

## TRUST YOUR GUT: HARNESSING THE POWER OF INTEROCEPTION

*By Dr. Ilene Naomi Rusk*



When we ask others “How do you feel?” we’re generally inquiring about both emotions and physical sensations. It’s just one of many often-used expressions that conveys a very real mind-body connection into which researchers are delving even deeper now. This science and physiology of the brain and body awareness is called “interoception” and something that can truly benefit our wellbeing when we learn to harness its power.

Interoception is simply our “perception of the state of the body.”<sup>1</sup> Not to be confused with introspection - the inward reflection on one’s thoughts and feelings - interoception deals with our physical body, our sensations and perceptions. It’s also different from our ability to sense the external world around us (exteroception) and our sense of different parts of our bodies relative to each other and moving through space (proprioception). Interoception instead allows us to “sense physiological signals originating inside the body, such as hunger, pain, and heart rate.”<sup>3</sup>

Neuroscientists and psychologists have long studied our innate abilities to sense our own internal bodily experiences. Interoception provides essential feedback that allows our central nervous system to keep our bodies in a tightly controlled homeostatic balance. Our brains keep track of and make adjustments as necessary to keep our bodily processes running smoothly, from maintaining a constant body temperature to regulating breathing rate, heart rate, hunger, and thirst. We typically think of these processes as subconscious phenomena, but new science shows that your gut feelings are interoceptive sensations that sometimes can act as useful behavioral guides. It’s also another way to build neuroplasticity.

## Going with Your Gut

In the financial markets, “gut feelings” are a common occurrence and an often-employed tactic. New research suggests that our autonomic system’s feedback to our brain can beneficially influence complex decision making. Interoceptive abilities can happen in the gut, but can also result from a sense of the heart, lungs, or other aspects of the body. A recent study investigated the interoceptive abilities of traders making rapid, high-stakes decisions on the markets. The results are shocking: traders who were better at introspection (or interoception?) than the general population did better at trading! They had a greater ability to accurately sense their own heart rate & the more accurately they were able to estimate their heart rate, the more profitable they were.

This study of high-risk decision making on the trading floor is among the first real-world studies linking interoceptive ability to performance. The results sync with previous research showing that people in a laboratory setting were able to make more rapid and optimal gambling decisions with interoception without spending time using conscious reasoning. These studies don’t “prove” that being in touch with your heart rate yields better performance, but they present strong evidence that that an ability to listen to one’s gut leads to better decision making.

Another recent study tested experience-based, risk-taking behavior by virtually inflating a body silhouette, where more pumps into the silhouette yielded bigger prizes. Participants had to learn when to stop inflating and avoid popping the items, which would result in losing the prize. The results showed that higher interoception led to more conservative decision making of the body stimulus, suggesting that people with higher body awareness themselves were more careful making decisions about the body. <sup>7</sup>

There is a strong connection between internal self-awareness and bodily cognition because they both have been linked to interoception processing of body-related stimuli. It turns out that people with high interoceptive abilities showed a stronger memory-guidance of spatial attention towards images of the body compared to images of common objects. <sup>7</sup> We gather from this data that higher interoception means stronger internal somatic awareness and guides our intuition to make better decisions!

Decision making is also influenced by emotion-regulation capacity. Mental clarity is the result of proper emotion-regulation, which can be built up by using interoception techniques. A recent study found that early life adversity, specifically childhood trauma, negatively impacts interoception accuracy. Interoceptive accuracy is strongly related to emotion-regulation, where higher interoceptive accuracy indicates more habitual somatic and emotional awareness. Participants with childhood trauma had lower interoceptive awareness after stressful events, such as a coldpressor stress test, suggesting inefficient brain-body connection. <sup>5</sup> Mastering interoception seems to be crucial for people who have been exposed

to early life adversity, trauma, and related anxieties because body awareness can facilitate the brain-body connection and help with self-awareness and healing.

## The Physiology of Interoception

Where do neuroanatomists think interoceptive abilities live in our brains?

Our brains work as dynamic, ever-shifting networks and pathways that do not easily map to the colored blobs that show up on brain scans. The interoceptive pathways seem to “represent the ongoing status of all tissues and organs of the body, including skin, muscle, and visera.” <sup>2</sup> Sensory neurons that ascend from the body to the brain tell our central nervous system about the condition of the body, triggering signaling cascades that act to correct any perturbations from the delicate homeostatic balance. We experience feelings related to homeostatic balance regularly - we feel hot or cold, feel pain, itch, feel hunger or thirst, muscle aches, or a need to breathe more deeply. <sup>2</sup>

Our internal somatic awareness and our feelings are deeply intertwined: the parts of the brain that make us consciously aware of our emotions depend on the way our brains are representing our physical state. <sup>2</sup> A brain region called the insula is known to play an essential role in the processing of both our emotional awareness and physical body. The multitude of signals given off about the state of our bodies all come up into the insula for processing. The body-emotion link is strong here: we sometimes act on emotions that aren’t linked to subjective feelings - these are perhaps generated by a subtle internal awareness of our internal physical state.

Neuroscientists are interested in how the brain forms these higher order representations of your physical body. While our brains obviously control many homeostatic processes that take place below the level of conscious awareness, the central nervous system also creates a subjective, higher-order perception of the body’s state. While our sense of the body might be elicited by an automatic change to maintain homeostasis, we can also become aware of our bodies at other times. Interoception in this sense happens “from the point in processing onward where there is a higher order integration of information, sensory and neural, taking place to form a body state representation in the central nervous system.” <sup>2</sup> Some brain injury studies point to the importance of interoceptive signals for learning. People with brain damage in a specific area called the ventromedial prefrontal cortex can lose the ability to learn from negative feedback despite retaining IQ. <sup>3</sup>

A recent functional connectivity MRI study revealed that interoception and anxiety states have some overlapping biomarkers. The intensity of interoception is mainly governed by top-down processing of somatic information, while anxiety is mostly related to bottom-up processing in interoceptive attention tasks. The findings point to heavy involvement of cingulo-opercular task control (COTC)

network which transmits interoception to the superior cortex for cognitive control and guides intrinsic arousal involved in attention sustainability. Two other major networks were identified biomarkers for interoception: sensorimotor area (SSM) which is extensively connected to the insula, and the ventral attention network (VAN), which plays a role in attentional trend and processing emotional signals of anxiety. <sup>8</sup> COTC plays a role about equally in anxiety and interoception, but the connectivity within this network may be abnormal for anxiety related sensations compared to interoception. The overlaps in functional connectivity between anxiety and interoception helps us understand that interoception may be a good anxiety treatment since the brain seems to activate similar networks differently.

## Healing Powers

Interoception has long been recognized for its healing potential in healing the body and mind. Enhancing interoceptive abilities may be a way to address mental and physical health problems and increase neuroplasticity.

Some traditional Mexican healing and addiction ceremonies employ the use of salvia, a substance known to alter our interoceptive perceptions. Salvia leaves which include "salvinorin-A, the most potent naturally occurring psychedelic substance known." <sup>4</sup> Scientists know that "salvia alters dopamine levels in ancient parts of the brains responsible for motivation, reward, and the internal sense of what is going on in our bodies." <sup>4</sup> Low doses of salvinorin-A can improve interoceptive abilities, with "subjects experiencing their own bodies as safe and trustworthy." <sup>4</sup>

Some Western researchers suggest that interoception could have additional clinical applications in the treatment of emotional problems or the many medical conditions that respond to psychological factors. For example, it has long been understood that emotion plays a major role in the experience of pain. Negative emotions are known to intensify experiences of pain and lower our pain tolerance abilities, while positive emotions have the opposite effect. Interoception and the body-emotion link are therefore essential for understanding the causes and treatment of chronic pain.<sup>1</sup>

In Western psychology, interoceptive exposure techniques help expose people to uncomfortable bodily sensations. Interoceptive conditioning is sometimes used to treat panic disorder by replicating the physical sensations associated with panic attacks in a controlled environment while working to reduce a patient's conditioned fear that the manifestation of these symptoms will mean a panic is on the way. Interoceptive conditioning has also been investigated in the treatment of cancer-related fatigue, hypertension, eating disorders, mood and anxiety disorders, and drug addiction. Interoception has also been explored in relation to emotional regulation, decision making, sexual dysfunction, empathy, hypnosis, and



meditation.<sup>1</sup> Most people in medicine and healthcare are trained to be very cognitively oriented and may forget about reading the subtle information from their (does their refer to the physicians or patients?) bodies, or guiding patients to sense themselves from their inner sensations and perceptions. Interoception is a useful tool to lay strong foundations for genuine body-mind connection.

Why is it so important to develop this skill? Interoceptive abilities form the very underpinnings of the powerful mind-body connection. In psychosomatic illness, interactions between perturbations in our homeostatic balance and emotional states are very likely at play. The "feeling self" is not just in the head - it is rooted throughout the entire body. <sup>2</sup> When we can balance the inner experience of our bodies with our outer experience of the world, then true peace and harmony can occur.

## Body-Scan Meditation

While the applied science of interoception is still a fledgling field, there are some proven ways to get back in touch with your body.

If you prefer to listen to an audio guide, a recorded body scan meditation is available from the University of Berkeley's Greater Good in Action. (Should this be an endnote or follow the narrative below instead of being placed here? Or perhaps in italics?)

This body-scan meditation asks you to focus on different areas of your body, one by one. Moving from your toes to the top of your head, the exercise helps you become mindful of the body. Although we do not often notice, our bodies instinctively respond to our emotions. If you pay attention, you are likely to find strong sensations in different

parts of the body. These feelings may be caused by stress, such as a tightness in the stomach or shoulders. Doing a systematic body scan helps you identify and relieve tension where you find it. As you go through the body scan, remember not to judge or stop to analyze uncomfortable feelings when and where you find them. Simply notice the tension, whether that's a tightness in the forehead or a clenched jaw, for example, and let go of the tension with the breath. Recognize that you may have to repeat the 'letting go' part multiple times. If you experience mind-wandering or have a hard time keeping a sharp focus on each layer of the body throughout the body scan, take a few cleansing breaths or start to count your breaths for a few rounds to regain focus. Always remember to be nonjudgmental and accepting of yourself and your current emotional state. Simply observe what is happening. With awareness and acceptance, the 'letting go' becomes easier.

## *A guide to your practice.*

- Begin in an upright seated position or lying on the floor, face up. Create a straight line with your upper body from head to pelvis. Let your shoulders down away from your ears, bring your chest forward, and draw your belly in. If you are sitting up, straighten your spine by lifting yourself from the crown of your head. If you are lying down, draw your chin closer to your chest and find a relaxed state in the position. If you feel any tension, simply adjust to ensure comfort while ideally maintaining a straight spine.
- Close your eyes. Now, bring your attention to your body.
- Feel the weight of your body on the chair or the floor. (Should you add the "chair" aspect to the step above regarding an upright seated position, e.g. on the floor or in a chair?)
- Notice your breath. Follow the natural flow of your inhales (the "in-breath") and exhales (the "out-breath"). Notice the breath entering the body and leaving the body.
- Bring your attention to your feet. Notice the weight of your feet on the floor. Feel inside your feet - the vibration, pulsations, and pressure. With the out-breath, relax your feet.
- Notice your legs. Feel any tension. Scan the calves, the knees, the thighs, and hips. With the inhale, send attention to any tense areas. On the out-breath, release.
- Notice your back. Feel any sore spots and points of tension. With the in-breath, send oxygen to the tension. With the out-breath, release.
- Notice your stomach. Feel the sensation of the in-breath in your stomach. On the out-breath, let the stomach soften.
- Bring attention into your hands. Feel into the fingertips. Notice any sensations, tingling, pulsing. Feel the aliveness of your hands. With the out-breath, relax your hands.
- Notice your arms. Feel sensations in the wrists, lower arm, elbows, and upper arms. Let your arms be soft.
- Feel your shoulders. Notice any tenseness. Let the shoulders relax away from your ears. Spend some time taking a few breaths, in and out, in and out, relaxing the shoulders.
- Notice your neck. Notice your throat. Is your throat tight? Breathe into the throat. With the out-breath, soften.
- Bring your attention to your jaw and to your tongue. Relax
- Bring your attention to your whole head. With the breath, relax the top of your head. With the next breath, relax the forehead.
- Pause.
- Allow your attention to expand. Be aware of your whole body. Tune into your breath and send waves of relaxation throughout the body.
- Open your eyes when you feel ready.
- Notice changes that occurred in your body and your mind. Regular practice of a body scan meditation may help you build your interoceptive abilities, becoming more in touch with your body throughout your day. Interoception builds the mindful awareness of bodily sensations and their shifts. For example, after regular mindfulness practice, you might be more likely to notice the sensation of anger rising in your body. You can then use mindful breathing in combination with the body scan to identify anger and self-soothe. Do that you can direct anger in a positive direction, making you feel more empowered. Interoception builds mind-body awareness and builds neuroplasticity. It helps you to become more emotionally intelligent and physically aware so that you can make good choices about your own healing and readjust choices based on feedback from your wise body.

## References

1. Ceunen, E., Vlaeyen, J.W.S., & Van Diest, I. (2016). On the Origin of Interoception. *Frontiers in Psychology*, 7. doi: 10.3389/fpsyg.2016.00743
2. Craig, A.D. (2007). Interoception and Emotion: A Neuroanatomical Perspective. *Handbook of Emotion*, 3rd Ed.
3. Kandasamy, N., Garfinkel, S.N., Page, L., Hardy, B., Critchley, H.D., Gurnell, M. & Coates, J.M. (2016). Interoceptive Ability Predicts Survival on a London Trading Floor. *Nature: Scientific Reports*, 6. doi: 10.1038/srep32986

4. Addy, P.H., Maqueda, A.E. (2015). Traditional Medicine from Southern Mexico Offers Help with Addiction. *Scientific American*.
5. Schaan, V. K., Schulz, A., Rubel, J. A., Bernstein, M., Domes, G., Schächinger, H., & Vögele, C. (2019). Childhood Trauma Affects Stress-Related Interoceptive Accuracy. *Frontiers in psychiatry*, 10, 750. <https://doi.org/10.3389/fpsy.2019.00750>
6. Neukirch, N., Reid, S., Shires, A. (2019) Yoga for PTSD and the role of interoceptive awareness: A preliminary mixed-methods case series study. *European Journal of Trauma & Dissociation*, 3. doi. [org/10.1016/j.ejtd.2018.10.003](https://doi.org/10.1016/j.ejtd.2018.10.003)
7. Salvato, G., De Maio, G. & Bottini, G. (2019). Interoceptive sensibility tunes risk-taking behaviour when body-related stimuli come into play. *Scientific Reports* 9, 2396. <https://doi.org/10.1038/s41598-019-39061-0>
8. Wu, X, Shi, L., Wei, D., Qiu, J. (2019) Brain connection pattern under interoceptive attention state predict interoceptive intensity and subjective anxiety feeling. *Human Brain Mapping*, 40,6. <https://doi.org/10.1002/hbm.24488>

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