

## Anxiety sensitivity and pain-related anxiety in the prediction of fear responding to bodily sensations: A laboratory test

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### Abstract

**Objective:** The present investigation sought to examine the simultaneous effects of anxiety sensitivity and pain-related anxiety on fear and anxious responding to a 10% carbon dioxide enriched air challenge. **Methods:** Participants included 247 adults (53% women; mean age=21.91 years, S.D.=8.41) recruited from the community. At the laboratory, participants were administered a structured clinical interview, completed a battery of self-report measures, and underwent a 10% carbon dioxide enriched air challenge. **Results:** Both anxiety sensitivity and pain-related anxiety were significantly and uniquely predictive of post-challenge panic attacks, total post-challenge panic attack symptoms, and intensity of cognitive panic attack symptoms. Anxiety

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sensitivity, but not pain-related anxiety, also was predictive of post-challenge physical panic symptoms. The observed significant effects for both anxiety sensitivity and pain-related anxiety were evident above and beyond the variance accounted for by gender, age, current level of nonspecific bodily pain, and negative affectivity. Neither anxiety sensitivity nor pain-related anxiety was significantly predictive of change in anxiety focused on bodily sensations or heart rate. **Conclusion:** Results suggest that anxiety sensitivity and pain-related anxiety, although related to one another, may be independently important variables underlying fear reactivity to bodily sensations.

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There is a large body of empirical research examining risk processes underlying fear responding to bodily sensations [1–3]. Perhaps the most well-known construct in this domain is anxiety sensitivity (AS) [4]. AS is defined as the extent to which individuals believe that anxiety and anxiety-related sensations have harmful consequences [2,5]. Empirical study of this construct indicates that AS is composed of a global, higher-order factor and three lower-order factors, namely concerns about mental incapacitation (AS-mental concerns), concerns about physical symptoms of anxiety (AS-physical concerns), and concerns about the social consequences of experiencing anxious arousal (AS-social concerns) [6].

Prospective [7–11] and laboratory [12–16] studies suggest that AS increases the risk for more intense anxiety symptoms and anxiety psychopathology.

AS and anxious and fearful responding to bodily sensations may be one of a variety of cognitive-based factors that may underlie vulnerability to fearful responding to bodily sensations. Indeed, researchers increasingly are exploring the possibility that there may be cognitive factors beyond AS that are relevant to anxiety and fear processes focused on somatic symptoms [17,18]. For example, significant relations have been observed between fear responding to a biological challenge and discomfort intolerance (defined as the capacity to withstand uncomfortable physical sensations) [19]. Other work has examined a comprehensive affect sensitivity and tolerance model including AS, discomfort intolerance, and distress tolerance (defined as the ability to withstand negative emotional states

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[20]) in relation to fear and anxious responding to a biological challenge. Here, Kutz et al. [21] found that within this model, only AS was significantly related to fearful responding. Collectively, this line of work suggests that there may be specific cognitive vulnerabilities beyond AS that could amplify fear responding to bodily sensations.

Previous work suggests that the development and maintenance of anxiety disorders and chronic pain may follow similar patterns consistent with fear-anxiety-avoidance models [1,22,23] and, consequently, may share similar underlying processes and mechanisms [24]. Pain-related anxiety is one specific cognitive factor of interest that has received growing theoretical and clinical attention, and is related to acute and chronic pain [17,25,26] and anxiety problems [27]. Pain-related anxiety is related to, but theoretically and empirically distinct from, AS; it refers to anxiety and worry about pain or pain-related events [17]. Individuals high compared to low in pain-related anxiety may be more apt to experience elevated levels of anxiety in response to pain or events perceived as potentially pain inducing. Consistent with fear-anxiety-avoidance models, pain-related anxiety might be one relevant factor implicated in the development and maintenance of anxiety psychopathology. McCracken et al. developed the Pain Anxiety Symptoms Scale (PASS) to assess pain-related anxiety [28] and, later, a shorter version of the PASS, the PASS-20 [29], to more quickly assess this construct. The validity of the PASS and PASS-20 is supported by significant positive correlations with measures of general anxiety, pain, disability, and depression [28,29]. The only apparent utility in using the PASS-20 over the original PASS is to lessen completion time and burden [29]. Research utilizing the PASS or the PASS-20 indicates that patients with chronic pain disorders report greater pain-related anxiety relative to a variety of comparison groups (e.g., nonclinical populations, persons with nonpain health disorders), over-predict the intensity of pain, cope maladaptively with pain sensations, and demonstrate elevated somatic reactivity (e.g., heart rate change) in anticipation of pain-eliciting physical activity [27,30]. Thus, pain-related anxiety may contribute to poorer emotional adjustment via a number of anxiety-related cognitive, behavioral, or physiologic processes.

Initial work suggests that pain-related anxiety and AS, although related are theoretically and empirically unique vulnerability factors for psychopathology [31,32]. Carleton et al. [27], for instance, found that pain-related anxiety does not differ across the spectrum of anxiety and depressive disorders but is higher among persons with such conditions compared to individuals without psychopathology. AS, on the other hand, is differentially elevated across these same clinical samples [27,33]. Specifically, individuals with panic disorder score significantly higher on the Anxiety Sensitivity Index (ASI) [34] than persons with depressive disorders, social anxiety disorder, or obsessive-compulsive disorder [27]. Moreover, individuals with chronic pain report similar levels of pain-related

anxiety compared to those with anxiety and depressive disorders, with the exception of scores on the escape/avoidance subfactor of the PASS, on which individuals with chronic pain tend to score higher [27]. Yet, this same chronic pain sample reports greater overall pain-related anxiety than nonclinical/nonchronic pain controls [27]. These data suggest that AS and pain-related anxiety may not be perfectly coupled across clinical populations. Although pain-related anxiety is elevated across the spectrum of anxiety disorders similarly to those with chronic pain, it remains unclear, however, whether AS and pain-related anxiety serve to increase risk for anxious and fearful responding to somatic perturbation independently of one another.

The purpose of the present study was to examine whether AS and pain-related anxiety represent distinct mechanisms for fear responding to bodily sensations by amplifying reactivity to these sensations during a laboratory-based biological challenge procedure. Given that most individuals can relate to the experience of pain and that many anxiety-related symptoms and disorders commonly co-occur with pain (e.g., tingling, muscle tension, post-traumatic stress disorder, panic disorder [35], those reporting greater pain-related anxiety may have amplified fear reactivity to induced bodily sensations. Based on extant research [11,27,28], we hypothesized that AS and pain-related anxiety, although related to one another, would each independently predict self-reported anxious and fearful responding to a 10% carbon-dioxide enriched air challenge. For heart rate, only pain-related anxiety was hypothesized to have a significant incremental effect based upon past work indicating its association to enhanced physiological arousal [30]; no such effect was posited for AS as past work has not found an association between this cognitive factor and heart rate [36]. Additionally, we hypothesized that these effects would be evident above and beyond the variance accounted for by other factors found to influence anxious and fearful responding to bodily sensations in past work, including gender, age, nonspecific bodily pain, and negative affectivity [36].

## Method

### *Participants*

Participants included 247 adults (53% women; mean age=21.91 years, S.D.=8.41) who were recruited via advertisements for a laboratory study on ‘emotion’ that were placed throughout various community settings and university-based bulletin boards and classrooms. The racial distribution of the sample reflected that of the Vermont population [37]: 91.5% Caucasian, 1.6% Hispanic, 1.6% African American, 0.9% Asian, 1.2% bi-racial, 1.2% responded as “other,” and 2% did not complete this question. The majority of the sample had a high school degree or

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