, or dorsal vagal) enables individuals to shift from one state to another (Spence, 2021). Chakra-focused meditations bring unconscious processes like breathing into conscious awareness (Saraswati, 1996), akin to neuroception and interoception.

Autonomic functioning has been measured in KY practitioners (Arambula et al., 2001; Nasrolahzadeh et al., 2023; Tyagi & Cohen, 2016). Nasrolahzadeh et al. (2023) measured heart rate changes and differences between KY meditative and rest states. A case study by Arambula et al. (2001) measured respiratory and cardiac patterns and brain activity in the occipital and parietal regions via electroencephalograph (EEG) during the kundalini mediation of an experienced practitioner. Respiration rates were recorded before and after KY meditation, and

there was a significant decrease in breaths per minute. Increased alpha EEG activity was observed during meditation, and theta EEG activity increased afterward. There were no significant cardiac changes. A meta-analysis evaluated KY with RSA and HRV and found favourable results, indicating that KY improves vagal control (Tyagi & Cohen, 2016).

KY as a Trauma Intervention

Yoga is a commonly utilized mind-body intervention used to treat trauma and an adaptable tool for people of any age or ability (Braun et al., 2021; Nemeroff et al., 2024; Spence, 2021; Taghavi & Kia-Keating, 2024; West et al., 2017). KY was chosen from the sea of yoga factions due to its multicomponent practices and accessibility. Most KY practices are gentle, inclusive, and effective ways to exert control over the autonomic nervous system through breathing, meditation, gentle movement, sound, or hand gestures.

KY Interventions for Trauma from a Polyvagal Framework

Three peer-reviewed studies have directly evaluated the effects of KY on post-traumatic stress from a PVT lens (Jindani & Khalsa, 2015; Jindani et al., 2015; Morrison & Dwarika, 2022). The impact of KY on PTSD symptoms and resilience outcomes was measured by Jindani et al. (2015) using a randomized control trial (RCT) design. A group of 50 trauma-exposed participants was recruited from social services centres in the Greater Toronto Area, Canada. A range of post-traumatic stress symptoms and responses were recorded before, during, and after KY intervention questionnaires previously mentioned. The KY treatment group received 90-minute KY sessions weekly and were encouraged to continue 15-minute daily practices between sessions. In Jindani et al.'s study, statistically significant improvement scores from the questionnaires were found compared to the control group, which did not receive any treatment. The researchers recommended that future research could help understand which elements of KY

influence symptom reduction. Jindani and Khalsa (2015) also conducted a qualitative phenomenological study with 10 participants from the RCT study using semi-structured interviews and thematic analysis to code participant responses. Thematic analysis showed overall improvements in physical energy, self-esteem, spirituality, and connection with oneself.

Another qualitative phenomenological study conducted by Morrison and Dwarika (2022) comprised of seven young adults from Johannesburg, South Africa, measured the impact of KY on post-traumatic growth in individuals with a history of adverse life experiences. Participants for this study were selected via participation in a KY training program. Semi-structured interviews with adapted questions from an adverse experiences questionnaire and a post-traumatic growth inventory were used to delineate five themes of growth: gratitude, interpersonal relationships, personal strengths, recognizing new possibilities, and spiritual change (Morrison & Dwarika, 2022). All participants in Morrison and Dwarika's study expressed themes of post-traumatic growth to various extents in more than one of the categories, attributing their growth to KY practice. A notable dissertation examined KY for healing from trauma using similar neurophysiological foundations to understand the mechanisms of trauma recovery (Nahai, 2012). Nahai's (2012) dissertation conducted a qualitative phenomenological study of 12 KY practitioners in the United States who self-reported healing from a traumatic event through yoga. Using thematic analysis, the themes of bodily awareness, agency, authority, allowing, appreciation for others, and authenticity emerged (Nahai, 2012).

KY Interventions for Trauma-Related Symptoms

Although not directly evaluating trauma or traumatic stress, several studies assessed the effectiveness of KY on global functioning (e.g., resilience, quality of life, well-being, etc.) or symptoms that are commonly associated with post-traumatic stress (e.g., memory, depression,

immune issues, compassion, etc.). KY has displayed global improvements in global functioning (e.g., Brandão et al., 2024; García-Sesnich et al., 2017; Granath et al., 2006; Mann & Jitender, 2018; Raghavan & Jasim, 2020; Sarkissian et al., 2018). In a single random group design, 60 adolescent male athletes were divided into two groups of 30 participants who were given a questionnaire measuring overall well-being (Mann & Jitender, 2018). The experimental group in this study engaged in 50-minute KY every other day for 6 weeks, and the control group did not receive any intervention. Well-being was reassessed after 6 weeks, and there was a statistically significant difference in the well-being scores of the experimental group compared to the control group. Visceral systems such as heart rate and blood pressure can also be measured for well-being. One study found that 2 months of simplified KY practices significantly improved these measures, which was also reflected on a scale of overall well-being compared to a control group (Raghavan & Jasim, 2020). A longitudinal study measured the immediate and long-term effects of KY on stress via salivary cortisol levels and self-reports; the study revealed no significant changes in salivary stress levels but significant improvements in perceived stress in both the immediate and long-term conditions (García-Sesnich et al., 2017). The effectiveness of KY can be considered by evaluating trauma-related symptoms such as cognitive functioning, emotional regulation, and sociality.

KY and Cognitive Functioning

Post-traumatic stress impacts cognitive functions such as memory, attention, and interoception (Crum et al., 2021; Esterman et al., 2019; Williamson et al., 2015). Therefore, studies that evaluate the effectiveness of KY on these aspects of cognitive functioning may also be able to extrapolate the findings in the context of post-traumatic stress. KY appears to have beneficial impacts on cognitive functioning (Chou, 2019; Engström et al., 2010; e.g., Eyre et al.,

2017; Ibrahim et al., 2022; Khalsa et al., 2009; Khalsa & Newberg, 2021; Krause-Sorio et al., 2022; Marciniak et al., 2014; van Aalst et al., 2020). Cognitive functioning is associated with increased hippocampal connectivity and grey matter volume (Hernández et al., 2016; Ibrahim et al., 2022). Hernández et al. (2016) also asserted that these parts of the brain are linked with attentional, cognitive, and emotional control, as well as compassion and interoceptive perception. Ibrahim et al. (2022) conducted an RCT study where KY practices showed significant increases in right hippocampal volume compared to a psychoeducation program for older adults. In another RCT, KY was found to show significant improvements in cognitive impairments, but this improvement was not significant in comparison to a memory enhancement program (Eyre et al., 2017).

KY and Emotional Regulation

Post-traumatic stress can cause significant emotional dysregulation and mood disruptions. PTSD has high comorbidity with diagnoses related to depression, anxiety, and emotional reactivity (Barboza, 2018). KY improves emotional dysregulation (Gabriel et al., 2018; Gothe et al., 2018; Khalsa et al., 2009; Kibby et al., 2021; Martinez et al., 2021; Maxwell & Katyal, 2022; Nemeroff et al., 2024; Shannahoff-Khalsa et al., 2019; Simon et al., 2021). A randomized clinical trial of 26 adults with generalized anxiety disorder found that CBT and KY interventions showed significant improvements compared to the control group but that CBT had better results than KY (Simon et al., 2021). However, Simon et al. (2021) reported a decreased dropout rate for KY, indicating that KY could be a treatment some individuals may prefer over CBT. Another study found that KY classes were significantly more effective for generalized anxiety disorder when compared to psychotherapy (Gabriel et al., 2018).

Specific KY Practices as a Trauma Intervention

KY practices can be assessed by isolating their main practices (see Appendix A for more information on yoga practices). The following sections will focus on how these isolated practices impact post-traumatic stress or related symptoms. Connections to PVT will also be outlined.

Pranayama

Praṇayama breathing techniques are used to awaken and clear the subtle body so that prana energy can be directed toward harnessing and channelling internal energy (Saraswati, 1996). These techniques allow individuals to significantly increase their awareness of their mind and bodily functions. Psychological and physiological states can be altered by controlling the speed, rate, rhythm, ratio, and duration of inhalation and exhalation (Saraswati, 1996), while holding the breath at the end of inhalation or exhalation, as well as alternating breaths through each nostril, are also techniques used.

Pranayama has been found to improve cognitive functioning (Chandra et al., 2017; Zaccaro et al., 2018), emotional regulation (Bhaskar et al., 2017; Jayawardena et al., 2020; Toschi-Dias et al., 2017), physical symptoms (Bhaskar et al., 2023; Eherer et al., 2012; Jyotsna et al., 2013; Kezele et al., 2023; Shi et al., 2023), social connectedness (Kanchibhotla et al., 2024), as well as global functioning (M. R. Goldstein et al., 2016; Korkmaz et al., 2024).

Uninostril pranayama was found to have activating and deactivating effects through sympathetic and parasympathetic cardiovascular measurements (Bhavanani et al., 2014). Bhaskar et al. (2017) and Chandra et al. (2017) found that rhythmic breathing increased vagal control and reduced psychological stress. Breath-based interventions were found to improve HRV, increasing parasympathetic activity and cardiac autonomic control (Bhaskar et al., 2017; Sürücü et al., 2021; Toschi-Dias et al., 2017). A systematic review of the psycho-physiological

correlates of slow breathing practices found that slow breathing has a deactivating impact on the autonomic nervous system, measured via HRV, RSA, and EEG (Zaccaro et al., 2018). Another systematic review found significant evidence that pranayama practices increased vagal control and had several physiological and psychological benefits (Jayawardena et al., 2020). Mathersul et al. (2022) found that yoga breathing exercises did not show physiological changes in emotional regulation and that only the control group found significant self-reported improvements in emotional regulation capacities.

Dhyana

Dhyanas encompass several forms of meditation that aim to pull the mind from the external experience, focus on internal sensations, or create stillness (Mallinson & Singleton, 2017; Singh, 2023). The true goal of meditations in KY is not solely for relaxation but to create awareness of both active and passive body functions simultaneously (Saraswati, 1996). Dhyana meditations include closed-eye visualizations or externally focused fixations of sight, sound, or bodily sensations (Mallinson & Singleton, 2017; Saraswati, 1996).

In a systematic review study, meditation was found to improve symptoms of post-traumatic stress, increase vagal control, and expand ventral vagal capacities within the parasympathetic nervous system (Poli et al., 2021). Mindfulness is a form of dhyana that focuses attention to the present moment (Mallinson & Singleton, 2017). Mindfulness has been found to improve psychological well-being and decrease stress symptoms (Dunning et al., 2019; Kelly & Garland, 2016; Taghavi & Kia-Keating, 2024; Taylor et al., 2020). Taylor et al. (2020) conducted a systematic review and meta-analysis and found that mindfulness yoga was an effective intervention for individuals exposed to trauma. However, Taylor et al. noted that future studies should utilize active control groups and long-term follow-up.

Asana

Asanas in KY are physical postures and poses that shift the autonomic nervous system from a sympathetic state to a parasympathetic state (3HO International, n.d.-b). Common postures, such as child's pose, are used in addition to asanas unique to KY focused on spinal movements. KY asanas activate specific muscles and pressure points to stimulate glands and organs, release emotional blocks held in the body, and open nadi pathways for prana energy to flow more freely (3HO International, n.d.-b).

Asanas are akin to mind-body practices where attention is directed to the sensations and gentle movements of the body. Mind-body practices are bottom-up interventions to regulate the autonomic nervous system (van der Kolk, 2014). Mind-body interventions have been found to enhance overall well-being and decrease symptoms of post-traumatic stress (Cahn et al., 2017; Hofmann et al., 2016; Kearney & Lanius, 2022; Taylor et al., 2020).

Mantra

Mantras are "verbal formulas" vocalized and repeated internally or audibly. They may be one syllable, such as *OM*, or several syllables (Mallinson & Singleton, 2017, p. 190). All matter vibrates at a frequency; mantras align the body's frequency with the frequency of the sound used (Chaugule et al., 2024). Vocalizations and sound processing are connected to autonomic regulation, specifically in mammals, for reducing stress-related symptoms and enhancing prosocial behaviour (Grooten-Bresser et al., 2024; Pant et al., 2022; Porges & Lewis, 2010). PVT suggests that tone, pitch, and rhythm reveal the speaker's physiological state (Porges & Lewis, 2010). Sound interventions have been found to reduce stress responses of the autonomic nervous system (Parizek et al., 2023), reduce PTSD symptoms (Pant et al., 2022), and improve sociality (Kawai et al., 2023).

Research on mantra-specific interventions is varied. Two systematic reviews found that mantra meditations produced improvements in emotional regulation and a decrease in stress and post-traumatic stress; both studies noted small to medium effect sizes and the need for more rigorous studies (Álvarez-Pérez et al., 2022; Lynch et al., 2018). Harne et al. (2019) conducted a literature review on 13 studies evaluating the OM mantra and concluded that OM had similar results. An exploratory RCT trial found that a mantra intervention showed significant improvements in cognitive functioning, emotional regulation, and well-being when compared to a music-listening control (Innes et al., 2018).

Mudra

Mudras consist of specific hand gestures that correspond with emotional states and specific areas of the body (3HO International, n.d.-d). Like the ear in acupuncture (He et al., 2012), the hand is a microsystem of the body (Saraswati, 1996), with a significant amount of cortical territory devoted to sensations in the hands (Venkatraman et al., 2019). Mudras communicate with the body and mind by stimulating specific points and nerves in the hands; a mudra commonly associated with yoga is the index finger and thumb touching with the other three fingers straightened (3HO International, n.d.-d). Mudras may act as switches to initiate balancing functions of the nervous system by applying tension to the nerves in the hands (Sunitha & Sharma, 2021). In a previous study, Sunitha and Sharma (2020) found that mudra therapy reduced hypertension, which is correlated with PTSD (Sumner et al., 2016; Sumner et al., 2019).

Some research has begun to connect concepts from KY to acupuncture (Chase, 2018; Sadi, 2023). Acupuncture has the potential to balance the nervous system when considered through the framework of PVT (Oleson, 2018; Shen et al., 2023) and may bridge the gap

between empirical research and mudras. Hand acupoints are connected to spinal nerves (Corradino & Maciocia, 2017). Acupuncture utilizes pressure points to influence the autonomic nervous system (Chase, 2018; Li et al., 2013) and a systematic review revealed the potential clinical uses of manual stimulation of acupuncture points to treat post-traumatic stress symptoms (Feinstein, 2023).

Discussion

If KY practices align with PVT tenants, then KY interventions would also be polyvagal-informed. Knowledge from one framework may be integrative into the other. PVT provides neurophysiological explanations for symptoms of trauma. Thus, KY interventions may also be appropriate for treating post-traumatic stress. However, integrating interventions steeped in ancient traditions into Westernized therapeutic settings is not without its challenges, both ethical and cultural. The following sections address the questions proposed at the beginning of this paper, ultimately examining the potential of KY as an intervention for trauma.

Do KY Practices Align With Tenets of PVT?

KY and PVT appear to align synergistically. Both systems refer to unconscious processes within the body that are intricately connected by a sprawling network of structures and functions emanating from the spinal and brain regions. The translations of the original yoga texts connect KY concepts and practices to the nervous system, but there is ambiguity as to which concepts correlate to which physiological processes (Madhvacharya, 2007; Mallinson & Singleton, 2017; Saraswati, 1996). A significant limitation was finding strong sources that could positively connect some of the KY abstractions with physiological processes. The research only hypothesized about the links of the nadis and prana to neurophysiology. However, the journals

with articles on chakra correlates were all peer-reviewed journals with moderate to good reputations.

Direct links between all the correlates of the two frameworks may not be necessary to evaluate the alignment of KY and PVT. KY practices, through the lens of PVT, demonstrate congruent insights into the functioning of the autonomic nervous system (Loizzo, 2016, 2018; Sullivan, Erb, et al., 2018; van Aalst et al., 2020; Venkatraman et al., 2019). Through quantifiable measurements, KY has displayed a propensity to improve vagal control (Arambula et al., 2001; Nasrolahzadeh et al., 2023; Tyagi & Cohen, 2016). Both systems rely on bidirectional mechanisms and interventions to obtain a balance within the mind and body. PVT and KY use breathing, mind, movement, and sound interventions to shift unconscious processes and focus on interoceptive abilities. KY utilizes acupressure, while PVT is only beginning to understand the potential of this intervention. Overall, polyvagal-focused aligns with kundalini-focused practice despite widely differing descriptions of each framework.

Are KY Practices Effective for Treating Post-Traumatic Stress?

This paper addressed the capacity of KY to treat post-traumatic stress from several different angles. First, three qualitative studies and one quantitative study directly revealed the effectiveness of KY to treat trauma directly from a polyvagal foundation. Second, five studies directly evaluated KY on elements of global functioning, showing overall improvements. Third, KY appears to be effective for treating specific psychological symptoms of post-traumatic stress, with 10 studies focusing on cognitive domains and eight on emotional regulation. Finally, when KY practices were considered separately, pranayama, dhyana, and asana practices showed positive outcomes, with ample research to support the claims. More research is needed on mantra and mudra practices.

It is important to note that in studies comparing KY or its related practices to CBT, KY was found to be equally or less effective despite statistically significant improvements. Regardless of the general positive evaluations of KY, there are important limitations to consider. Due to the limited peer-reviewed research directly evaluating KY on post-traumatic stress, this review relied heavily on extrapolations from KY's effectiveness on related symptoms or evaluating KY practices separately, leaving ambiguity on the propensity to claim that KY is an effective trauma intervention. More research directly assessing KY on post-traumatic stress is needed.

Common limitations were noted in the sources reviewed for KY and its practices for treating trauma and its symptoms. Operationalizing KY as a measurable intervention posed challenges that hindered claims of KY as a reliable and valid intervention. Repeated sample size limitations weakened KY's generalizability beyond the sample demographics. Future research may attempt to evaluate larger samples or different sample demographics. Further research could also focus on operationalizing yoga interventions or specific KY kriya sets to be tested in more than one study. Future quantitative research could evaluate KY and trauma, KY and specific trauma symptoms for people who have post-traumatic stress, and the difference between one KY practice versus KY kriya sets.

Another limitation was that many of the sources used in this paper were based on niche topics, in which several of the researchers were also yoga practitioners, which could bias results. The reflexive practice of stating researcher-practitioner identities facilitates the researchers' awareness and ability to mitigate this bias in qualitative and quantitative research (Dodgson, 2019; Jamieson et al., 2023). Researchers who did not identify researcher-practitioner bias in their work cannot be assumed to be nonpractitioners. Furthermore, many studies were published

in journals specific to yoga-related research, again risking bias toward favourable results. To temper these biases, future researchers may practice reflexivity, utilize nonpractitioners for their study, attain external reviewers, and publish their results in nonspecialized journals.

Conversely, I believe that bias against the validity of traditional medicine in Westernized culture often leads to KY research being published in specialized journals, where the focus on alternative therapies may increase the risk of bias in support of the journal topic. Broader, high-impact journals prioritize the research with modern scientific methods, potentially marginalizing studies on practices like KY that fall outside conventional medicine.

Rather than viewing the ancient texts as esoteric imaginings, research could approach the teachings as an ancient science grounded in cultural context. Yoga is a traditional system of medicine indigenous to India (Gangadhar, 2023). Although different from modern scientific methods, traditional medicine has been tested through generations of trial and error and is found to be valid and reliable through repeated successful outcomes (Shankar, 2019). Yoga research should include and be evaluated on phenomenological understandings, that is, the subjective, lived experiences of individuals engaging in yoga practices, focusing on their internal perceptions, emotions, and embodied sensations rather than solely relying on objective, measurable outcomes (Loizzo, 2016; Sullivan, Erb, et al., 2018).

Can KY Practices be Ethically Incorporated Into Therapeutic Settings?

Yoga-informed and trauma-informed interventions have already been integrated into therapeutic settings. Borrowing from these already-established frameworks, recommendations for ethically incorporating KY into therapeutic settings will be addressed. Risks and cultural considerations are also highlighted.

General Recommendations for Yoga-Based Counselling

On the one hand, fitting yoga practices into therapeutic settings can be considered appropriation; on the other, it may be considered a positive and decolonizing approach to holistic health (Millner et al., 2021). Zabel (2021) argued that yoga is meant to grow, change, and adapt: "In many ways, yoga traditions are not absolute visions of truth but rather they are conceived as an efficient and replicable means by which to arrive at truth while shedding the misconceptions that leave one mired in illusion" (pp. 102–103). After reviewing the literature on the ethical incorporation of yoga into therapeutic settings, including a systematic review of 24 articles on the same topic, the following clinical recommendations emerged for counsellors incorporating yoga-based interventions (Mallinson & Singleton, 2017; Matko et al., 2021; Ramsahaye et al., 2023; Singh, 2023; Spence, 2021; Sullivan, Moonaz, et al., 2018; Vollbehr et al., 2023):

1. Counsellors must be knowledgeable and competent in the intervention and the cultural context of the yogic traditions derived from it.
2. Counsellors should be active yoga practitioners and have used the techniques introduced into the therapy session on themselves before using them on clients.
3. A counsellor must assess each client, withholding assumptions and generalizations. This assessment should address cultural intersections, especially religious and spiritual aspects and how they may intersect with yoga practices.
4. A counsellor should provide a client with psychoeducation about yoga-based counselling and interventions, and possible risks. Education may also include the origin of the intervention and if it is derived from a religious practice.
5. Yoga-based interventions should be given in smaller, manageable doses.
6. A counsellor must prioritize consent and safety in the therapeutic relationship.

7. A counsellor should seek collaboration from relevant professionals. This may include addressing concerns within their personal yoga practice.

In addition to these recommendations, Sullivan et al. (2018) suggested that counsellors providing yoga-based therapy should understand, follow, and utilize the ethical principles in yoga to develop clinical reasoning skills and make ethical decisions in therapeutic settings. Matko et al. (2021) suggested that ethical principles should be incorporated into yoga interventions; they found that well-being was improved when yoga ethics was included compared to the same yoga intervention without the ethical component (e.g., nonviolence, truthfulness, and contentment).

Incorporating KY into therapeutic settings requires balancing the ethical principles of yoga traditions and clinical psychology. *Yamas* are moral guidelines for interacting with others (Sullivan, Moonaz, et al., 2018). Many of the yamas align with the ethical principles and standards of practice guiding Canadian counsellors in Alberta (see Appendix B; Canadian Psychological Association [CPA], 2017; College of Alberta Psychologists [CAP], 2023). Furthermore, the six recommendations above outline informed consent addressed in both manuals, as well as competence and self-knowledge (CPA, 2017) and diversity and cultural competency principles (CAP, 2023). By carefully considering these aspects, practitioners can create a safe and respectful environment that honours the integrity of both yoga and psychological ethical guidelines for behaviour. In addition, reflexive practice is recommended for counsellors, especially when addressing religion and spirituality (Prout et al., 2021).

Specific Recommendations for Trauma-Focused Counselling

Post-traumatic stress can be complex and may require longer courses of treatment, an array of interventions, and individually adapted interventions (Cloitre, 2021). Trauma-informed yoga therapy recommends (CAMH, n.d.; Spence, 2021; Wästlund et al., 2023):

- invitational use of language
- safe and welcoming space
- setting clear boundaries
- providing opportunities for client consent and choice
- normalization of symptoms and responses to yoga-based practices
- grounding and regulation strategies

Specific Recommendations for Kundalini-Based Counselling

Despite the promising benefits of KY practices, there are notable risks associated with KY practices. KY practice can open a pandora's box of consequences that can reveal a myriad of unpleasant emotions, sensations, memories, and perceptions. "Those who suffer do so not because of the kundalini awakening, but because they have not harmonized the nervous system" (Saraswati, 1996, p. 45). Saraswati's (1996) recommendations for personal KY practice, when extrapolated to therapeutic settings, have already been mentioned above. The only additional recommendation would be to seek KY-specific instruction, experience, and consultation.

Some KY practitioners practice to have a spiritual awakening known as a *kundalini awakening*. Kundalini awakening is an abrupt and intense rise of kundalini energy; this typically occurs when practitioners rush or force KY practices to obtain spiritual enlightenment. Although less relevant to the clinical use of KY, knowledge about kundalini awakening is imperative. Several case studies document psychotic symptoms as a side effect of intense KY practices

called physio-kundalini syndrome (Benning et al., 2019; Sharma et al., 2022; Suchandra et al., 2021). According to the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed., text rev.; DSM-V-TR; American Psychiatric Association, 2022), physio-kundalini syndrome is a cultural concept of distress (Benning et al., 2019). In response to Suchandra et al. (2021), Khalsa (2022) responded that psychotic symptoms were combined with the use of hallucinogens or life-threatening events and were not necessarily due to KY practice. Khalsa also noted that there were significant variations in the KY practices and cautioned against painting KY as a dangerous practice. Conceptualizing spiritual distress or awakening as psychosis is rooted in Westernized medicine; in Hindu belief systems, abnormal behaviours allude to an evolution of the mind where the individuals are considered to be in a crisis between states of evolution (Saraswati, 1996).

Overall, ethically incorporating KY practices into therapeutic settings is possible with additional training in KY and substantial proficiency in cultural competence (Benning et al., 2019; Sharma et al., 2022; Suchandra et al., 2021). Nevertheless, many yoga-informed interventions are also inherently kundalini-informed since KY encompasses various yogic practices. Furthermore, kundalini-informed practices appear also to be polyvagal-informed, and vice versa. Therefore, although KY may not be explicitly brought into a therapeutic setting, the foundational knowledge from KY is still utilized through yoga-based and polyvagal-informed practices.

Polyvagal-informed therapy begins with the counsellor tuning into themselves first (Geller, 2018). This may include grounding or regulation strategies before a session. The counsellor tunes into the client at the beginning and throughout the session to promote feelings of safety, calm, and presence. This minimum requirement for engaging in deeper therapeutic

work strengthens the therapeutic alliance. When these conditions are met, the optimal environment for therapeutic work has been established. These incorporate the hierarchical understanding of the nervous system to promote co-regulation between counsellor and client in hopes of improving neuroceptive and interoceptive capacities that promote recovery.

Reflexive Practice

Throughout writing this capstone, there were several instances where I had to practice reflexivity and ensure that I included a balanced depiction of KY in presenting the research. As a casual yoga practitioner, I am also at risk of practitioner-researcher bias in hopes that KY will be a beneficial intervention. Initially, I felt hopeful about incorporating KY into my future practice. Other times, I grappled with a sense of profound discomfort, feeling like another imposter appropriating KY. It felt like I was dissecting KY's essence to make it fit rather than appreciating the rich history and traditions, especially when KY is stripped of its spiritual aspects. Until I resolve this discomfort and gain significant experience in KY, I do not intend to practice KY-focused counselling.

Despite my reservations, I have gained valuable insights along the way, including a newfound dedication to expanding my personal KY practice in a culturally sensitive and spirituality-based manner. Professionally, I have developed a passion for polyvagal-informed interventions and developing skills in cultural competency. For this topic, cultural consideration warranted thorough discussion and thought, highlighting the importance of cultural competency required to be a counsellor.

Conclusion

The intersection of PVT and KY offers a promising framework for understanding and addressing trauma-based stress. As trauma continues to be a pervasive global issue, therapies

integrating both mind and body are increasingly recognized as essential for effective treatment. KY is a dynamic practice that aligns with the principles of PVT, focusing on balancing autonomic functions. This alignment suggests that KY may not only reduce post-traumatic stress but also foster post-traumatic growth.

By exploring the compatibility of KY with PVT, this study provides valuable insights into how ancient practices can be integrated into modern therapeutic settings. Ultimately, the fusion of these two approaches holds the potential to enhance both clinical and nonclinical strategies for trauma recovery, offering a holistic path toward healing and resilience. However, cultural and research considerations must also be considered to ethically integrate evidence-based interventions into clinical practice.

Beyond just therapeutic practice, the intersection of PVT and KY may have broader implications. A better understanding of ancient traditions juxtaposed in neurophysiological anatomy could allow modern researchers, educators, and policymakers to draw upon the wisdom and technology developed over thousands of years. Opening conversations about the credibility of ancient knowledge could temper bias and catapult research, education, and policy toward an integrated, multidisciplinary understanding of the nervous system, including managing trauma impacts and improving bio-psycho-social well-being.

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Appendix A

Different Branches of Yoga and Their Connections and Differences to Kundalini Yoga (KY)

Practice	Connection to KY	Key focus	Unique aspects
Tantric Yoga	Rooted in the same tradition as KY, both involve energy work and focus on the chakras.	A broader yogic system that encompasses KY.	Stronger emphasis on duality and the union of opposites in the spiritual journey.
Sudarshan Kriya Yoga	Similar pranayama techniques emphasize kriyas.	Pranayama-based and kriya-based yoga.	Focus on cyclical breathing to balance the nervous system.
Mindfulness	KY incorporates mindfulness through present-moment awareness.	Dhyana-based practice.	Mindfulness meditation traditionally involves nonjudgmental awareness without KY's energy/chakra focus.
Embodiment Yoga	KY emphasizes body-mind connection, using breath and movement to anchor awareness.	Asana-based yoga.	Embodiment yoga focuses specifically on the experience of being in the body and can involve somatic awareness.
Hatha Yoga	KY stems from Hatha Yoga traditions, using similar asana and pranayama, but KY adds a more pronounced focus on kriyas and energy.	Asana-based meditation.	Hatha yoga focuses more on asana for flexibility and strength without the energetic awakening of KY.
Transcendental Meditation	KY includes mantra-based meditation but often with more dynamic movement and breath components.	Mantra-based yoga.	Transcendental meditation emphasizes silent mantras without movement or breath exercises.
Kirtan Kriya	The direct part of KY is meditation, which involves chanting, mudras, and visualization. It combines breath, mantra, and sound to stimulate cognitive and emotional healing.	Mantra-based yoga.	Emphasis on specific syllables to activate different areas of the brain and nervous system.
Trauma-Informed Yoga	KY's focus on energy regulation through breath and movement aligns well with trauma-informed practices, promoting nervous system regulation (similar to polyvagal theory).	Trauma-focused yoga.	Explicit focus on creating a safe, accessible environment and avoiding triggering trauma reactions.
Yoga Therapy	Shares a therapeutic focus with KY, using yoga practices to promote healing.	Yoga for therapeutic settings and purposes.	Emphasizes therapeutic outcomes, often in a clinical or therapeutic setting, targeting specific health conditions.

Appendix B

Yoga's Moral Guidelines, Yamas, Compared to the Canadian Psychological Association's Ethical Principles

Yamas	Canadian Code of Ethics	Explanation
Ahimsa	I.1-8: General respect and rights I.9-11: Non-discrimination I.31-36: Protections for vulnerable individuals and groups II.1-5: General caring II.13-17: Risk/benefit analysis II.28-II.47: Minimize/offset/correct harm III.15-18: Respect for society	*Ahimsa* means nonviolence. It is the first of the five ethical principles for interacting with others. It focuses on not harming others and on non-harming behaviours.
Satya	I.16-26: Informed consent III.1-8: Accuracy/honesty III.13-22: Straightforwardness/openness III.23-27: Avoidance of incomplete disclosure/deception	*Satya* means truthfulness and refers to honesty, integrity, and compassionate truth. It may also extend to seeking absolute truths or acquiring new knowledge.
Asteya	I.12-11: Fair treatment/due process II.18-27: Maximize benefit III.28: Avoidance of conflict of interest IV.4-14: Beneficial activities	*Asetya* means non-stealing and refers to avoiding the exploitation of others, while also promoting giving to others and society.
Brahmacharya	II.6-12: Competence and self-knowledge II.28: Recognizing power differentials and refraining from sexual relationships with clients IV.19-28: Development of society	*Brahmacharya* refers to self-restraint. Knowledge is the prerequisite for self-restraint, including self-knowledge, learning, and using that knowledge to benefit others.
Aparigraha (Non-possessiveness/non-attachment)	I.31-36: Freedom of consent II.10: Self-awareness II.9, II.25, III.4 IV.20, and IV.24: Stay up to date on current knowledge	*Aparigraha* means non-possessiveness. It requires adaptability to clear out the old and make room for the new by letting go of attachment to materials and ideals.

Note. Information on yoga's moral guidelines, yamas, retrieved from Mallinson and Singleton (2017), Ramsahaye et al. (2023), and Sullivan, Moonaz, et al. (2018). Ethical principles are from the *Canadian Code of Ethics for Psychologists* (Canadian Psychological Association, 2017).