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Taming the Wandering Mind: Where Buddhism & Polyvagal Theory Meet

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Mindfulness Studies, Lesley University

Thesis

September 2022

Dr. Melissa Jean and Dr. Andrew Olendzki

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Abstract

The ability to tame the wandering mind is at the heart of the insights emerging from the places where Buddhism and the Polyvagal Theory (Porges, 2001, 2011) meet. A polyvagal understanding of how our nervous system functions opens the door to developing skills that can strengthen our ability to regulate ourselves and others during times of challenge. The Buddha's meditation instructions, laid out in the Satipaṭṭhāna Sutta, the Establishment of Mindfulness Discourse offers a type of attentional training that allows us to become aware of our current neural state so that we can make intentional choices to tame our wandering mind. Research shows that this ability to govern our current neural state provides greater psychological and physiological flexibility and tolerance and is associated with benefits ranging from cardiopulmonary fitness and immune function to psychological health and improved executive functioning (Gerritsen & Band, 2018; Poli et al., 2021). While the polyvagal theory offers a neurobehavioral understanding of how and why our minds wander, Buddhism gives us the insights and practices to keep our minds from wandering on. This reduces suffering for ourselves, our communities, and the world.

Keywords: mindfulness, Buddhism, polyvagal theory, Satipaṭṭhāna Sutta, evolution

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Taming the Wandering Mind: Where Buddhism & Polyvagal Theory Meet

The Pali word *samsāra* means “wandering on” (Goldstein, 2016, p. 193). From a traditional Buddhist perspective, *samsāra* refers to our wandering through the different realms of existence over many lifetimes. But this same process of wandering can be seen at work within a single lifetime, and even a single day as we inhabit different “mind worlds” (p. 193) from one moment to the next. Whether we are happy, sad, bored, excited, fearful, calm, anxious—or whatever, as we contemplate the arising, passing, and both arising and passing away of these various mind states, we begin to free ourselves from both identification with and reaction to them (p. 194). The Satipaṭṭhāna Sutta, the Buddha’s Discourse on Establishing Mindfulness, offers instructions for understanding the body-mind process and different methodologies and techniques for freeing the mind from the causes of suffering (p. 15). This twenty-six-hundred-year-old sutta offers four fields through which we can establish mindfulness; they are: body, feelings, mind, and dhammas (categories of experience). The Buddha said that when we establish mindfulness in them, or of them, we abide safely. But when we are not mindful, not aware, that is when we often get lost in harmful reactions, creating suffering for ourselves and others (p. 22). And then we wander on...

In what might at first seem like a completely different undertaking, the Polyvagal Theory (PVT) was developed in the latter half of the Twentieth Century by Stephen Porges (2001). It explains the science of safety and connection and how our nervous systems have evolved to be social structures that find balance and stability in relationship with others. Like the Satipaṭṭhāna Sutta, PVT offers a map of—not *mind worlds*, but—the nervous system. And like the Satipaṭṭhāna Sutta, which teaches different techniques for establishing mindfulness so that we might free ourselves from suffering, the PVT offers an understanding of how our nervous system

functions, which opens the door to developing skills that can strengthen our ability to anchor ourselves and each other in safety and regulation during challenges to our sense of equilibrium (Dana, 2021, p. 15). The “vagal” in PVT refers to the vagus nerve, the primary nerve of the parasympathetic nervous system. Interestingly, the word *vagus* means *wanderer* in Latin. The vagus nerve was so named because of its length and the way it connects to so many places throughout the body (Dana, 2021, p. 40). Although it may just be an amusing linguistic coincidence that *samsara* means *wandering on* and *vagus* means *wanderer*, when I read Stephen Porges’ (2011) book, *The Polyvagal Theory: Neurophysiological Foundations of Emotions, Attachment, Communication, and Self-regulation*, I couldn’t help but see the many parallels between the Buddha’s teachings about mindfulness, and how this bundle of nerves’ influence, and our attunement to the various *mind worlds* it creates, often determines whether we can “free ourselves from both identification with and reaction to them” (Goldstein, 2016, p. 194), or whether we continue to suffer and wander on.

By exploring the places where these two systems meet and support each other, I will show that while PVT offers a neurobehavioral understanding of how and why our minds wander, Buddhism gives us the insights and practices to keep our minds from wandering on. To illustrate this more fully, it is important to first review the origins and basic concepts of PVT.

The Polyvagal Theory (PVT)

The PVT (Porges, 2001, Porges, 2011) emerged from the study of the evolution of the vertebrate autonomic nervous system (ANS) and is based on the functions of the ANS that automatically regulate several major organs, including the heart, the lungs, and the gut. The ANS is divided into two branches, the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS). The SNS is primarily activated in response to changes in the external

environment, while the PNS is modulated primarily by internal changes in the viscera. The SNS is responsible for the fight/flight mode of organisms. It stimulates available energy--raising heart rate, blood pressure, and (indirectly) respiration rate--and dampens homeostatic processes that are not needed in the present moment. The PNS is known as the rest/digest system and acts as an opposing force to the SNS.¹ The PNS lowers heart and respiration rates and increases digestion.

According to PVT, circuits in the brain dynamically regulate the ANS.² This regulation is bidirectional, with the brain and its neural sentries continuously monitoring body state, and body state dynamically influencing brain function. Thus, the ANS monitors and responds to both internal and external stimuli, servicing the needs of both the internal viscera and responding to external challenges (Porges, 2011, p. 67). But the ANS is not merely a response system, quiescently awaiting challenges from the external environment. Rather, this bidirectional system continuously attempts to maintain homeostasis and promote physiologic stability. And shifts in ANS activity that disrupt these processes are associated with stress (p. 65).

The PVT describes three phylogenetic stages of the development of the mammalian ANS. “These stages reflect the emergence of three distinct subsystems, which are phylogenetically ordered and behaviorally linked to social engagement, mobilization, and immobilization” (Porges, 2011, p. 267). Specifically, the myelinated (ventral) vagus (VV) plays a key role in social communication, self-soothing and calming behaviors, and inhibits

¹ It is important to note that PVT challenges the prevailing theoretical model of the ANS as a paired-antagonistic system (i.e., balanced between sympathetic and parasympathetic influences) and posits, instead, a hierarchical and adaptive, dual-sympathetic-parasympathetic system (Porges, 2011, p. 4).

² The PVT challenges Western science’s implicit mind-body dualism by providing a bidirectional brain-body model that interprets the brain regulation of peripheral physiology (e.g., neural regulation of both cardiovascular and endocrine function) as providing a neural platform for emergent adaptive social and defensive behaviors (Porges, 2011, p. 3).

sympathetic adrenal influences; the sympathetic-adrenal component (SNS) is key for mobilization, including active avoidance, and inhibiting dorsal vagal influences; and the unmyelinated (dorsal) vagus (DV) is key to immobilization behaviors such as death feigning and passive avoidance (p. 287). These three circuits can be conceptualized as providing adaptive responses to safe (VV), dangerous (SNS), and life-threatening (DV) events and contexts (p. 55).

According to PVT, the evolution of the nervous system determines the range of emotional expression, quality of communication, and the ability to regulate the body and behavioral state, including the expression and recovery of stress-related responses. The theory describes how mammals--especially primates, have evolved brain structures that regulate both social and defensive behaviors. To switch effectively from defensive to social engagement strategies, the nervous system must do two things: (1) assess risk, and (2) if the environment looks safe, inhibit the primitive defensive reactions to fight, flee, or freeze (Porges, 2011, p. 12). It is important to note that PVT assumes that many of the features of risk and safety are not learned but are hard-wired into our nervous system and reflect adaptive strategies associated with our phylogenetic history (p. 247), and emergent social engagement and defense behaviors are considered adaptive or maladaptive, depending on the level of risk present in the environment (p. 12).

Of particular importance to mammalian social behavior is the parasympathetic component of the ANS and the vagus nerve (Porges, 2011, p. 284) which is considered the main effector and effector of the PNS (Gerritsen and Band, 2018, p. 6). The vagus is not a single nerve but a complex bundle of nerves that begins in the brainstem and travels through the viscera, affecting many different organs, including the heart, lungs, and digestive system. And, according to PVT, the vagal nerve complex has two distinct branches—the ventral vagal (VV) and the

dorsal vagal (DV)--with each branch being associated with a different adaptive behavioral strategy (Porges, 2011, p. 218). The evolution of this system in mammals permitted the emergence of complex social interactions and social communication. For example, the neural regulation of the ANS (via the vagus nerve) is linked to the neural regulation of the muscles of the face and head, which signal to others our emotional state. This enables mammals—especially primates, to make the complex array of facial gestures and vocalizations involved in active listening (i.e., the modulation of our middle ear muscles) and sound production (i.e., the modulation of the laryngeal and pharyngeal muscles) associated with social communication (p. 248). So, PVT is essentially an attempt to reorganize our conceptualization of the ANS with a focus on the specific neural circuits involved in regulating visceral organs for specific adaptive functions related to affect, emotions, and social communication behaviors (p. 259).

Indeed, one of the most important features of PVT is its understanding and description of how the ANS links visceral state regulation and emotion to both the expressive and receptive domains of social communication (Porges, 2011, p. 284), what is known--in PVT terms--as the Social Engagement System (SES). Specifically, the theory posits that for people to engage in behaviors that help foster social engagement and human development, they first need to feel safe. When the environment is perceived as safe, two important features are expressed. First, “bodily state is efficiently regulated to promote growth and restoration (e.g., visceral homeostasis)” (p. 55). This is done through an increase of the influence of the VV on the cardiac pacemaker which slows the heart, inhibits the fight-or-flight mechanisms of the SNS, dampens the stress response system of the hypothalamic-pituitary-adrenal (HPA) axis (e.g., cortisol), and reduces inflammation by modulating immune reactions. Second, the evolutionary coupling of the brainstem nuclei that regulate the VV with the nuclei that regulate the muscles of the face and

head resulted in the bidirectional link between spontaneous social engagement behaviors and bodily states. This meant that an integrated SES emerged in mammals when the neural regulation of visceral states that promote growth and restoration (via the VV) was linked with the neural regulation of the muscles controlling eye gaze, facial expression, listening, and prosody (p. 55).

From a biobehavioral standpoint, the human SES regulates facial muscles, including the muscles around the eyes that promote social gaze and emotional expressivity; middle ear muscles that enable human vocalizations and language to be extracted from background sounds; muscles of mastication involved in ingestion; laryngeal and pharyngeal muscles used in sucking, swallowing, vocalizing, and breathing; and muscles of head and neck that enhance social gesture and orientation, such as turning and tilting (Porges, 2011, p. 250). Collectively, these muscles act as filters that limit social stimuli (e.g., observing facial features, listening to the human voice) and determine how humans engage with their social environment (p. 220).

Most relevant to my inquiry, the principles of PVT illustrate the emergence of a brain-face-heart circuit (Porges, 2011, p. 249), which provides a basis not only for investigating the relationship between social and emotional engagement and autonomic regulation but also for exploring how these bidirectional biobehavioral processes can be positively impacted by interventions such as mindfulness practices, which have been found to affect neural regulation of body state and social and emotional behavior. To illustrate this connection more fully, I will review some of the foundational concepts of Buddhism and begin to bring them into direct conversation with PVT.

The Four Noble Truths

Twenty-six hundred years ago the Buddha famously awakened under the Bodhi tree. At that time, he came to understand what would be called the Four Noble Truths. These are that

there is suffering, that we can know the causes of suffering, that we can envision the cessation of suffering, and the path for doing so. Suffering, as the Buddha saw it, comes from the fact that we inhabit bodies and are conscious of the fact that these bodies are subject to aging, sickness, and death. And we crave for this not to happen. What the Buddha understood was so profound it may seem simple. But because we have bodies that interact with the environment and each other and have biological systems that break down and eventually cease to function, we do not want to come to harm; we want to survive and thrive. And to the extent that this does or does not happen, we suffer.

From a polyvagal perspective, our mind worlds--how we think, feel, and act--begin with neuroception. Neuroception, a term coined by Stephen Porges (2011), is responsible for bringing about the autonomic state changes that either invite us into connection with people, places, and experiences or move us away from connection and into the protection of fight, flight, or shutdown. When a social situation is considered safe, an individual can access the tools of the SES, such as facial expressions, eye contact, and vocal intonation. With a neuroception of VV safety, we move out into the world and into connection with self and others. But a neuroception of danger brings a move into sympathetic fight and flight, while a neuroception of life threat takes us into DV collapse and shutdown (Dana, 2021, p. 30). According to PVT, “these three streams of embodied listening are always working, micro-moment to micro-moment, below the level of our conscious awareness” (p. 29). So, from a polyvagal perspective, we could say we suffer because we have a body-mind that includes a nervous system that is always working to protect us from aging, sickness, and death. It has evolved to keep us safe, healthy, and connected. And its actions (and reactions) stem from this energy of vigilance and self-preservation in a world in which harm, decay, and death are inevitable.

Only, we do not like that any of this is true. Indeed, the first noble truth points to the “unsatisfactoriness” (Olendzki, 2003, p. 11) of our human situation (what in Buddhism is known as dukkha), and to the fact that our suffering manifests in many ways we are not accustomed to acknowledging. In fact, we are so averse to facing this first truth that many of the mind worlds we create are distractions aimed at keeping us from facing it. And in our efforts to actively ignore the facts of aging, sickness, and death, we pursue pleasure (grasping), we avoid pain (aversion), and we deny change (delusion). “This is where our troubles begin” (Olendzki, 2010, p. 78). Because “these are all aspects of a daily coping strategy that is inherently limited in its ability to provide any lasting sense of safety, meaning or fulfillment” (Olendzki, 2003, p. 11). Thus, in addition to the physical suffering our bodies may encounter, we create mind worlds that suffer disappointment, loss, anguish, fear, loneliness, stress, worry, hatred, bitterness, resentment, alienation, and so on. This is why the overall focus of the Buddha’s teachings was on our mental health (Wright, 2020, p.73).

And certainly, denying the reality of suffering and pretending otherwise renders us incapable of addressing the problem. Thankfully, the Buddha also understood how to work with all of this. And the first step toward health and healing is to acknowledge and understand our own personal experience of suffering (Wright, 2020, p. 73), which means overcoming our denial and recognizing that there are identifiable symptoms that need to be addressed. Indeed, the first thing the Buddha, also known as the Great Physician, does is to throw back the sheets and reveal the true nature of the body-mind. “There is nothing evil or disgusting or inherently flawed about the psycho/physical organism, it is just that it is suffering from an affliction and is in need of healing” (Olendzki, 2003, p. 11). Put more plainly: “Suffering is a simple, fundamental fact of life that healthy individuals have learned to face directly and effectively” (Wright, 2020, p. 73).

In fact, the broad outline of early Buddhist theoretical psychology seems remarkably similar to how we might frame the issue through a polyvagal lens. In his writing on Buddhist psychology, Andrew Olendzki (2003), described our human situation this way:

An organism, comprised of both physical and mental factors and processes, lives in a dynamic equilibrium with its environment, both shaping and being shaped by that environment as a response to various internal and external sets of conditions. The psychophysical organism has the ability to perceive or “know” its environment to various levels of accuracy, through mediating systems of sensory representation, as well as the capacity to respond and act with varying amounts of autonomy. (p. 2)

Likewise, the creation of PVT came about partly because Stephen Porges (2011) was intrigued with the possibility of using physiological measures to understand psychological states (p.1). In his writing about PVT, Porges reflects that emotions, affect regulation, and interpersonal social behavior are processes that describe basic human experiences in response to events, environmental challenges, and people. And these processes depend on the dynamic bidirectional communication between the peripheral organs and brain via the central nervous system. This bidirectionality means that peripheral physiological reactions can be initiated by the brain in response to the environment, and alternatively, changes in peripheral physiological state can influence the brain and—ultimately, alter our perception of the world. This is how our physiological state can profoundly influence the quality of our psychological processes and our feelings can, in turn, determine dynamic changes in our physiology. And it is this complex interplay between our psychological experience and our physiological regulation which shapes our sense of self (p. 257). In other words, it is the complex interplay between our body and brain,

and between these systems, the environment, and each other which creates not only the mind worlds we inhabit but the way these mind worlds lead to suffering.

So, broadly speaking, while the mobilizing and protective energies of the ANS that evolved to move us towards pleasure and away from pain are adaptive, what the Buddha understood was that when these energies are determining our thoughts and behavior without our awareness (delusion), it can lead to maladaptive grasping and aversion. “Wanting what pleases us and wanting to do away with what causes us distress is part of a primordial operating system that has served all creatures on this earth quite well for eons. Buddhism is pointing to an evolutionary step requiring us to abandon this reflex and replace it with a more mature mental state, equanimity (Olendzki, 2016, p. 236). Here we can experience both pleasure and pain and still abide independent, not needing things to be other than they are. Indeed, the deeper questions have to do with the extent to which we can know and transform ourselves in meaningful ways. “While the theoretical issues have to do with explaining how it all works, the practical matter is usually more about achieving and sustaining a state of well-being” (Olendzki, 2003, p. 2). And this means finding a cure for our suffering.

And so, the rest of what the Buddha taught was how to begin working with these truths in order to transform suffering. Because “coming to terms with suffering in life is the starting point for doing something about it” (Wright, 2020, p. 75). Therefore, the third noble truth turns us from analysis of the problem to the possibility of a solution: if you eliminate or ameliorate the conditions that give rise to suffering, you will have eliminated or diminished that suffering. The understanding, here, is that the causes of suffering are located within us and are therefore within our power to change. It is not necessary to change the world to make it conform to our wishes. What is necessary is to transform our relationship with our suffering and to the world.

“Ironically, this inner change alters [our] relations to others, a position from which [we] might actually change the world” (p. 74). Grasping, aversion, and delusion can be replaced by other relations to the world that reduce suffering, which tends to ripple out, reducing suffering for communities, countries, and beyond. This latter point is a message of hope, a declaration that a life that is free of suffering is available to us all (p. 75). We can do something about the problem of suffering and begin living a life of peace, experiencing the joy of open, compassionate relations with others and the world. And this ability to transform ourselves beginning with our relationship with our own body-mind is at the heart not only of the Buddha’s teachings but the insights emerging from PVT.

Indeed, one of the essential insights the Buddha’s teachings shares with PVT is that we can engage with and modify our body-mind system. Two important concepts for understanding how this can be done are “vagal tone” (Porges, 2011, p. 63) and the “vagal brake” (p. 92). The PVT proposes that the development of appropriate social behavior is dependent on the ability to regulate cardiac vagal tone (p. 102). Cardiac vagal tone is a construct that describes the functional relationship between the brainstem and the heart.³ In general, greater cardiac vagal tone produces a slower heart rate and regulates the transitory changes in heart rate in response to stimulation (p. 222). And vagal tone is a good measure of parasympathetic activity (p. 4).

Furthermore, the PVT proposes a model that presents two contrasting roles of the vagus. In one role, the vagus supports homeostatic functions, while in the other, the vagus serves as a mediator of motor responses to environmental challenges. Thus, vagal tone can be conceptualized as having two roles. First, during states of low environmental demand (e.g., sleep or quiet states), vagal tone fosters physiological homeostasis to promote health, growth, and

³ It is interesting to note that the pali word, *citta*, can be translated as heart, mind, or heart-mind.

restoration. And second, during states characterized by physical, emotional, or social challenge, the vagus acts as a brake to rapidly regulate cardiac output (and thus metabolic output) (Porges, 2011, p. 103). This rapid regulation of the vagus in support of environmental demand has been labeled the vagal brake. And though the vagus is referred to as if it is one nerve, all twelve of our cranial nerves come in pairs. And it is the right vagus nerve that connects the brain to the heart, forming the vagal brake (Dana, 2021, pp. 41-42). This brake provides a neural mechanism to change visceral states by slowing or speeding heart rate. “Neurophysiologically speaking, the influence of the vagal brake is reduced or removed to support the metabolic requirements for mobilization (e.g., fight-or-flight behaviors) and maintained or increased to support social engagement behaviors” (Porges, 2011, p. 229). Practically speaking, without the regulating influence of the vagal brake, the heart would beat dangerously fast (Dana, 2021, p. 45).

However, the vagal brake is not an all-or-none construct. Rather, the vagal brake represents the graded inhibition of the cardiac pacemaker by vagal efferent fibers (Porges, 2011, p. 103). In other words, the vagal brake functions by allowing us to feel and use some of the mobilizing energy of the sympathetic nervous system without being pulled into the survival state of fight and flight. “As the vagal brake releases a bit, the energy in the sympathetic system is felt more strongly, mobilizing the system. And then, as the vagal brake reengages, there is a return to feeling less of the mobilizing energy of the sympathetic system” (Dana, 2021, pp. 46-47). Thus, the vagal brake provides a mechanism to rapidly switch between physiologic states that either support social communication or energize mobilization. Ideally, “the energies of the ventral and sympathetic systems can work in cooperation, enlivening our experience” (Dana, 2021, p. 50). And the ability to flexibly move between these states is a sign of well-being and resilience (p. 53).

From a functional standpoint, by modulating visceral state, the vagal brake enables individuals to rapidly engage and disengage with objects and other individuals and to promote self-soothing and calm behavioral states (Porges, 2011, pp. 219-220). In effect, this creates an active voluntary motor system associated with the conscious functions of attention, motion, emotion, and communication, that we can think of as a “smart vagus” (p. 41). Therefore, the concept of the vagal brake provides a neurophysiological mechanism that may promote the development of appropriate social behavior (p. 106). Indeed, there is extensive literature demonstrating that vagal regulation of the heart, both in terms of cardiac vagal tone and efficient regulation of the vagal brake, is related to emotional reactivity, social engagement, and reactions to stress (p. 239). Because, when the vagal brake is not functioning, there is the potential for greater dependence on the sympathetic excitation of the cardiovascular system, which may create health risks (e.g., hypertension) and lead to difficulties in modulating behavioral state (i.e., rage, panic, aggression) (p. 269). This is how the phylogenetic shifts, which have promoted greater bidirectional communication between brain and viscera in humans and other mammals, also provide opportunities for mental processes, including voluntary behavior, to have an impact on body state (Porges, 2011, p. 266). And it illustrates how a greater understanding of VV complex (VVC) functions—including the vagal brake--can lead to interventions that “both calm visceral state and promote more prosocial interactions” (p. 266).

All of this leads to the Buddha’s fourth and final truth which lays out the path of positive change, known as the Eightfold Path. These teachings include particular areas of human self-cultivation that enable an enlightened relation to the world. These healthy qualities of character are grouped into three categories: wisdom, virtue, and meditation. And they call upon us to acquire an appropriate understanding and intention (wisdom); appropriate speech, actions, and

occupation (virtue); and appropriate self-discipline, mindfulness, and concentration (meditation) (Wright, 2020, p. 74). The rest of this paper will focus mainly on the latter group, self-discipline, mindfulness, and concentration, with the idea that these lay the groundwork for successfully cultivating the others.

Mindfulness

From a polyvagal perspective, many of the Buddha's instructions can be seen as directions on how to bring mindfulness to our ANS. As I have described, the ANS is not merely an important bidirectional conduit between body and brain and brain and body, and between body-mind and the rest of the world, it also provides an important doorway through which we can affect our visceral state as well as the thoughts and even perceptions that get bundled together with our neuroception, creating the mind worlds that accompany these states. And while we cannot work directly with neuroception, we can work with our body's response to it by taking the implicit experience of neuroception and explicitly noticing it. By turning our attention toward the state that has come alive, we bring an otherwise nonconscious experience into conscious awareness (Dana, 2021, p. 31). And while the ANS works without the need for us to listen in and watch over it, learning to tune in to autonomic states is an important skill (p. 70) that can be developed. And learning to attend to neuroception in this way allows us to begin to shape our mind worlds in new ways.

From a Buddhist perspective, it could be said that by attending to our neuroception in this way we are paying attention on purpose to the present moment without judging (Kabat-Zinn, 2013) that there is a body-mind with a nervous system that is working in service of our survival. This is mindfulness, and it is the first tool we have for working with our mind worlds to reduce our suffering. From a Buddhist perspective, mindfulness is a "*sankhāra*, a

mental/emotional/behavioral state that arises and passes away in a moment in conjunction with consciousness and other functions such as feeling and perception” (Olendzki, 2016, p. 88).

Mindfulness, as a mental state, is always healing and never afflictive because it co-arises with such factors as equanimity, nonattachment, loving-kindness, and compassion. And mindfulness meditation is the practice of cultivating this benevolent quality of mind and learning to sustain it, moment after moment, even in challenging circumstances (p. 88).

From a polyvagal perspective, “whether we are talking about feelings, emotions, states, or moods, we are always attempting to describe the internal states that are continuously being monitored and regulated by the nervous system” (Porges, 2011, p. 76) through neuroception. And so, from a polyvagal perspective, mindfulness practices are essentially neural exercises that broaden the ability of the VVC to govern a person’s current neural state, which promotes (among other things) resilience (Poli et al., 2021, p. 11). Indeed, recent research has begun to show what the Buddha began teaching 2600 years ago, and what mindfulness meditation practitioners already know through experience, and that is that (among other things) these teachings comprise a range of practices whose aim is to improve autonomic regulation, which “provides greater psychological and physiological flexibility and tolerance by leveraging emotional reactivity and ameliorating the physiological reactivity threshold” (p. 11). Put more plainly, when we are anchored in the regulating energy of the VV state, the ANS is in balance, and “we experience the sense of well-being that comes with a feeling of healthy homeostasis. And in times of challenge, we are able to reflect (rather than react), collaborate, and communicate” (Dana, 2021, p. 54).

What both perspectives are describing is a type of attention and training that allows us to become aware of the mind worlds created by our current neural state so that we can make intentional choices to reduce suffering. By “recognizing that a wandering mind can easily get

entangled with suffering and cause harm to ourselves and others, we undertake the training of a focused mind” (Olendzki, 2016, p. 94). Both approaches help hone the intentional deployment of attention through embodied awareness and the cultivation of clarity and emotional balance. In other words, both systems help us wake up to our present moment and make conscious choices to regulate ourselves so that the mind can cease wandering on.

Indeed, recently, the field of contemplative neuroscience has begun to focus on the important role of the ANS and the VVC, specifically, in mediating brain-body functions, as well as taking note of the VVC’s influence on the body-mind connection. And so, investigators have begun to look at contemplative practices through the lens of PVT. For instance, Lucus et al. (2018), used PVT as a framework to understand the role and value of Mindfulness-Based Movement (MBM) as a potential intervention for cancer care and control. Like many contemplative neuroscientists, these authors regarded MBM as a type of neural exercise that broadens the ability of the VVC to govern a person’s current neural state. With MBM, however, the physiological state was understood as being manipulated not only by social engagement and mindfully focused attention but also through movement (p. 6). In this study, the authors proposed that MBM promotes resilience and improves the efficiency and effectiveness of engaging and disengaging the calming VV pathways that adjust cardiac output necessary for movement (i.e., vagal tone/the vagal brake). They also proposed that during calm states in which the SES is functioning, “the social cues from voice and face maintain a physiology of safety characterized by a strong vagal influence to the heart that supports health, growth, and restoration” (p. 6). This aligned with earlier research by Fredrickson (2001), who showed that social connection facilitates positive affect, which increases the calming effect of the vagus on the heart.

Here, two things start to become clearer. First, mindfulness can have a beneficial impact by helping practitioners attune to and intervene with the functions of the ANS via the vagal brake (helping to develop our *smart vagus*). And second, mindfulness practices can influence the entire sweep of ANS functions as defined by the PVT including—importantly, the SES.

Mindfulness of the Body

One of the paradoxes of mindfulness is that it is accompanied by a deep sense of embodiment. “We feel expanded beyond ordinary boundaries while feeling most close to ourselves” (Hermans & Geiser, 2012, as cited in McCown & Ahn, 2015, p. 67). In the Satipaṭṭhāna Sutta, the Buddha’s discourse on mindfulness, the body was understood to be the first gateway to establishing mindfulness. In his book, *Mindfulness: A Practical Guide to Awakening*, which interprets this sutta for practical use, Joseph Goldstein (2016) tells us, “The Buddha spoke of mindfulness of the body as being the basis for every kind of accomplishment and for leading onward to nibbāna, to awakening” (p. 84). After the Buddha’s death, his cousin and close attendant for many years, Ānanda, was said to remark that, “mindfulness of the body can truly be considered one’s best friend. In the midst of endless thought proliferation, of emotional storms, of energetic ups and downs, we can always come back to just this breath, just this step” (p. 84). In this way, the body becomes the site where thoughts and emotions can be explored and deconstructed by bringing attention to the experience of the present moment, particularly at an embodied, sensory level. “After all, one can only feel the body in the present moment” (McCown & Ahn, 2015, p. 50). This is why a mindfulness curriculum like Mindfulness-Based Stress Reduction (MBSR) emphasizes bringing participants to embodied experience in the first few classes, starting with the body scan practice and other explorations of sensory, proprioceptive, and interoceptive experiences (p. 49). This means that not only does

deep embodiment accompany mindfulness, but it is also one of the central pathways through which it is established.

This connects directly to PVT, which views life as a sensory experience. Indeed, Porges (2011) observed that “during every moment of our lives, we experience the world through our varied sensory systems. Sensory experiences drive our behavior and contribute to the organization of our thoughts and emotions” (p. 75). Because, as I have established, the vagus is not merely a cranial nerve meandering through the periphery, one of its functions is to constantly monitor the state of the visceral system and send up homeostatic parameters to the brain. In fact, the information carried along our vagal pathways travels in two directions, with 80 percent flowing from the body to the brain and 20 percent flowing from the brain to the body. So, “when we are disconnected from our bodies, we are also disconnected from the ability to tune in to the important information being sent from the body to the brain through the vagal pathway” (Dana, 2021, p. 42). And by processing information from the environment through the senses, the vagus also functions as a sentry that is continuously evaluating risk, distinguishing whether situations or people are safe, dangerous, or life-threatening (Porges 2011, p. 247). This is why the vagus has been characterized as the “great wandering protector” (Gerritsen & Band, 2018, p. 6).

In a related way, the Buddha taught that mindfulness acts as the guardian of the sense doors by keeping us aware of what is arising through the senses (including our thoughts) and helping us to not get lost in the proliferation of desires. While we are all tossed about by the waves of endlessly changing conditions and the worldly vicissitude of life, when mindfulness of the body is developed, we can ride these waves with balance and ease (Goldstein, 2016, p. 463). So, while our nervous system is continually monitoring our visceral state and evaluating risks in the environment through the senses, mindfulness of the body teaches us to monitor (among other

things) the information coming from our nervous system. And by turning toward these experiences with curiosity and compassion we can regain the ability to respond rather than simply react, which in turn leads to feelings of self-efficacy and well-being (Kabat-Zinn, 2013; Dana, 2021).

Mindfulness of Breathing

One of the most important aspects of mindfulness of the body, and where it intersects directly with PVT, is mindfulness of breathing. In the Satipaṭṭhāna Sutta, the Buddha gives a series of progressive instructions regarding the breath as the first of the contemplations on the body (Goldstein, 2016, p. 91). The humble breath is a good object of meditation because everyone breathes, the breath is always present, and it leads to both deep concentration and penetrative insight. The breath is also useful for stabilizing our wandering mind because it is the antidote to distraction and discursive thoughts (p. 92). And the Buddha said that when developed and cultivated, mindfulness of breathing is of “great fruit and great benefit” (p. 91) and can take a person all the way to the “true knowledge and deliverance” (91) of enlightenment.

From a neurophysiological standpoint, the breath, which is controlled by the ANS, has the important quality of being both an automatic process and one we can intentionally manipulate. This allows it to be a direct pathway to our ANS (Dana, 2021, p. 217). In fact, one of the most important functions of the vagal brake is that it regulates our respiratory rhythm by subtly releasing and reengaging with every breath cycle. "On each inhalation the vagal brake offers a slight release and the heart rate speeds up just a bit, and then on the exhalation the vagal brake reengages, and the heart rate returns to a slower beat” (p. 46). This makes the breath via the vagal brake one of the most important doorways through which we can interact with and

influence not only our autonomic states but the mind worlds they help create. And this is one of the reasons it is such a key part of mindfulness practice.

In recent years, the importance of this connection between breathing, the vagus, and mindfulness and meditation practices has come to the attention of contemplative researchers. In 2018, Gerritsen and Band attempted to reveal some of the underlying mechanisms leading to the positive effects of contemplative activities (what they call ContActs), primarily through examining the role of the vagus nerve and breathing. Through a careful review and analysis of the overlapping patterns of specific phenomena related to practices such as meditation, yoga, and tai chi chuan, they proposed a neurophysiological model that explained how the specific respiration styles used in these practices could operate, by “phasically and tonically stimulating the vagal nerve: respiratory vagal nerve stimulation (rVNS)” (p. 1). They concluded that “The vagal nerve, as a proponent of the parasympathetic nervous system (PNS), is the prime candidate in explaining the effects of contemplative practices on health, mental health and cognition” (p. 1). And while they were not able to definitively prove a causal link between breathing, vagal nerve stimulation (VNS), and improvements in body and mind, there was ample evidence suggesting the existence of this link (p. 16).

In general, when looking at breath patterns, longer, slower breaths bring more ventral vagal energy, rapid or irregular breathing (sharp inhalations or exhalations) increases sympathetic activity, while matching the length of inhalation and exhalation maintains a state of autonomic balance (Dana, 2021, pp. 218-219). Contemplative practices use breathing techniques ranging from slowing down respiration cycles, shifting to longer exhalations compared to inhalations, diaphragmatic breathing, stimulating faster respiration patterns, or paying attention to natural breathing. In their review, Gerritsen and Band (2018) found that slow and deep

breathing with an emphasis on long exhalation was dominant across traditions, including Buddhist traditions such as Zen and Vipassana. This sort of respiration stimulates vagal functioning which results in PNS over SNS dominance and structural and functional changes in higher cortical areas, all of which have been associated with beneficial effects in cardiopulmonary fitness, immune function, psychological health, stress, anxiety, and executive functions (p. 15).

What is interesting about Gerritsen and Band's (2018) study is that it was one of the first devoted to revealing the mechanism underlying reported benefits of ContActs and suggesting a neurophysiological explanation for these benefits centering on PVT. Up until this review, most research on ContActs had focused on investigating outcomes and understanding different aspects of ContActs, rather than trying to understand what, specifically, might be creating those outcomes. And while this extensive review did include, among other things, the idea that body perception is also uniquely central in affective processing and the sense of self (p. 5), because this study looked for neurophysiological "mechanisms" (p. 2) to produce a neurophysiological model, it did not consider the more social (or subtle) aspects of ContActs, such as those associated with the SES (including feelings of safety and connection), which are also central to PVT. And while the authors did nod to the fact that many of the contemplative traditions they studied are not practiced in isolation, but in group sessions, and that social, and even physical, contact could be a factor in the beneficial effects of contemplative practices (p. 15), they did not explore group effects on breathing (their own focus), nor did they examine any other aspects of group contemplative practice including the VV system's role in safety, regulation, and co-regulation and how—with training and over time—these can improve vagal tone and build resilience (Dana, 2021, p. 7). Furthermore, as I will explore in the next section, the breath is also

intimately linked with the SES because it affects our vocal communication, which becomes particularly relevant when considering practices with a vocal component (i.e., instruction, guidance, chanting, etc.).

The Buddha's instructions on mindfulness of breathing, however, start with the simple awareness: "As we breathe in, we know we're breathing in; when we breathe out, we know we're breathing out" (Goldstein, 2016, p. 92). Simple, though perhaps not so easy at first, because when we focus on our breathing like this, the mind tends to get carried away by plans and memories and judgments and comments—all the kinds of mental proliferations which make up our mind worlds. But, as Goldstein reminds us, each time we notice our attention has wandered, in this part of the practice, we simply gently let go and begin again (p. 92). When we focus on our breathing like this, we begin the process of bringing our attention into the body and noticing that there is a body and that it is breathing. This begins to shift our awareness toward the 80 percent of the information that flows from the body to the brain through the vagal pathway.

The second set of instructions the Buddha gives on mindfulness of breathing is: "Breathing in long, one knows, 'I breathe in long.' Breathing in short, one knows, 'I breathe in short'" (Goldstein, 2016, p. 92). The idea here is not to control the breath in any way, but simply to notice how it is. "We are just being mindful of how each breath presents itself, whether long or short. This instruction is a reminder that this is not a breathing exercise, but a training in mindfulness. Any kind of breath will do" (pp. 92-93). When we focus on our breathing like this, we begin to notice what the breath is like in the body in this moment—long or short? This further strengthens our ability to tune into the important information being sent from the body to the brain along the vagal pathway. In fact, the Buddha's next set of instructions is to breathe in and out experiencing the whole body (p. 96), which can mean feeling the whole body as we breathe

or feeling the "breath body" (p. 95) by experiencing the beginning, middle, and end of each breath. Either way, this practice shifts us from noticing to training. Here, we feel the breath and feel the body and feel the breath in the body and as the body, all of which help to strengthen our awareness of the sensations of the body and the ever-changing nature of these sensations.

The Buddha's last instruction on mindfulness of breathing is training in calming the bodily formations with each breath. "Sometimes just softly repeating the words "calm, calming" is helpful in tranquilizing the breath" (Goldstein, 2016, p. 96). This is an example of how, in the most basic way, mindfulness of breathing trains our attention, and how our attention trains our body. "As the breath is calmed, the body becomes more still, and as the body posture becomes still, the breath itself is calmed. These two approaches interweave and support each other" (pp. 96-97). The PVT understanding of this is that paying attention to breathing like this engages the vagal brake and improves vagal tone in a way that fosters physiological balance and promotes health, growth, and restoration. So, calming the breath literally calms the body, and calming the body literally calms the breath, especially when we pay attention. In fact, the roots of PVT emerged when Porges (2011) observed that when people focused their attention on task demands, their beat-to-beat heart rate pattern stabilized (p. 3). This underscores not only the beneficial effects of mindfulness of breathing but also that it is not merely the mechanism of breathing but paying attention that shifts our autonomic state. This, in turn, shifts our mind state. Thus, we see the entire cycle of paying attention to the breath shifting our autonomic state (calming the body) cycling up to our brain (calming our thoughts) and calming our thoughts cycling down to calm our body. And this is how being mindful of our breath promotes greater bidirectional communication between brain and viscera, and how this practice ultimately allows us to influence and change our mind worlds.

Indeed, mindfulness of breathing goes much farther than simply calming the body. Certainly, resting in VV regulation is restorative and feels good (Dana, 2021, p. 44), and being attuned with the body is an important part of the shift towards embodiment. But the refinement of the breath can also become the vehicle for a further refinement of mind (Goldstein, 2016, p. 94). When we meditate on our breathing and simply notice when our mind wanders, bringing it back gently, again and again, we are training ourselves to recognize how our mind works. We notice what it feels like to be in VV regulation. We recognize when we make a shift from the swirl of mental proliferations to *just this breath*. We realize that our mind worlds are not rigid or fixed and in fact change over time. “As mindfulness and concentration get stronger, we...see for ourselves that what appears solid and stable is really insubstantial and in constant flux” (p. 65). We learn to savor each moment of consciousness and look closely at its texture and nuance (Olendzki, 2010, p. 97). And we discover we can shift our mind worlds and develop new ones by making intentional choices about what we pay attention to and how.

As an example of what I mean, PVT sees compassion and self-compassion as emergent properties grounded in our capacity to be in a state of VV regulation (Dana, 2021, p. 267). “Since survival states automatically activate self-criticism, when we move out of safety and connection into a state of protection, we lose the capacity for self-compassion” (p. 66). And because mindfulness of breathing can serve as a platform for VV regulation, it is one of the places we can develop our capacity for these benevolent states. “When meditating, it does no good and some harm to blame yourself for your attention wandering off the breath, or to get annoyed at the person behind you for coughing” (Olendzki, 2016, p. 227). In fact, like the interconnected relationship between breath and body, the capacity to rest in VV regulation and to experience compassion interweave and support each other. And both capacities can increase with

time and practice because repeated conscious awareness of positive affect from relational experience has been found to enhance vagal tone and act as a powerful enabling force in promoting positive well-being (Kok & Frederickson, 2010). In other words, “as our ability to anchor in the ventral system deepens, so will our capacity for compassion” (Dana, 2021, p. 271). And while stand-alone compassion and self-compassion practices have become increasingly popular in recent years, leading to a steadily growing number of research articles and trainings, early Buddhist discourses understood that the meditator arouses the mental state of compassion in order to dwell with the mind imbued by it (Anālayo, 2021). In other words, compassion and self-compassion are part of mindfulness practice, itself. And we can see this each time we notice the attention has wandered off the breath. Instead of being swept into dysregulation, we can move into a moment of awareness and bring compassion to ourselves and to the fact that we have a body-mind system that works like this. And, as we develop a mind imbued with benevolent attitudes including compassion and self-compassion, our capacity to rest in VV regulation deepens. This is how mindfulness of breathing helps to simultaneously develop and deepen both regulation and compassion.

And all of this is how mindfulness of breathing connects us with our common humanity because breathing and the ANS are common denominators in our human experience. Not only because we share this phylogenetic heritage with all other human beings, but because (as I will explore in the next session) the breath is intimately connected with our SES in that it allows us to feel a sense of connection with others and to “see others as we are ourselves” (Dana, 2021, 271). Each time we notice the flicker of annoyance at the person coughing behind us when we are meditating, instead of being swept into dysregulation by the *distraction* of the mind wandering, we can move into a moment of awareness and bring compassion to the fact that *we all* have a

body-mind system that works like this. And this is why the vagus is sometimes called the compassion nerve (p. 266), and perhaps why the Buddha said that mindfulness of breathing, when developed and cultivated, leads to pleasant dwelling in this very life (Goldstein, 2016, p. 98).

It is important to remember, though, that because the breath is a direct pathway to our ANS, it is not only a regulating resource but also an activator of our survival states (Dana, 2021, p. 217). This is why, for many people, breath practices can be a cue of danger. “Changing the rhythms and cycles of breathing can quickly begin to shift our autonomic state” (p. 218). As I have shown, even the act of simply noticing the breath slows and deepens it a bit. And for some, as they begin to breathe just a bit slower or take a slightly deeper breath, instead of finding the way to safety and regulation, they may drop into disconnection and collapse (p. 218). “When we get pulled out of ventral safety and connection and get lost in a place of dysregulation, we move from flexibility to rigidity and feel the effects of a nervous system that is stuck in the intensity of sympathetic mobilization or dorsal shutdown” (pp. 53-54). And this is when we feel distress. Recognizing that people can experience such different reactions using this doorway to mindfulness and meditation, we can start to appreciate the great range and importance of the Buddha’s ability to tailor his teachings to the particular audience he was addressing through skillful means (Goldstein, 2016, pp. 82-83). Because “Meditation accesses the flow of experience, upon whose leading edge our world and our self gets formed” (Olendzki, 2010, p. 106), teaching people to navigate these complex waters safely requires great skill and care to meet each individual exactly where they are in the present moment. While we all share a common phylogenetic makeup, each of us arrives at the present moment with our own set of experiences and histories. “The myriad moments we have experienced, from loving and joy

filled to scary and hurtful, are woven together and create a particular design. Depending on our personal histories, we build stronger patterns of connection or stronger patterns of protection" (Dana, 2021, p. 136). The good news is that no matter how our lives have been shaped and influenced by our prior conditioning, each new moment presents an opportunity for awareness, which in turn opens new possibilities for health, healing, and change.

Inner/Outer/Between

Another important place where the Buddha's teachings on mindfulness align with PVT is the importance the Buddha placed on attending to--and ultimately transcending--the simple dualisms of inner/outer, mind/body, self/other. In the Satipatthāna Sutta, the Buddha reminds us again and again that an essential aspect of mindfulness practice is contemplating our experience internally, externally, and both (Goldstein, 2016, p. 56). In what does not seem like a coincidence, neuroception also "follows three streams of awareness: inside, outside, and between" (Dana, 2021, p. 30). From a Buddhist perspective, contemplating internally means, for example, being aware of the present moment and the sensations arising in the body such as those associated with breathing, or sensations of heat or cold, tightness or pressure (Goldstein, 2016, p. 58). According to PVT, inside listening happens as neuroception attends to what is taking place inside the body—heartbeat, breath rhythms, muscle action—and inside the organs, especially those involved with digestion (Dana, 2021, p. 30). Here, it seems clear that contemplating our experience internally, especially when applied to mindfulness of the body, means bringing awareness to our neuroception. And so here we can follow the Buddha's instructions to establish mindfulness that "there is a body" (Goldstein, 2016, p. 67) to the extent necessary for bare knowledge and continuous mindfulness. This quality of bare attention means observing objectively without getting lost in associations and reactions. "It's the simple and direct knowing

of what's present without making up stories about experience" (p. 67). In other words, it is paying attention to the sensations of the body without getting lost in the mind worlds that so often accompany them.

Next, Goldstein (2016) tells us that contemplating the body externally can begin with being mindful of the bodily actions of others when they draw our attention. And then, "we can be mindful of their movements without getting distracted or lost in judgments about them" (p. 58). In a similar way, outside listening, according to PVT, begins in our immediate environment, with our physical bodies, then expands out into the larger world to include the environment where we are located (Dana, 2021, p. 30). Here, again, is a place where mindfulness of the body serves as a platform from which—resting in VV regulation, we can begin to expand our awareness outwards.

From a Buddhist perspective, "The emphasis on mindfulness both internally and externally keeps things in balance" (Goldstein, 2016, p. 192). In this way, we do not become overly self-centered or self-absorbed, forgetting the context in which we are living, nor do we become so caught up in the externals that we miss what is happening in our own bodies and minds (pp. 193-194). From a polyvagal perspective, because the vagal system deals both with servicing the needs of the internal viscera and with responding to external challenges, adaptive behavioral strategies and homeostasis can be seen as the ability and competence to trade-off between internal and external needs. "Based on this model, homeostasis and response strategies to environmental demands are interdependent" (Porges, 2011, pp. 104-105). And so, when we practice mindfulness of the body internally and externally, we practice becoming aware of what each autonomic state feels like and what it feels like to shift between autonomic states. Moving out of VV regulation into SNS or DV dysregulation and back again is not a problem. "In fact, the

goal is not to stay in a state of regulation but rather to...recognize when we're moving out of regulation and being pulled into a survival response and be able to return to regulation" (Dana, 2021, p. 53). Each time we notice we are moving toward dysregulation and practice shifting back to regulation, we are engaging the vagal brake and strengthening our vagal tone. This makes it easier to do it again the next time. And this is how and why the ability to flexibly move between these three states promotes well-being and resilience (p. 53). And all of this serves as the platform and practice through which we can explore the other three foundations of mindfulness: mindfulness of feelings, mindfulness of mind, and mindfulness of dhammas (categories of experience).

And being mindful of the body externally has another advantage. As Goldstein (2016) points out, when we are mindful of someone else moving very carefully, without distraction, we become more concentrated ourselves. "This is one reason the Buddha suggested that we associate with those who are mindful and concentrated: it's contagious" (p. 60). This leads to the third way of contemplating our experience, being mindful internally and externally--both. "Being mindful internally, externally, and both reminds us of the comprehensive nature of mindfulness practice—to be aware of whatever there is, whether it is within us or without. And, in the end, to go beyond this division altogether" (p. 60). PVT also recognizes a "third stream of awareness, listening between" (Dana, 2021, p. 31) as the way our nervous system communicates with other systems one-on-one or with a group. This points to the SES, which, as I have described, involves pathways traveling through several cranial nerves that regulate the expression, detection, and subjective experiences of affect and emotion (Porges, 2011, p. 269).

According to PVT, as mammals evolved from more primitive vertebrates, a new circuit emerged to detect and to express signals of safety in the environment (e.g., to distinguish and to

emit facial expressions and intonation of vocalizations) and to rapidly calm and turn off the defensive systems (via the vagal brake) to foster proximity and social behavior (Porges, 2011, p. 269). This recent neural circuit, known as the SES, has a control component in the cortex (i.e., upper motor neurons) that regulates brainstem nuclei (i.e., lower motor neurons) to control eyelid opening (e.g., social gaze and gesture), facial muscles (e.g., emotional expression), middle ear muscles (e.g., extracting human voice from background noise), muscles of mastication (e.g., ingestion), laryngeal and pharyngeal muscles (e.g., vocalizing, swallowing, breathing), and head-turning and tilting muscles (e.g., social gesture and orientation). All of this is connected to the vagal brake, which slows heart rate and lowers blood pressure, which (by actively reducing autonomic arousal) promotes the calm states necessary to express social engagement behaviors and to support health, growth, and restoration (p. 270). These “phylogenetic principles illustrate the emergence of a brain-face-heart circuit and provide a basis for investigating the relation between several features of mental health and autonomic regulation” (p. 266). If we go down the list of muscles regulated by the SES (eyes, face, mouth and jaw, back of the head, neck and upper back) we see many of the places where people regularly hold tension, as well as places we routinely focus our attention when meditating. Considering these places in the body are linked directly with components in the brainstem and cortex, it is easy to see how paying attention to, and softening these parts of the body, can have an immediate calming effect.

More importantly, beyond the mechanistic relaxation of muscles and calming of the heart, PVT posits that as a collection, these muscles function as neural gatekeepers detecting and expressing features of safety (e.g., prosody, facial expression, head gestures, eye gaze) that cue others of intention and control social engagement with the environment (Porges, 2011, p. 270). And I think this gatekeeping duty is one aspect of the SES that gets invited to shift when we

meditate, because “the same neuroendocrine and autonomic systems that permit high levels of social behavior and social bonds regulate the management of stressful experiences and the capacity of the mammalian body to heal itself” (p. 296). From my understanding of PVT, it seems like the practice of putting down the need to engage with others for some minutes while still being engaged and alert requires us to find balance between the energies of all three autonomic states (VV, SNS, DV) so that we can pay more attention to the inner/outer/between environments without becoming overwhelmed.

When I meditate, the facial muscles around my eyes are invited to relax (either closed or softly focused on nothing of interest), my ears become more attuned to the environment, my head, neck, and face muscles relax because they are no longer required to send or receive messages of social engagement. This is particularly true when I meditate alone. And meditating alone offers me an opportunity to cultivate my own sense of safety and regulation. And to notice that I am doing so. And all of this steadies my heart rate, breathing, and blood pressure via the vagal brake. It is no surprise, then, that the first of the four ways the Buddha gave for establishing mindful awareness was to focus on the sensations of the body, including the sensations of breathing or sound or other parts of the SES because doing so taps directly into the physiological mind-brain-viscera communication that is considered by PVT to be the royal road to affect regulation (Porges, 2021, p. xvi).

No Self. Nevertheless, “because states of immobilization for mammals are periods of vulnerability” (Porges, 2011, p. 181), resting in stillness means opening the door to experiencing the complex feelings that come with contacting the most primitive component of our ANS (the DV) and getting comfortable with immobilization or “death feigning” (p. 16). Indeed, “the ability to become still without stimulating a survival response is a complicated and challenging

process” (Dana, 2021, p. 274). From a neurobiological standpoint, stillness is a blend of autonomic states where the two branches of the vagus, the oldest dorsal and newest ventral, work together so we can immobilize without fear.

The ventral state brings us alive and into connection with passion, ease, and calm, while the dorsal state brings survival through numbing and collapse. It’s only when these two vagal pathways—the ancient energy of immobilization and the new energy of connection—join together that we can experience becoming safely still. (Dana, 2021, p. 274)

From a Buddhist perspective, when we practice “mindfulness internally, externally, and both internally and externally, we begin opening to the understanding of *anattā*, the empty, selfless nature of feelings and all experience” (Goldstein, 2016, p. 193). This dissolving of the distinctions between inner and outer takes us beyond the ordinary and transports us across a boundary to what might be thought of as “the sublime” (McCown & Ahn, 2015, p. 64). Here, as we let go of our “mind-created concept of self” (Goldstein, 2016, p. 299) we become more open to experiences that can range from blissful to terrifying (and everything in between). It is here we can approach and be with/in aversive experiences of physical and emotional pain and suffering. And here, also, we can open to a contradictory or paradoxical sense of pleasure (pp. 64-65). “...when the senses are filled to their capacity by conscious awareness, one loses oneself. While this sounds threatening in principle, most people actually cherish the rare moments of heightened awareness that often accompany such a “loss of self”” (Olendzki, 2016, p. 295).

Viewing these experiences through the lens of the ANS, we can see that while the sympathetic system brings mobilizing energy, the VV system, through the actions of the vagal brake, brings regulation and infuses us with positive emotions such as awe, compassion,

gratitude, and love (Yaden et al., 2017, p. 152) which we feel first toward ourselves and then outward to others, the world, and beyond. “In these moments, we move beyond our singular self into a deep sense of interconnection. We feel a sense of oneness with people and the planet” (Dana, 2021, pp. 258-259). This dissolving of the distinctions of inner and outer comes when all three autonomic states can join together in safety and balance. And it is mindfulness--the turning towards and being with/in experience—that makes abiding in these powerful moments possible (McCown & Ahn, 2015, Martin et al., 2021).

All of this connects back to mindfulness of the body and mindfulness of breathing. When we meditate, we can observe our breath as it enters and exits the body, going from inner to outer. Then, as concentration grows, we can investigate the place where the breath transitions from being separate to being part of the body and where it transitions from being part of the body to separate again. Eventually, as mindfulness and concentration grow even stronger, we can investigate the place where this differentiation and separation dissolves, becoming inner, outer, and both. This is yet another way mindfulness of the breath not only connects us with the body but underscores the body-mind’s both/and ever-changing nature. When we experience the impermanence of phenomena, internally, externally, or both, we also understand their unsatisfying and selfless nature. “We can then see for ourselves the obvious truth that when we cling or hold on to that which changes, we suffer” (Goldstein, 2016, p. 659). On the relative level, we live and act and relate as individuals, one with another, with all our personal mind worlds and personal histories. “On the ultimate level, there’s no self, no “I,” no one there at all” (Goldstein, 2016, p. 131). We are *both* separate *and* part of everything. In this ever-changing world we dwell moment to moment as inner, outer, both/and between.

Group Practice and the SES. Expanding on these ideas, PVT also posits that “our capacity to heal ourselves is physically linked to our relationships with other people” (Porges, 2011, p. 295), and that person-to-person interactions that trigger neural circuits promoting calm physiological states can also contribute to health, healing, and growth. As an example of how this works, “the neural pathways regulating the orbicularis oculi, a sphincter muscle around the eye involved in expressive displays, also are involved in the dynamic regulation of the stapedius muscle in the middle ear” (p. 249). This means the neural mechanisms associated with emotional cueing via eye contact are shared with those needed to listen to the human voice. Furthermore, by modulating laryngeal and pharyngeal muscles to regulate intonation of vocalizations (prosody) and coordinating both facial and vocal motor tone with respiratory actions, “the frequency of breathing is encoded into the phrasing of vocalizations, which--independent of the content of speech--may express meaning” (p. 288). For instance, urgency may be conveyed by short phrases associated with short exhalations (i.e., rapid breathing), while calmness would be conveyed by long phrases associated with long exhalations (i.e., slow breathing) (p. 289). This is particularly significant when we consider teachings that include vocal instructions or chanting. Because, according to PVT, the vocal prosody of the words may be at least as important as the words, themselves, for determining whether people feel safe and connected with VV regulation. And here is where the meeting of the SES and mindfulness and meditation practices gets particularly interesting because it is here that the *between* of neuroception involves co-regulation, or regulation between nervous systems (what Goldstein (2016) termed “contagious” (p. 60)), which is a central component of the SES and PVT.

The question then becomes, what happens when we practice mindfulness and meditate together? Indeed, as Goldstein (2016) pointed out, the Buddha suggested that we should

associate with those who are mindful and concentrated, and the Buddha reportedly said that “admirable friendship, admirable companionship, admirable camaraderie is actually the whole of the holy life” (Thanissaro, Bh., Trans., 1997). This is often overlooked in Western mindfulness, where our emphasis tends to be on individual practice and individual outcomes. But “while the world seems to be increasingly focused on self-regulation and independence, co-regulation is the foundation for safely navigating daily living” (Dana, 2021, p. 32). This may be why Mindfulness-Based Programs (MBP's) such as Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT) were originally designed to be delivered in groups (Griffith et. al. 2019, p. 1315) with each course being a unique, co-creation between individual members in relation to each other, to the group, and the group and individuals in relation to the teacher (McCown, 2016). And this may also explain some of these programs’ successes.

But even though most mindfulness research has used group-based interventions, this research has largely overlooked the role of group practice, itself (Griffith et. al., 2019). And even fewer studies have looked at group outcomes. Indeed, “the fact that we learn mindfulness together, that mindfulness is a relational achievement, has been obscured for decades in the scientific literature” (McCown, 2016, p. 11). This may be partly due to Kabat-Zinn (2013) grounding MBSR within a culture of education rather than therapy—the sessions are termed “classes” (Griffith et al., 2019, p. 1316) and the facilitators are “teachers” (p. 1316), and partly due to a research focus on the outcomes of mindfulness training for individuals, such as effects on depression and well-being, and that existing group process research is largely embedded within a psychotherapy context and thus does not directly relate to the skills-based, psycho-educational MBP context (p. 1316).

Nevertheless, as teachers of mindfulness programs know, “the way the group process is managed has a profound influence on the quality of participants’ experience and learning” (Griffith et. al., 2019, p. 1315). Under optimal conditions, group mindfulness practice, as seen through a polyvagal lens, facilitates a neuroception of familiar individuals and individuals with appropriately prosodic voices and warm expressive faces that translates into social interactions that promote a sense of safety. And when the environment is appraised as being safe like this, “the defensive limbic structures are inhibited enabling social engagement and calm visceral states to emerge” (Porges, 2011, p. 273). When we learn to experience safety in stillness like this, we find we can “be comfortable with silence, engage in self-reflection, attune with other people and meet them in wordless connection, and be present to the joy of intimate experiences” (Dana, 2021, p. 275). Indeed, in their discussion on group relationality, mindfulness educators McCown and Ahn (2015) observed that “through the practice of mindfulness pedagogy, the group may co-create a “safe” space—peaceful faces, postures, voices, and gestures—helping even those who are struggling for emotional balance to move towards the “social engagement” response” (p. 62). And this response “circulates in the group as through a resonance circuit, making it more possible for participants to be with/in the experience of the moment” (p. 62). Truly, sometimes being around others who are peaceful and regulated is the very thing our nervous system needs to remember how to come back to VV regulation and balance because we are literally “wired for connection” (Dana, 2021, p. 15).

Support for all of this can be found in Lucas et al.’s (2018) study that used PVT as a framework for understanding the role and value of Mindfulness-Based Movement (MBM). In essence, these authors hypothesized that mindful awareness is mediated by regulating the VV as a person “totally embraces the present moment through movement in space” (p. 12). Their

findings suggested that MBM promotes the experience of a heartfelt connection between participants by providing a safe and supportive environment where participants could share their experiences (with others who can relate to and empathize with one another), and by providing a specific set of tools and techniques for breaking up periods of immobilization (so that participants had opportunities to move within a social and physical environment). They concluded that MBM aims to teach participants how to self-regulate their behavior by first developing an awareness of their experience and then applying those skills (p. 12). They believe that too often, physical activity and engagement with life are experienced as a series of things *to do* on the treadmill of living productively, “rather than an experience of *being* a part of life, fully engaged and playfully connected in an embodied and relational manner in moment-to-moment existence” (p. 12). Additionally, they emphasized that attunement included not only being attuned with our bodies as we move (inner) or attunement with the physical environments in which our lives are embedded (outer) but also attunement with another person in an experience of mindful awareness (between).

Likewise, Poli et al.’s (2021) recent systemic review of the scientific literature using a polyvagal perspective to identify common psychophysiological mechanisms underlying the beneficial effects of mindfulness and compassion practices found that many of the processes associated with mindfulness and compassion practices--such as listening, chanting, breathing, shifting posture, and facial expressivity—not only promoted parasympathetic activity and increased vagal tone but also recruited the SES through cues of safety, such as a quiet environment and “the presentation of prosodic vocalizations (e.g., chants) in the frequency band that would overlap with the vocal signals of safety that a mother uses to signal safety to her infant” (p. 12). These researchers concluded that feeling safe in an environment that provides

sensory cues that—via neuroception—down-regulate defense and establish calm (i.e., resting in a ventral vagal state) promotes emergent properties that can lead to a greater capacity to feel and express presence and compassion, and that the learning strategies for self-regulation may help individuals improve their relationship to suffering (p. 12).

The Middle Way

All of this points to one of the most important concepts the Buddha gave us, one that was revolutionary at the time and still seems so today, and that is the idea of the Middle Path or the Middle Way. “The Buddha’s way of life was the result of his effort to focus on regimes of mind-body training that would eliminate the [grasping], [aversion], and [delusion] that negatively affect most people’s lives” (Wright, 2020, p. 15). Before achieving enlightenment, the Buddha spent many years experimenting with different forms of indulgence and austerity as a way to free the spirit. Upon achieving enlightenment, however, the Buddha renounced both these extremes. Implicit in this was a rejection of the common understanding that mind and body were separate, and that spirituality required the mortification of the body to free the mind. In a similar way, by positing an adaptive bidirectional mind-brain-body biobehavioral model of the nervous system, PVT challenges Western science’s implicit mind-body dualism (Porges, 2011). The ANS is literally the middle path between mind, brain, and body. And PVT gives us the functional mechanisms of neuroception and vagal tone/brake vital to understanding how this interdependence works. I believe that not only did the Buddha realize that body and mind are not separate, and that what affects a part affects the whole, and what affects the whole affects the parts, but also that unity and balance is our natural state of being. And this is why the Buddha spoke of mindfulness of the body as being the basis for every kind of accomplishment and for leading onward to nibbāna, to awakening.

Conclusion

Through a dialogue between Buddhism and PVT, I have begun to show how the Buddha's meditation instructions, laid out in the Satipaṭṭhāna Sutta, the Establishment of Mindfulness Discourse can be seen as interventions that both calm visceral state and promote more prosocial interactions. Specifically, through an exploration of Mindfulness of the Body, which focuses on the sensations of the body, including the sensations of breathing and other parts of the SES, I have shown that the Buddha's first way for establishing mindful awareness taps directly into the physiological mind-brain-viscera communication that is considered by PVT to be the royal road to affect regulation. And how this, in turn, can serve as a platform from which—resting in VV safety and regulation--we can begin to explore the other three foundations of mindfulness: mindfulness of feelings, mindfulness of mind, and mindfulness of dhammas (categories of experience). Certainly, these latter three establishments are ripe for investigation through a polyvagal lens. Future research should include studies specifically designed to understand the impact and functions of the SES where they intersect with mindfulness practices, including the important role of group practice (and its impact on and the benefits of group stillness). And more studies should look at the intersection of PVT, mindfulness, and trauma.

Through this exploration and the common theme of wandering, I have shown that while PVT gives us an understanding of how the human nervous system has evolved through the ages, Buddhism teaches us how we can evolve in this very life. “As embodied creatures, we find ourselves with reflexes to pursue what is pleasant and to avoid what is painful” (Olendzki, 2016, p. 78-79). And while this may, indeed, be where our troubles start, it is also where our opportunities to develop begin. When we explore the places where Buddhism and PVT meet and support each other we see how the evolutions of both our individual and common-human selves

go hand in hand. By understanding our nervous systems, we see that they are flexible and dynamic and have a built-in capacity to change, balance, and heal. By practicing the Buddha's teachings, we learn that we can make choices that change our lives in ways that reduce suffering for ourselves, our communities, and beyond. When we learn to take responsibility like this, we start to see that, rather than being a burden, this ability to transform ourselves and the world beginning with our relationship with our own body-mind is where our freedom lies.

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