

Interoception: A Nuanced Look Within

By Neil Pearson

Interoception is an important construct for yoga therapists. Although the brain is always receiving information about the body and its internal processes, we are not always aware of this. Suffering can alter our awareness, while yoga provides an opportunity to enhance it. With practices we refer to as interoceptive, contemplative, or mindful, we can learn to be more aware—or less aware—of individual or of all of our physiological processes. More awareness provokes suffering in some people, and here we learn that all interoception is not the same. Discernment is a key to such practices. As we practice interoceptive techniques of yoga, we can and should consider questions such as, “Is this really dangerous?”, “Is this something more than a fleeting experience?”, and “What happens when I shift into being a detached witness?”

There is no consensus on the definition of interoception. Some refer to it as the perception of our physiological state or the experience of the state of our bodies. Regardless of how it is defined or described, interoception is complex. Like our five better-known senses (sight, hearing, smell, taste, touch), our interoceptive sense is not differentiated completely from other experiences or even by whether a sensation arises from stimuli inside versus outside the body. In their 2016 article “On the Origin of Interoception” in *Frontiers in Psychology*, Erik Ceunen and his colleagues stated the following:

Interoception has in fact come to refer to a multimodal integration not restricted to any sensory channel, not restricted to mere sensations, but also relying on learned associations, memories, and emotions and integrating these in the total experience which is the subjective representation of the body state.

There are many important points to be unpacked in this quote.

- Interoceptive awareness is a multimodal integration of sensation, learning, memories, and emotions. As such, interoception does not allow us to experience the raw data of sensory signals from the body. This does not intend to imply that we cannot become more skilled in awareness of body sensations or more discerning about their importance.
- Interoception is an experience; thus, it will be influenced by past experience and predictions of future experiences.
- Interoception is not restricted to information from the viscera, from homeostatic mechanisms, or from the autonomic nervous system.

Pathway to Awareness

In 2009 the neuroscientist A. D. (Bud) Craig helped us understand interoception diagrammatically in his article “How Do You Feel—Now? The Anterior Insula and Human Awareness,” published by *Nature Reviews: Neuroscience*. The insula, like the anterior cingulate cortex, has been shown to be more active when individuals focus on the state of their body. According to Craig and other researchers, the

dorsal posterior insula receives and processes signals about physiological processes that for the most part occur without our conscious involvement. These can be referred to as homeostatic inputs because they are involved in maintaining physiological balance. The signals originate from A-delta and C fibers, ascend the spinal cord, and relay through the posterior basal medial thalamic nuclei to the insula. Interoception arises after integration of these inputs with many networks of the brain, as can be viewed in Figure 1.

Intriguingly, Craig’s diagram helps provide an explanation for an experience discussed by Cuenen and colleagues. Imagine seeing and feeling snow, but cold sensations are absent. Would the snow feel real? Snow changes the physiological state of your hands and fingers, yet if it did not—even when you could see the snow falling from the sky, smell the new snow, hear it crunching under your feet, and watch it melt in your hand—would you perceive it as snow? This suggests that our experience of our inner state and our experience of the world around us are in at least some situations highly integrated and influential on each other. Research shows that even the facial expressions of others can affect processing of information about one’s own body state, especially for pain.

Interoceptive experiences can be amplified by emotions, especially when we cannot discern the meaning or importance of something that previously carried on below our consciousness.

Interoception and proprioception are also intertwined. Proprioception can be described as our experience of body position and movement, relative to other body parts and relative to external objects and factors such as gravity. Awareness of the existence of one’s upper arm or its muscle tension might be considered interoceptive, while awareness of the position of the upper arm in relation to forearm and shoulder is proprioceptive. If either ability is diminished, it will influence the other.

Making Sense of Signals

Measuring Interoception

Close your eyes for a moment. Start from a place of calm. Decide to be a witness to experience. Without changing anything but your awareness, feel yourself breathing. Stay with that for a few breaths. Be an explorer, curious about the less obvious sensations.

Now shift your awareness to your heartbeat. Maybe you do not feel it in your chest but in other areas of your body. This can be a subtle sensation. It can take some time. Again, be an explorer. Once you find it, imagine moving your finger to match the beat. Let go of this when you are ready.

The accuracy of detecting one’s heartbeat is considered a measure of overall interoceptive accuracy. Awareness of subtle sensations is required, as is differentiating the heartbeat from other physiological processes. Evidence suggests that those who can more accurately detect their pulse are also more aware and discerning, not only of

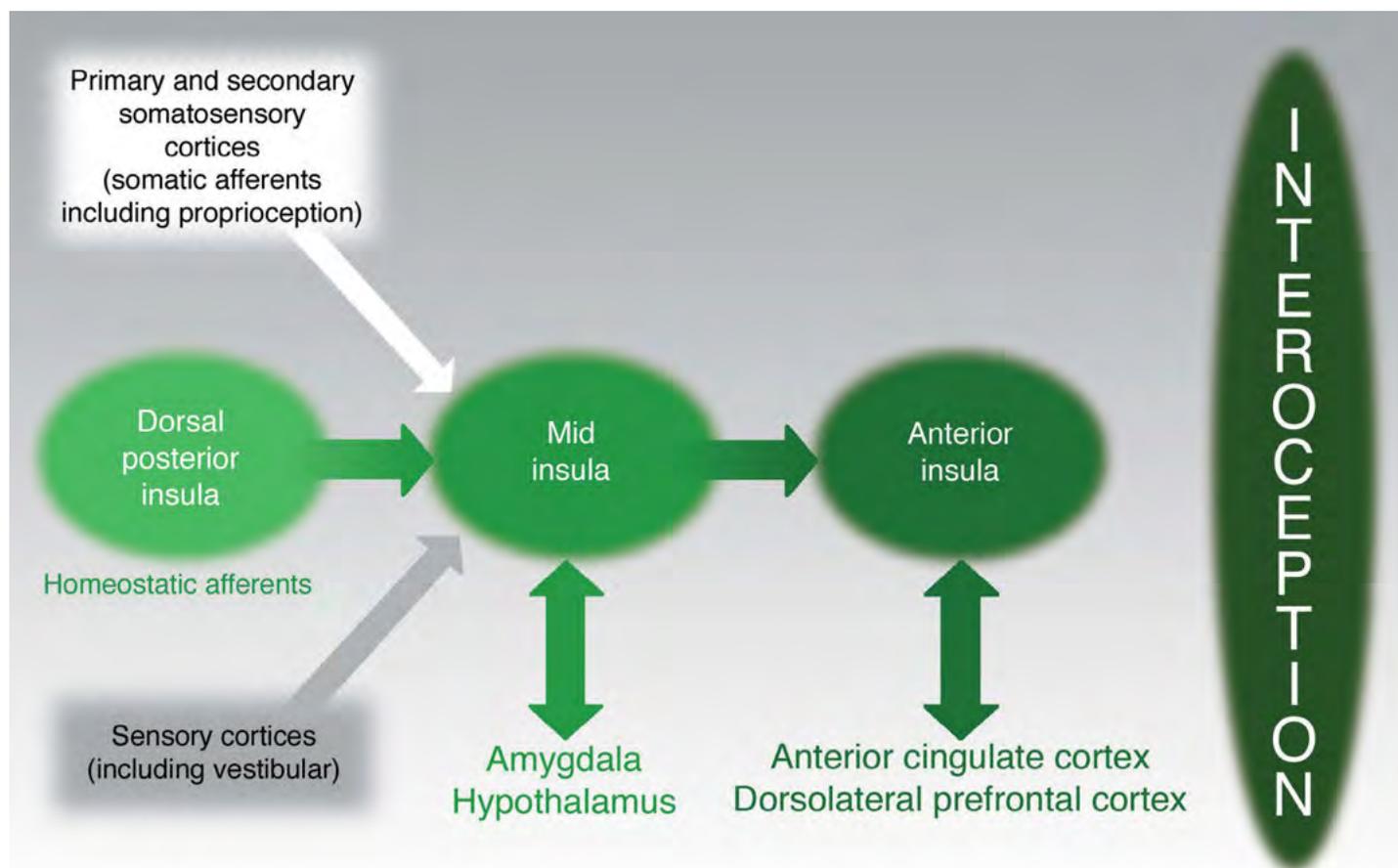


Figure 1. Path of interoceptive processing (adapted from A. D. Craig’s 2009 work mentioned in the text).

their own emotions, but of the emotional state of others as well. Yet such a broad statement might not be consistent with the experiences of individuals, for example, after a recent myocardial infarction or severe angina attack. Interoceptive experiences can be amplified by emotions, especially when we cannot discern the meaning or importance of something that previously carried on below our consciousness.

As we understand it, pain and suffering and interoception are linked. Researchers have shown that pain is an interoceptive process. In 2011, Valery Legrain, PhD, and other researchers demonstrated in “The Pain Matrix Reloaded,” in *Progress in Neurobiology*, that the neural networks engaged when we experience pain and other forms of interoceptive awareness are similar. Therapeutically these interconnections seem more complex. Pain can disrupt the accuracy of interoception such that an area of the body is experienced as distorted, perhaps too small or too big.¹ Other individuals report that they cannot feel anything in the area of pain besides the pain. As if interoceptive awareness of nonpain signaling from the body has been blocked or overridden, the individual understands that the body is still there yet has no other interoceptive awareness of it.

Awareness in Practice

Several years ago, I worked with a woman in her late 60s who experienced a dramatic worsening of pain radiating into her right leg after surgery. Even though the surgery was reported as uncompliat-

ed, this woman’s leg pain had changed from a “line of pain about as thick as a finger” running from her lower back to her big toe before the surgery to her “whole leg being pain” afterward. When I guided her in a simple interoceptive practice of scanning her body for subtle nonpain sensations, she—like most people—found this easiest in her hands and face, but she could also clearly feel sensations in her left leg without moving it. When she focused on the right leg, she reported that all she could feel was the pain.

It took some time and practice, but this client learned how to stay calm while she acknowledged the pain in her leg, then tried to look through it and under it and behind it to find the subtle nonpain sensations. We were trying to create some interoceptive awareness beyond the pain, and she would practice switching from left leg to right to help her know what sensations to look for. Thankfully, she was willing to keep trying, because nothing changed at first. After a few days, though, she reported feeling some vague nonpain sensations in her right leg. She couldn’t discern whether they were more like sensations of where her leg was or just that her leg existed in a way besides pain.

The great news for her, like many others, is that when she felt something other than pain, it felt like the pain became less intense. It was almost as if recovering even a little nonpain interoceptive awareness was associated with less pain. The relief didn’t last long, but she was excited to see where this could go. Over many weeks, she reported recovering interoceptive awareness of the subtle nonpain sensations of her right leg, and she progressed to being able to

almost entirely shut down the pain through a simple interoceptive practice of spending some time calming her breath and mind while scanning through her right leg, acknowledging the pain, and being an explorer for nonpain sensations in her leg.

Three really important points need to be made here.

1. A few weeks into this process, she asked me, “When I find these subtle nonpain sensations and can feel my leg more, am I actually finding the sensations and becoming aware of the signals arising from my body, or am I making them up?” She was perfectly fine with my uncertainty, understood that it would be difficult to prove one way or the other, and wasn’t going to stop something that was helping so much regardless of what we guessed about how it worked.
2. As many patients experience, it is difficult to differentiate proprioception, specifically our sense of where our body is in space or the position of joints, from other physiological experiences. At times it’s easiest to begin with proprioceptive awareness before practicing interoceptive awareness.
3. Acknowledging the pain is an interoceptive practice, as is awareness of the pain’s intensity, quality, and location. Therapeutically these practices are most successful when an individual has some skill and capacity in physiological and psychological regulation. However, anything that draws our attention to experiencing or regulating our physiological state can be referred to as an interoceptive practice.

Import for Wellness

Interoceptive practices are any processes that draws our attention to experiencing our physiological state. As such, techniques that require awareness and those that focus on self-regulation of physiology can improve interoceptive awareness. Research not only shows that interoception awareness and accuracy can be trained but that such practice will increase the thickness of the insular cortex.² Of interest is that in meditators with thicker insular cortices, the intensity of a noxious stimulus required for the individual to refer to their experience as pain can be lower than in nonmeditators—that is, the meditators had a lower pain threshold (not the same as pain tolerance). Tolerance to increasing pain intensity is also higher while meditating versus while not engaged in meditation. This suggests that some changes in interoception do not generalize outside of the period in which interoception awareness is practiced. Related to this, those who practice interoceptive awareness typically only increase interoceptive accuracy to the specific physiological states to which they attend during meditation. The conclusion seems to be that practicing meditation does not create a general increase in interoceptive awareness, yet it can increase accuracy or discernment while in meditation.

Awareness of our physiological state is vital for effective self-regulation, both physiologically and psychoemotionally.³ In business training, we learn that nothing can be managed if it is not measured. In sports psychology, we hear that awareness is the first step in change and progress. When we are suffering, we often lose connection to important physiological experiences. Although we experi-

ence more pain, we become less interoceptively aware otherwise.

At times we misinterpret the state of our physical self. Interoceptive accuracy declines. Other times our attempts at restoring adaptive processes are ineffective. Without interoceptive awareness, accuracy, and discernment, self-regulation becomes difficult.

Building the Skills

When interoceptive awareness, discernment, and accuracy are negatively affected, what do we do?

We practice.

We practice anything that requires bringing our attention to our physiological state: Pranayama. Asana. *Pratyahara* (drawing our awareness inward). *Dharana* (mental focus and concentration). *Dhyana* (meditation or, literally, “moving the mind”). Any mindful movement.

Regardless of how it is defined or described, interoception is complex. Like our five better-known senses, our interoceptive sense is not differentiated completely from other experiences or even by whether a sensation arises from stimuli inside versus outside the body.

Yoga therapy is a process supported by research as a path toward less suffering. Among the many practices, techniques, and constructs within yoga, experience and research evidence demonstrate the importance of interoception. Its importance for safety and prevention during asana may seem clear, yet it holds an equally powerful role in well-being and in decreasing suffering. When experiencing pain, whatever we believe its source, and no matter how intense, interoceptive practices are effective aspects of all yoga therapy plans.

YTT

References

1. Tsay, A., Allen, T. J., Proske, U., & Giummarra, M. J. (2015). Sensing the body in chronic pain: A review of psychophysical studies implicating altered body representation. *Neuroscience and Biobehavioral Reviews*, 52, 221–232. <http://dx.doi.org/10.1016/j.neubiorev.2015.03.004>
2. Lazar, S. W., Kerr, C. E., Wasserman, R. H., Gray, J. R., Greve, D. N., Treadway, M. T., . . . Fischl, B. (2005). Meditation experience is associated with increased cortical thickness. *Neuroreport*, 16(17), 1893–1897.
3. Farb, N., Daubenmier, J., Price, C. J., Gard, T., Kerr, C., Dunn, B. D., . . . Mehling, W. E. (2015). Interoception, contemplative practice, and health. *Frontiers in Psychology*, 6, 763. doi: 10.3389/fpsyg.2015.00763



Neil Pearson, PT, MSc(RHBS), BA-BPHE, C-IAYT, E-RYT 500, is a physical therapist and yoga therapist. He is also a clinical assistant professor at the University of British Columbia. Learn more at www.paincareu.com.