

Interoceptive cues: When 'gut feelings' point to anxiety

Exploring patients' somatic experiences can help expose their unconscious fears

Ms. N, age 48, is seen in an outpatient clinic for episodic, impulsive aggression and evaluation of possible bipolar disorder. When you ask her to describe one of her episodes—which always involve a conflict with her partner or another loved one—Ms. N says, “I just lose control ... I go blank.” You observe Ms. N's deep, sighing respirations, trembling hands, and restless, fidgety leg movements. When you ask about her awareness of her physical state while she was recalling the incident, she immediately calms, looks at you quizzically, and states, “I don't know how I feel.”

When assessing a patient who might have an anxiety disorder, don't overlook the body. In addition to worry and avoidance, body-centered feelings are a vital component of anxiety and an important treatment target.¹

This article:

- highlights clinically relevant neurobiology of anxious feelings
- discusses interoception—awareness of the physiologic state of one's body—and its connection with anxiety
- explains the use of interoceptive cues as an aid to diagnosing and treating anxiety.

Affective neuroscience and fear

Interoceptive cues are questions directed toward the somatic manifestations of anxiety. Because these questions encourage patients to consciously experience the physical symptoms of anxiety, using interoceptive cues essentially is an exposure-based intervention that may



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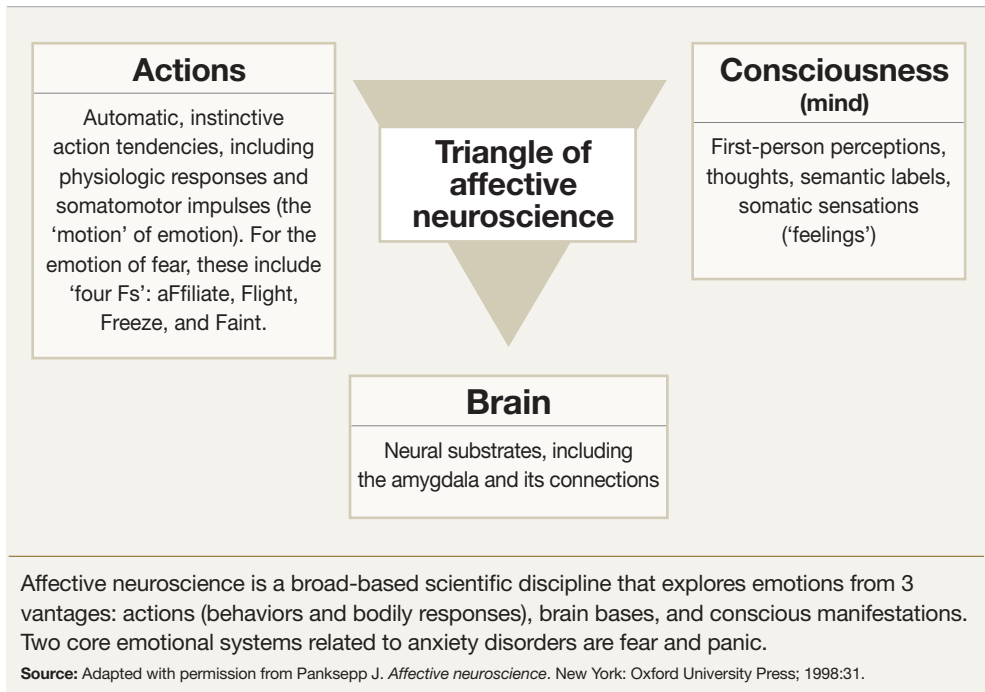


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Interoceptive cues can foster awareness of physical symptoms of unrecognized anxiety

Figure
A,B,C model for understanding emotions



feel counterintuitive to practitioners who are more accustomed to trying to relieve anxiety.

Emotions are thought to be grounded in brain areas that receive and regulate somatic signals, such as the amygdala and insula.² A feeling-focused approach to anxiety wedds affective neuroscience—the study of emotions—with clinical assessment and treatment of anxiety disorders, and conceptualizes that fear is a core component of many anxiety-related disorders.^{3,4}

Although the DSM-IV-TR views anxiety disorders as clinically heterogeneous, affective neuroscience emphasizes what these disorders have in common.⁵ This unifying perspective allows clinicians to anchor anxiety disorders and anxiety-related disorders—such as hypochondriasis—in core emotional systems that have 3 clinically important aspects—actions (behavior and body), brain, and consciousness (mind) (Figure).⁴ Two emotional systems related to anxiety disorders are fear (anxious anticipation) and panic (evolutionarily related to separation anxiety and suffocation alarm signals). Viewing anxiety disorders as rooted in core emotion systems allows you to incorporate recent advances in emotional

neuroscience, including interoception, into your clinical practice.

Detecting 'hidden' anxiety

Conscious symptoms. Activity in the brain's fear system can generate conscious experiences, including worry, heightened arousal, attentional biases, and body-based feelings of fear. Anxious feelings—by definition, sensory experiences—are an important component of an anxiety assessment and relatively easy to identify.

Kroenke et al⁶ evaluated a 2-item screening tool, the Generalized Anxiety Disorder scale (GAD-2) that highlights both cognitive (worry) and somatic (feeling) sides of anxiety. Researchers asked 965 randomly sampled primary care patients, "Over the past 2 weeks, how often have you been bothered by the following problems:

- feeling nervous, anxious, or on edge
- not being able to stop or control worrying.

Possible responses ranged from 0 (not at all) to 3 (nearly every day). The GAD-2 was as specific for detecting anxiety disorders as a 7-item scale, the GAD-7, (88%), though less sensitive (65% vs 77%).

Nonconscious symptoms. A challenge arises, however, when patients demonstrate signs of anxiety (stress-related physical symptoms such as stomach pains or avoidance-related behaviors) without conscious awareness of anxious feelings. Though patients may intellectually understand the concept of body-based “gut feelings,” these sensations are often reflexively ignored, avoided, or mislabeled. Patients may use terms such as “stressed,” “distressed,” or “tense,” focus on the external source of the fear (rather than their response to it), or reflexively engage in behaviors (avoidance, impulsive behaviors) without being aware of their internal responses.

Anxiety symptoms that occur without corresponding awareness can be called occult, nonconscious, or unconscious anxiety. These symptoms, unique to each patient, can be used as:

- cues to the patient that he or she is anxious
- stimuli to be desensitized (via exposure-based interventions)
- markers of treatment progress.

Patients who experience occult anxiety often have a deficit in interoception (**Box**).^{2,7-11} Using interoceptive cues to foster awareness of these unrecognized body-based symptoms can provide insight into formerly unrecognized manifestations of anxiety.

Neurobiology of anxiety

The fear system. Dynamic changes in stimulus-specific physical sensations—*anxious feelings*—are linked to activity of the brain’s fear system. This system, which detects and rapidly learns to anticipate danger or distress, can exhibit low-level tonic activity (chronic, generalized anxiety), phasic high-amplitude reactivity (spikes of anxiety), and combinations of the 2.^{4,12}

This precognitive, primary-process alarm system can generate:

- *behaviors*, often centered around avoidance—though other types (such as impulsive) can occur
- *physiologic responses*, which may or may not become conscious
- *states of mind*, including attention (hy-

Box

Interoception: Looking inside the mind and body

Consciously experiencing an emotion, attending to an emotionally arousing external stimulus, and remembering an emotionally arousing event all involve overlapping mental and neurobiologic processes in brain areas that process and regulate sensations from the body.^{2,7} Therefore, one does not need to remember “how one felt in the past” to elicit similar neurobiologic and physiologic responses in the present. These responses are re-created in the present when one consciously activates the memory. This understanding underlies the use of interoceptive cues.

Interoception is intentional, mindful awareness of the physiologic state of one’s body. Consciously directing attention to one’s internal state actively unifies the activity of the attending mind and brain with ongoing visceromotor sensations from the body.^{8,9} These body-based somatic markers often lie at the border of consciousness and can be brought into awareness via interoceptive cues.⁹ Awareness of and exposure to these often private, physiologic symptoms is an important part of many evidence-based therapies for anxiety disorders.^{10,11}

pervigilance, dissociation), cognitive contents (specific worries), and viscerosomatic awareness (“feelings”).

Through learning—and under the influence of temperamental/genetic predispositions—the fear system can be linked to internal and external stimuli, yielding a spectrum of clinical disorders that includes anxiety disorders.⁵

Brain basis of fear. The amygdala and insula are 2 key components of the brain basis of fearful feelings.

The amygdala processes internal or external stimuli, alerts other brain areas that a threat is present, and triggers a fear or anxiety response (*Table 1, page 52*).¹³⁻¹⁶ Early, nonconscious threat detection by the amygdala may be a core component of the brain basis of many anxiety disorders.¹⁷

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Patients may avoid or ignore ‘gut feelings’ of anxiety and instead describe themselves as stressed, distressed, or tense



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In anxiety-prone individuals, the insula may act as a somatic semaphore, signaling danger ahead with a body-centered warning

Table 1

Amygdala output pathways that result in anxiety symptoms

Link to specific brain area	Clinically important responses
Hypothalamus	Sympathetic activation: increased heart rate, sweating, dilated pupils, striated muscle tension, strained breathing
Dorsal motor nucleus of vagus	Parasympathetic activation: slowed heart rate, bladder and bowel symptoms—frequent urination, diarrhea—via smooth muscle activity, gastric acid secretion
Parabrachial nucleus	Increased respiratory rate: sighing respirations
Ventral tegmental area/ locus ceruleus	Generalized arousal, perceptual vigilance (excessive stimulation leads to disruption of attention/dissociation, via prefrontal cortical connections)
Nucleus reticularis pontis caudalis	Startle response, jumpiness
Periaqueductal gray matter	Automatic coping patterns, from passive (freeze, collapse) to active (confrontation, fight)
Trigeminal facial motor nuclei	Jaw tension, facial expressions of fear

Source: Adapted with permission from references 13 with additional information from references 14-16

Amygdala activity has been associated with automatic fear perception, associative fear learning, trauma,¹⁸ and (on the treatment side) extinction of learned fears via active coping.¹⁹ The amygdala provides an extremely rapid response to fearful stimuli—within milliseconds—and can be active without conscious awareness of the stimuli (which may take several hundred milliseconds to develop).^{20,21}

Inputs into the amygdala can come from:

- inside the brain (memories, images, emotions, predictions of the future)
- or outside (contemporary stimuli).

In treatment, the amygdala may be one site of activity of serotonergic medications.²² It is partially regulated by orbitofrontal and medial prefrontal areas that may be target sites of “top-down” psychotherapeutic interventions.²³

The **insula**—a sector of cortex tucked beneath the fissure between the temporal and parietal lobes—is involved in interoception, modulation of emotional processing, and emotional learning, especially as related to aversive internal states.^{24,25}

Paulus²⁴ proposes that in anxiety-prone individuals the insula may create a negatively valenced, preattentive, body-centered warning of negative things to come—in a sense, a somatic semaphore

that signals danger ahead. In a related study, Stein et al²⁶ presented college students with emotion-provoking faces. Students prone to anxiety had elevated activity in the amygdala and insula compared with normal controls.

The insula also may respond to mindful mental exercise. Lazar et al²⁷ found increased cortical thickness in prefrontal and anterior insula in 20 subjects with extensive experience in insight meditation, which involves focusing attention on internal states.

CASE CONTINUED

Using focused interoception

You help Ms. N become aware of her somatic symptoms of anxiety by using a series of questions to direct her attention to her physical responses in a “head-to-toe” approach: “Do you notice the tension in your jaw?” “Is your neck tense?” “How is your breathing now?” Though Ms. N had been unaware of these symptoms, she easily agrees: “Yes, now that you mention it, I am aware of that, but I never knew it was anxiety. I thought it was just stress.”

This exercise reveals marked generalized muscle tension, sweating, and a brief period of going “blank” in her mind when she recalled one of her impulsive, aggressive episodes. You explain that these physical reactions are

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part of the normal biologic fear response. Apart from these symptoms, Ms. N denies any prototypical manic symptoms and does not meet bipolar disorder criteria.

Using interoceptive cues

To frame an interoceptive inquiry, discuss with patients how the brain's fear system is connected to the body, and explain that investigating these physical symptoms can assist diagnosis and treatment. For example, you might ask, "Could we look into your physical responses in these situations to help us better understand your difficulties?"

To actively explore somatic markers of anxiety (anxious feelings), encourage the patient to describe a specific stressful or avoided situation in detail. While he or she does this, direct the patient's attention to objective physiologic markers of anxiety, such as strained breathing or increased heart rate. Use body-directed questions (interoceptive cues) to foreground these sensory experiences in the patient's mind. For example:

- "As we are discussing this issue, I notice your breathing becomes more strained. Do you notice it?"
- "As you picture this incident in your mind, are you aware of what happens in your body?"
- "When you perceive her in that way, what do you notice about your physical response?"

You can further inquire into these somatic symptoms and their effect on the patient by asking, "How long have you been having these particular symptoms?" "How frequently do they occur?" or "How distressing are these symptoms?" These questions can separate transient physiologic arousal (normal) from pathologic (recurrent, disabling) responses that may respond to treatment. These cues and their responses can be used as person-specific biomarkers to assay a patient's:

- ability to attend to his or her somatic state
- baseline level of autonomic arousal
- internal state before problematic behaviors (such as impulsive or self-harming behaviors, substance use)
- tendency toward anxiety-related perceptual disturbances (such as dissociation).

When the patient actively attends to and carefully describes his or her somatic sensations, the immediate outcome typically is anxiolytic. A shared awareness of the anxiolytic nature of this exercise—"It's interesting that paying attention to these feelings actually reduces anxiety"—creates a positive first step toward further exploration. Pa-

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Reference: I. Barkley RA, Fischer M, Smallish L, Fletcher K. Young adult outcome of hyperactive children: adaptive functioning in major life activities. *J Am Acad Child Adolesc Psychiatry*. 2006;45:192-202.

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When patients attend to and describe somatic sensations, the immediate outcome typically is anxiolytic

Table 2

Activity of the fear system

Inputs

Contemporary situations
Memories (visual and sensory)
Anticipated future situations
Other nonconscious body and brain processes (including the physiologic symptoms of emotions and anxiety—a ‘fear of fear’ or ‘fear of feelings’)

Outputs

Physical symptoms
Thoughts
Perceptions
Behaviors
States of attention

tients can feel the power of the mind to regulate distress.

Overcoming barriers to interoception

Many patients—including those with dissociative disorders, impulse control disorders, or disorders with significant obsessive features—have difficulty using their attention to bring physical symptoms to mind. Some develop automatic, phobic patterns of disattention to contemporaneous somatic feelings of anxiety. This experiential avoidance is the fear of fear itself—fear of the conscious experience of fearful feelings. Their typical responses to interoceptive cues include:

- lack of awareness (“I don’t know,” “I wasn’t aware of anything”)
- perceptions, phrased as feelings (“I feel as if he doesn’t like me”)
- action tendencies or impulses, phrased as feelings (“I feel like I want to get out of there”)
- a verbal explanation of why they are anxious (“I’m worried about what might happen”).

Depending on the context of your inquiry, if the patient does not respond to an interoceptive cue with actual body-centered feelings, you can:

- reframe the question: “OK, but when you perceive him in that way, if you focus your mind on your physical reactions, what do you notice?”

- point out observable symptoms: “Did you notice as we were talking about this issue that your breathing got very shallow, and your hands got tense?”

Some patients may look transiently “spacey” or report “checking out” during the exercise. Inquire specifically about this because they may be demonstrating dissociative symptoms: “Does this sometimes happen when you are stressed, that you lose touch with your sense of your body, you go numb or your mind goes blank?” These symptoms warrant attention, as they may preclude effective retention of the exercise.

Explaining occult anxiety

Regardless of how far you choose to pursue an interoceptive inquiry, uncovering an interoceptive deficit—an inability to describe one’s somatic experience—may be diagnostically helpful. Doing so identifies a potentially modifiable component of self-awareness. So-called mindfulness-based and emotion-focused therapies assist patients in developing a more robust awareness and understanding of their emotions, including the somatic sensations of emotion (see *Related Resources*).

With appropriate psychoeducation, an interoceptive exploration makes anxiety a real, physical event anchored in brain-body function, and facilitates a nonshaming, organ-based explanation of anxiety. Psychoeducation about fear grounds physical symptoms of anxiety in a brain-based, evolutionarily selected neural system whose activity has a variety of inputs and outputs (*Table 2*).

An organ-based, body-centered discussion also may reduce defensiveness in patients who feel (or have been told) that anxiety is “not real” or signals personality weakness. This model may help trainees and medical colleagues avoid outdated distinctions between real/organic problems and functional/emotional problems and find a more conciliatory construct based in emotional neuroscience.

Related Resources

- Barrett LF, Mesquita B, Ochsner K, Gross JJ. The experience of emotion. *Annu Rev Psychol* 2007;58:373-403.
- Damasio A. *The feeling of what happens: body and emotion in the making of consciousness*. New York: Harcourt, Inc., 1999.
- International Experiential Dynamic Therapy Association. www.iedta.net.
- Centre for Emotions and Health. www.istdp.ca.
- International Center for Excellence in Emotionally Focused Therapy. www.eft.ca.

Disclosure

Dr. MacDonald reports no financial relationship with any company whose products are mentioned in this article or with manufacturers of competing products.

Serotonergic medications and psychotherapy—both of which work on the brain—have demonstrated broad efficacy for anxiety disorders.⁵ Several national organizations offer information about evidence-based psychotherapeutic treatments grounded in emotional awareness and neuroscience (see *Related Resources*).

CASE CONTINUED

Putting interoception to work

Your psychotherapeutic work with Ms. N focuses on attending to and consciously modulating her newly labeled anxiety. For example, after an inquiry into a “stressful” situation, you help her use careful interoceptive attention—and when necessary, mindful relaxation and breathing—to regulate her fear symptoms.

She finds that these simple “exposure/regulation” exercises are enough to rapidly resolve her impulsive behaviors. In distressing situations, she can now be aware of her reactions and make a conscious choice of how to react. Your psychotherapeutic work now proceeds toward more effective interpersonal expression of other emotions.

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continued



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*From a retrospective survey assessing the prevalence, comorbidity, and impairment of adult ADHD in 3199 adults, age 18 to 44. Depressive disorder includes major depressive disorder and dysthymia.

Reference: 1. Kessler RC, Adler L, Barkley R, et al. The prevalence and correlates of adult ADHD in the United States: results from the National Comorbidity Survey Replication. *Am J Psychiatry*. 2006;163:716-723.

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Uncovering an interoceptive deficit identifies a potentially modifiable component of self-awareness

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Bottom Line

Body-centered feelings are a vital component of anxiety. Consider using interoceptive cues—questions directed toward uncovering somatic manifestations of anxiety—to detect, understand, and treat anxiety and anxiety-related disorders. An interoceptive exploration facilitates a nonshaming, organ-based explanation of anxiety that may reduce defensiveness in patients who feel that anxiety is not real or signals a personality defect.

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