



Discomfort intolerance: Evaluation of incremental validity for panic-relevant symptoms using 10% carbon dioxide-enriched air provocation

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ARTICLE INFO

Article history:

Received 29 January 2008

Received in revised form 27 June 2008

Accepted 27 June 2008

Keywords:

Discomfort intolerance

Anxiety

Panic

Negative affectivity

Biological challenge

Avoidance

ABSTRACT

The present investigation examined the relation between discomfort intolerance and panic-relevant symptoms among 216 (117 women) young adults who participated in a biological challenge procedure. Partially consistent with hypotheses, after covarying for anxiety sensitivity, negative affectivity, and emotional acceptance, the intolerance subscale of the Discomfort Intolerance scale [DIS; Schmidt, N. B., Richey, J. A., & Fitzpatrick, K. K. (2006). Discomfort intolerance: development of a construct and measure relevant to panic disorder. *Journal of Anxiety Disorders*, 20, 263–280] was significantly incrementally related to increased post-challenge anxiety focused on bodily sensations, physical panic symptoms, and behavioral avoidance, but not cognitive panic symptoms. Inconsistent with prediction, the avoidance subscale of the DIS was not significantly related to any of the dependent variables. Results are discussed in relation to better understanding the role of discomfort intolerance as a unique explanatory factor in the context of panic psychopathology.

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There has been an increasing scientific and clinical interest focused on evaluating the role(s) of various forms of tolerance for affective, psychological, and physical stressors in the etiology and maintenance of psychopathology (Gross, 1998; Hayes, Wilson, Gifford, Follette, & Strosahl, 1996; Zvolensky & Otto, 2007). For example, psychosocial treatments have been designed, in part, to modify such tolerance variables as a way to promote greater degrees of psychological health (Barlow, Allen, & Choate, 2004; Hayes, Strosahl, & Wilson, 1999; Linehan, 1993). Despite much scholarly and clinical interest in tolerance processes, broadly defined, there is surprisingly limited research that has evaluated the relations between (specific) tolerance variables and psychological symptoms and disorders. As a consequence, there is little empirical knowledge about the actual role of tolerance factors in mental health and psychological disorders more generally.

Although there are numerous tolerance variables proposed as being relevant to specific types of psychological problems (e.g., pain tolerance, affect tolerance, distress tolerance), *discomfort intolerance* has been theorized as one type of tolerance factor relevant to panic psychopathology. Discomfort intolerance is operationalized as individual differences relating to the capacity to

withstand *uncomfortable physical sensations* (Schmidt & Lerew, 1998; Schmidt, Richey, Cromer, & Buckner, 2007; Schmidt, Richey, & Fitzpatrick, 2006). Thus, in contrast to constructs that are delimited to specific internal stimuli such as pain (Feldner et al., 2006; Geisser, Robinson, & Pickren, 1992), discomfort intolerance has been conceptualized as relating to interoceptive (bodily) sensations that are uncomfortable, not necessarily painful, to the individual more generally. Past work has documented that discomfort intolerance is theoretically related to, but distinct from, other constructs such as distress intolerance, which indexes the degree of tolerance for negative emotional states (Simons & Gaher, 2005). It also has been conceptually distinguished from emotional or experiential avoidance that reflects individual differences in the unwillingness to experience aversive cognitions and affective states (Hayes et al., 1996).

The core conceptual idea driving discomfort intolerance work in relation to panic psychopathology is that persons less able to tolerate aversive physical sensations may be less able to withstand such stimuli and therefore escape or avoid situations (e.g., public settings) or activities (e.g., exercise) that may trigger them (Schmidt & Lerew, 1998). If such individuals high in discomfort intolerance consistently were unable to withstand physical stress and discomfort associated with fear and anxiety, and by extension escaped or avoided it, they may place themselves at greater risk for maladaptive panic-relevant

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learning. For example, greater ability to tolerate physical stress (e.g., bodily sensations) may theoretically permit certain people to experience exposure to unwanted and feared sensations. Such exposure is well-established as a method that can contribute to less avoidance and more rational cognitions rather than elevations in anxiety symptoms and cognitive distortions (Barlow et al., 2004). This type of perspective is consistent with integrative theoretical models and intervention strategies that attempt to modify anxiety and other problematic emotional states by changing one's response to aversive interoceptive (e.g., bodily sensations) and exteroceptive (e.g., stressful life occurrences) events (Hayes & Shenk, 2004; Orsillo, Roemer, & Barlow, 2003; Ramel, Goldin, Carmona, & McQuaid, 2004).

In order to empirically study the putative relation between discomfort intolerance and the onset and maintenance of panic and related anxiety disorders, Schmidt et al. (2006) developed the Discomfort Tolerance scale (DIS). The DIS is a five-item self-report instrument that examines how much one can tolerate uncomfortable physical sensations. Factor analytic study, using principal axis factoring, has indicated that the DIS is comprised of a global higher-order discomfort intolerance factor and two sub-factors entitled Intolerance of Discomfort or Pain (e.g., "I can tolerate a great deal of physical discomfort" – reverse scored), and Avoidance of Physical Discomfort (e.g., "I take extreme measures to avoid feeling physically uncomfortable;" Schmidt et al., 2006). Although limited in overall scope, the DIS has thus far demonstrated sound psychometric properties (e.g., high levels of internal consistency as well as convergent and discriminant relations with other established constructs; Schmidt et al., 2006).

Schmidt et al. (2006) also have explored the associations between discomfort intolerance and panic and related symptoms using the DIS (Schmidt et al., 2006). In the earliest reported study, Schmidt and Lerew (1998) examined discomfort intolerance (global construct) in relation to physical disability among a large sample of military cadets during basic training. Discomfort intolerance was significantly predictive of sick call (i.e., number of days not participating in training due to reported illness) among the cadets after statistically controlling for treatment history, physical fitness level, demographic factors (e.g., gender), and other psychological risk variables (e.g., anxiety sensitivity; McNally, 2002). In a separate two-part investigation, Schmidt et al. (2006) found that discomfort intolerance (global construct) was significantly elevated among those with panic disorder compared to control groups of clinically anxious individuals and persons with no history of Axis I psychological disorders (Study 1). In Study 2 of this same report, Schmidt et al. (2006) examined the DIS in terms of its association with change in self-reported anxiety using a carbon dioxide (CO₂) challenge paradigm among clinical ($n = 45$) and non-clinical ($n = 45$) participants. Greater anxiety reactivity (pre–post change) was found among those scoring higher compared to lower on the DIS (global score) but only among the non-clinical sample (Schmidt et al., 2006). This body of work suggests that discomfort intolerance is related to anxiety reactivity to bodily sensations. In a subsequent and more recent test, Schmidt et al. (2007) examined discomfort intolerance in terms of responsivity to CO₂-induced bodily sensations among a nonclinical community sample with no history of panic attacks ($n = 44$). Results indicated that the global discomfort intolerance factor (DIS total score) was incrementally predictive of post-challenge self-reported anxiety above and beyond the variance accounted for by trait anxiety and anxiety sensitivity. When this association was further examined in follow-up analyses by entering each of the subscales of the DIS instead of the total score into separate regression equations (cf. simultaneous entry), the Avoidance of Physical Discomfort

subscale demonstrated the strongest association with self-reported anxiety.

Extant work using the DIS suggests discomfort intolerance is related to anxiety-related symptoms, but the investigations in this regard are limited in number and scope. Although promising, there are at least three key limitations of existing research that warrant further study. First, previous tests have evaluated the cross-sectional and predictive explanatory value of individual facets of the discomfort intolerance, but not evaluated them in the same overarching model. That is, in regression equations evaluating the role(s) of DIS sub-factors in regard to panic problems, DIS subscales have been evaluated in separate regression models and have not yet been evaluated simultaneously in a single model that concurrently evaluates their shared and independent relations with the studied dependent variables. Given that the two facets of discomfort intolerance are empirically related to one another and both theoretically expected to be associated with panic symptoms (Schmidt et al., 2006), it is important to examine their respective effects in the context of one another. This type of test would help elucidate the unique explanatory value of each facet of distress intolerance for panic symptoms while explicitly considering their shared variance with one another.

Second, there have been only two tests that address the role of distress intolerance in terms of incremental validity for panic symptoms. In one study, baseline anxiety symptoms were used as a covariate (Schmidt et al., 2006), and in the other investigation, trait anxiety and anxiety sensitivity were evaluated (Schmidt et al., 2007). A more comprehensive test of discomfort intolerance in terms of panic symptoms could be attained if there was simultaneous covariation for a generalized tendency to experience negative mood rather than only anxiety symptoms (negative affectivity), anxiety sensitivity (for replication), and emotional acceptance. Each of these factors could represent higher-order constructs related to discomfort intolerance that could alternatively account for past findings linking distress intolerance to panic. For example, an individual prone to experience negative mood (e.g., sadness, anxiety, anger) may be less able to tolerate distressing physical sensations; likewise, individuals with a limited ability to tolerate physical distress may be more likely to experience negative affect. This type of perspective suggests that negative affectivity may share systematic associations with discomfort intolerance, although currently such relations have yet to be empirically tested. Similarly, if an individual is hypersensitive and fearful of anxious internal sensations (anxiety sensitivity), then, they may be less able to tolerate various forms of physically uncomfortable or distressing sensations. And finally, a person who has a greater capacity to embrace adverse events (emotional acceptance) may have greater levels of tolerance for distressing physical sensations or vice versa. It is not empirically clear as of yet whether discomfort intolerance is distinguishable from emotional acceptance. Thus, it is possible that the variance these constructs theoretically may share explains previously observed associations between distress intolerance and panic. Overall, the relevance of discomfort intolerance for models of panic vulnerability would be significantly strengthened if this construct and its lower-order factors accounted for variance above and beyond negative affectivity, anxiety sensitivity, and emotional acceptance.

A final limitation of past work pertains to two methodological features of past biological challenge studies addressing discomfort intolerance. First, the sample sizes were rather limited in both investigations (Schmidt et al., 2006, 2007). Thus, expanding the sample size would lend confidence in the generalizability and stability of past observed effects. Additionally, it would be useful to

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