A test of the interactive effects of anxiety sensitivity and mindfulness in the prediction of anxious arousal, agoraphobic cognitions, and body vigilance

Anka A. Vujanovića, Michael J. Zvolenskya, Amit Bernsteina, Matthew T. Feldnerb, Alison C. McLeisha

aThe University of Vermont, Department of Psychology, 2 Colchester Avenue, John Dewey Hall, Burlington, VT 05405-0134, USA
bUniversity of Arkansas, USA

Received 30 November 2005; received in revised form 21 June 2006; accepted 23 June 2006

Abstract


Keywords: Anxiety sensitivity; Mindfulness; Panic vulnerability; Body vigilance; Anxiety

Introduction

Anxiety sensitivity (AS) is the fear of anxiety and anxiety-related sensations (Reiss & McNally, 1985). This cognitive factor is theorized to predispose individuals to the development of panic and certain types of other anxiety problems (Reiss & McNally, 1985), a perspective that is empirically supported (Schmidt, Lerew, & Jackson, 1997, 1999). The vast majority of research on AS has focused on demonstrating its role in panic vulnerability (McNally, 2002). A topic that has received significantly less empirical attention is to what extent other theoretically relevant factors interact with AS in terms of predicting panic vulnerability.
Mindfulness has increasingly been theorized to play an important role in psychological functioning generally and anxiety problems specifically (Zvolensky, Feldner, Leen-Feldner, & Yartz, 2005). Although distinct operationalizations of “mindfulness” have been proposed (e.g., Baer, Smith, & Allen, 2004; Zvolensky et al., 2005), Brown and Ryan (2003) developed a promising theoretically derived self-report measure entitled the Mindful Attention Awareness Scale (MAAS). The MAAS assesses individual differences in the frequency of mindful attention and awareness states over time, and thus, we will refer to this construct as “mindfulness.” According to Brown and Ryan (2003), mindfulness, as indexed by the MAAS, denotes conscious “attention to, and awareness of, what is occurring in the present” (p. 824). Here, mindfulness refers to open observation of internal and external processes, a process that may be important in disengaging individuals from automatic thoughts, habits, or maladaptive behavioral patterns (Brown & Ryan, 2003). This construct differs theoretically and empirically from other self-awareness-related constructs, such as objective self-awareness, self-consciousness, and other related constructs that define self-awareness (Brown & Ryan, 2003). This conceptualization of mindfulness also is distinct from the attention training model set forth by Wells, White, and Carter (1997), as attention training is a cognitive technique based on an information processing approach, while Brown and Ryan’s (2003) construct of mindfulness is theorized to offer a basic, perceptual—rather than cognitive—display of the current moment, a neutral appraisal or perception of stimuli “as they are” (Brown & Ryan, 2003, p. 824).

Initial work on the MAAS has indicated that it is negatively related to the intensity and frequency of negative affect symptoms over time (Brown & Ryan, 2003; Study 4). For example, high levels of mindfulness, as indexed by the MAAS, have been associated with lower mood disturbance and stress symptoms among cancer patients (Carlson & Brown, 2005). Other studies have found that the MAAS incrementally predicts affective vulnerability relative to negative and positive affectivity and emotional expression and processing associated with approach-oriented coping (Carlson & Brown, 2005). Building from previous work, it was theorized that mindfulness may interact with established cognitive risk factors, such as AS, to significantly decrease vulnerability for panic-relevant symptoms and problems. Here mindfulness may serve to “dampen” the negative effects of an established risk factor like AS. For example, an individual high in AS is likely to fear the negative consequences of aversive stimuli (McNally, 2002) and cope with the corresponding emotional distress through escape/avoidance-oriented tactics (Zvolensky & Forsyth, 2002). Moreover, research on emotional learning suggests that this type of process unfolds rapidly and in a largely automatic fashion (Bechara et al., 1995). To the extent that a high AS individual can allocate attention to, and awareness of, what is occurring in the present moment, however, this cascade of automatic anxiety-related processes may be hindered or forestalled altogether. Specifically, mindfulness may theoretically permit the high AS individual to attend to the current situation, thereby gaining a more objective perception of the level of personal threat, rather than reacting to it in an excessively anxiety-relevant manner (i.e., catastrophizing). Here, we would theorize that only anxiety/panic processes should be related to this interactive process (cf. depressive symptoms) in the immediate situation, as this interactive mechanism seems specific to anxiety-related states. For example, according to Clark’s (1986) cognitive model of panic, individuals who engage in catastrophizing or “what if” future-oriented thinking thereby trigger the physiological symptoms of anxiety, thus leading to panic responses. A high AS individual with little ability to allocate attentional resources to the present moment may be more apt to report catastrophic cognitions and hence a greater range of more intense panic-relevant symptoms. This type of perspective is broadly consistent with models of mindfulness (Zvolensky et al., 2005) and information processing perspectives for anxiety psychopathology (Wells, 1994, 1999).

Together, the current study sought to examine the interactive effects of mindfulness and AS in predicting panic-relevant symptoms. It was expected that AS and mindfulness would interact to differentially relate to panic-relevant criterion variables. This perspective was driven by the conceptual model that if an individual can engage in mindfulness, this person would be at a significantly lower risk of experiencing automatic fearful cognitions related to panic symptoms. In addition, to test the specificity of this interactive association with panic-relevant symptoms, it was hypothesized that the AS by mindfulness interaction would not be significantly related to anhedonic depressive symptoms (i.e., an effect unique to the panic model and not apparent generally for all negative mood states).
Method

Participants

A total of 248 participants (136 females; $M_{age} = 22.4$ years, $SD = 7.93$) were recruited through the general community in Vermont via flyer placement in a local well-traveled marketplace, local restaurants, and university-based bulletin boards. Participants were recruited for participation in a study on “emotion” that involved the completion of theoretically relevant measures and perhaps a laboratory component. We did not over-sample for high-risk individuals purposefully, as the global aim of the investigation was to gain a broad-based understanding of the risk processes among a community sample. The racial composition reflected that of the local population (State of Vermont Department of Health, 2000): approximately 93.5% of the sample was Caucasian, 2.4% African-American, 1.6% Asian-American, .8% Hispanic, and 1.6% other. Participants were excluded on the basis of limited mental competency or the inability to give informed, written consent.

Measures

Anxiety Sensitivity Index (ASI)

The ASI (Reiss, Peterson, Gursky, & McNally, 1986) is a 16-item measure on which respondents indicate, on a 5-point Likert-type scale ($0 = \text{very little}$ to $4 = \text{very much}$), the degree to which they fear the potential negative consequences of anxiety-related symptoms and sensations. The ASI is made up of one higher-order factor (ASI total score) and three lower-order factors: Physical, Psychological, and Social Concerns (Zinbarg, Barlow, & Brown, 1997). In the present investigation, we utilized the total ASI score, as it represents the global AS factor and therefore takes into consideration different types of lower-order fears.

Mindful Attention Awareness Scale

The MAAS is a 15-item questionnaire on which respondents indicate, on a 6-point Likert-type scale ($1 = \text{almost always}$ to $6 = \text{almost never}$), their level of attention and awareness to present events and experiences (Brown & Ryan, 2003). The MAAS total score is derived from summing all the items. The MAAS shows good internal consistency and psychometric properties across a wide range of samples ($\alpha = .80 \sim .87$; Brown & Ryan, 2003; Zvolensky et al., in press).

Mood and Anxiety Symptom Questionnaire (MASQ)

The MASQ is a measure of affective symptoms (Watson, Weber, Assenheimer, & Clark, 1995). Participants indicate how much they have experienced each symptom on a 5-point Likert-type scale ($1 = \text{not at all}$ to $5 = \text{extremely}$). The General Distress: Depressive Symptoms scale (MASQ: GDD) measures depressed mood, which is expected to be nondistinguishing relative to anxiety. The General Distress: Anxious Symptoms scale (MASQ: GDA) indexes anxious mood, which is expected to be nondistinguishable relative to depression. The Anxious Arousal scale (MASQ-AA) measures the symptoms of somatic tension and arousal. The Anhedonic Depression Scale (MASQ-AD) measures a loss of interest in life. Only the MASQ-AA and MASQ-AD subscales were used in the present investigation.

Agoraphobic Cognitions Questionnaire (ACQ)

The ACQ is a 14-item scale measuring the frequency of frightening or maladaptive thoughts about the consequences of panic and anxiety (Chambless, Caputo, Bright, & Gallagher, 1984). Items are rated on a 5-point Likert-type scale ($1 = \text{thought never occurs}$ to $5 = \text{thought always occurs}$). The ACQ has been shown to have excellent psychometric properties (Kotov, Schmidt, Zvolensky, Vinogradov, & Antipova, 2005).

Body Vigilance Scale (BVS)

The BVS was used to assess attentional focus on somatic symptoms (Schmidt, Lerew, & Trakowski, 1997). The BVS is a four-item instrument on which respondents indicate, on an 11-point Likert-type scale ($0 = \text{none}$ to $10 = \text{extreme}$), the degree to which they agree with a particular statement regarding attentional focus on bodily sensations and related processes. The BVS has adequate internal consistency ($\alpha = .75$) and it has been
used successfully among clinical (Schmidt, Lerew, & Jackson, 1997; Schmidt, Lerew, & Trakowski, 1997) and nonclinical populations (Zvolensky & Forsyth, 2002).

**Procedure**

Participants responding to community-based advertisements for the study were scheduled for an individual appointment by a trained research assistant. At this appointment, upon receiving a description of the study, participants provided verbal and written consent and then completed a self-report battery assessing mindfulness and affect-related variables. Upon completion of the study, participants were debriefed regarding the aims of the study and compensated for their efforts.

**Analytic approach**

To address the current hypotheses, hierarchical multiple regression analyses were performed. The criterion variables were: anxious arousal symptoms, anhedonic depressive symptoms, agoraphobic cognitions, and body vigilance. The main effects of AS and mindfulness were simultaneously entered at step 1 and their interaction was entered at step 2 in the model. This model tests whether mindfulness interacts with AS and ensures that any observed effects for the interaction term are unique and not attributable to the main effect terms in steps 1 or 2 (Cohen & Cohen, 1983).

**Results**

*Descriptive data and zero-order correlations among theoretically relevant variables*

Please see Table 1 for zero-order correlations. All correlations are significant and in the expected direction with the exception of the non-significant association between mindfulness and body vigilance.

*Regression analyses*

Please see Table 2 for a summary of the regression analyses. In terms of anxious arousal, step one of the model accounted for 35% of variance. As hypothesized, AS was a significant predictor of anxious arousal symptoms; however, there was no effect for mindfulness. As hypothesized, after controlling for the variance accounted for by step one of the model, there was a significant interaction between AS and mindfulness at step two in the model.

Concerning agoraphobic cognitions, step one of the model accounted for 41% of variance. AS and mindfulness were both significant predictors. As hypothesized, there was a significant interaction between AS and mindfulness at step two in the model.

In terms of body vigilance, 15% of the overall variance in body vigilance was accounted for at step one in the model. Here, AS was a significant predictor of body vigilance; there was no effect for mindfulness. Inconsistent with prediction, there was no significant interaction between AS and mindfulness in relation to body vigilance.

Finally, in regard to anhedonic depressive symptoms, step one of the model accounted for 25% of the variance in this criterion variable; AS and mindfulness were both significant predictors. As expected, there was not a significant interaction between AS and mindfulness for anhedonic depressive symptoms.

*Examining the form of the significant interactions*

Forms of the significant interactions were examined by inserting specific values for each predictor variable into the regression equations associated with the described analysis (Cohen & Cohen, 1983, pp. 323, 419). As

---

1Tests of mediation were performed and found to be nonsignificant. Mindfulness did not mediate the association between AS and any of the criterion variables. Thus, these analyses are not reported in the paper.
can be seen in Fig. 1, in regard to anxious arousal, the form of the interaction indicates that co-occurring low levels of AS and low or high mindfulness yield the lowest levels of anxious arousal; in other words, no significant differences were found between the low AS-low mindfulness and low AS-high mindfulness groups as relevant to levels of anxious arousal. Furthermore, co-occurring high levels of AS and low levels of mindfulness yield the highest levels of anxious arousal. It should be noted that individuals reporting both high AS and high mindfulness were almost nonexistent, as only one individual (n = 1; .4%) endorsed both levels of AS and mindfulness higher than one standard deviation above the mean. Therefore, high levels of AS co-occurred primarily with low levels of mindfulness, but not with high levels of mindfulness, in the present sample. An identical pattern of findings was evident for agoraphobic cognitions (see Fig. 1).
Discussion

Consistent with prediction, the AS by mindfulness interaction significantly predicted anxious arousal and agoraphobic cognitions in the expected direction. As shown in Fig. 1, co-occurring low levels of mindfulness and high levels of AS yielded the highest levels of anxious arousal and agoraphobic cognitions. The co-occurrence of low or high levels of mindfulness with low levels of AS (i.e., no significant differences were found between low mindfulness-low AS and high mindfulness-low AS groups yielded the lowest levels of anxious arousal and agoraphobic cognitions. Furthermore, the AS by mindfulness interaction did not significantly predict anhedonic depression, thus yielding support for the predictive specificity of the interaction. However, inconsistent with prediction, the AS by mindfulness interaction did not significantly predict body vigilance. One possible reason for this unexpected finding is that the mindfulness construct (Brown & Ryan, 2003), derived from a general measure of present-centered attention and awareness, does not significantly and specifically tap into somatic experience or physically based attention. Taken together, these findings collectively suggest that the AS by mindfulness interaction seems most evident for anxiety symptoms and body-oriented catastrophic thinking, but not all panic-relevant processes.

Evidence was found for the interactive role of mindfulness in strengthening the associations between high levels of AS and panic-related symptoms (i.e., when mindfulness is low) and decreasing the strength of the association between high levels of AS and panic-related symptoms (i.e., when mindfulness is high). Specifically, this pattern was observed in terms of both anxious arousal and agoraphobic cognitions. Although this significant interactive effect is broadly in line with moderation, it should be noted that, technically (Holmbeck, 2002), AS may not be a “true moderator” since individuals who endorsed both high AS and high mindfulness were almost nonexistent in the current sample. Thus, from a conservative viewpoint, evidence of a statistical interaction was obtained, but this interaction does not necessarily, uniformly, or unambiguously mean that moderation was fully operative. Given the early stage of work in this domain, replication of the
current findings would be important to further examine the nature of the identified interactive process. Here, it is noteworthy that mindfulness may actually maintain a number of relations with AS and thereby via multiple processes influence risk for panic problems. For example, elevated levels of mindfulness may decrease levels of AS. Alternatively, high levels of AS may hinder an individual's capacity for high levels of mindfulness. In the case of true moderation, it also is possible that elevated levels of AS may contribute to panic problems when mindfulness is low but not when mindfulness is high; and low levels of AS are not expected to lead to panic-related problems regardless of mindfulness level. Results of the present study provide an important empirical basis for further evaluating AS by mindfulness interactions in future work of panic vulnerability.

Overall, the observed findings underscore the importance of considering AS within multi-factor or multi-dimensional models of panic vulnerability. The current results are broadly theoretically consistent with traditional resilience models (Masten, 1994) of mindfulness in terms of panic problems. Though promising, the present cross-sectional design cannot definitively address the nature of these questions, but rather, provides a basis for exploring such questions in future work. It also is noteworthy that the mechanisms underlying the observed AS by mindfulness interaction may ultimately have translational implications for the clinical intervention and prevention of panic and related anxiety problems by offering an additional therapeutic means by which to clinically target panic-vulnerability factors such as AS. Future intervention studies targeting mindfulness could help to elucidate such issues by measuring changes in levels of AS as a function of changes in mindfulness as well as the corresponding changes in panic-related outcomes that result.

There are several limitations that warrant consideration. First, the current findings were based on a relatively homogenous community sample. As next steps in this program of research, it would be important to examine the interactive effects of mindfulness and AS in select clinical samples and among ethnically diverse individuals. Second, the current study tested the associations between AS and mindfulness, a specific mindfulness-based construct (Brown & Ryan, 2003). Mindfulness, as developed by Brown and Ryan (2003), is only one type of mindfulness construct and others have postulated different conceptualizations of mindfulness (e.g., Baer et al., 2004). It may therefore be prudent to examine the interplay between AS and other mindfulness-based constructs. Third, the present investigation utilized established self-report instruments as the principal assessment strategy. Future work might build upon the present findings and incorporate multimethod approaches to indexing the variables of interest. Fourth, due to the cross-sectional and correlational nature of the present research design, it is not possible to make causal statements concerning any of the relevant constructs. One important next step in this line of inquiry would therefore be to use prospective longitudinal research methodologies to evaluate the consistency of the present findings over time or to experimentally manipulate mindfulness in the laboratory and test singular and interactive effects with AS in terms of anxious and fearful responding to theoretically relevant stressors (e.g., bodily sensations). Fifth, since AS is only one of many risk factors for panic problems, future work directed at isolating the types of risk factors with which mindfulness may interact would be important in terms of systematically shaping the potential explanatory parameters of this construct. Finally, it may be promising for future investigations to explore the nature of the interactive relationship between multiple affect-tolerance-related factors (e.g., distress tolerance), other than AS and mindfulness in relation to anxiety as well as other outcomes of interest.

Acknowledgements

This paper was supported by National Institute on Drug Abuse research grants (1 R01 DA018734-01A1, R03 DA16307-01, and 1 R21 DA016227-01) awarded to Dr. Zvolensky. This work also was supported by a National Research Award (F31 DA021006-01) and University of Vermont McNeil Fund Award granted to Anka A. Vujanovic and a National Research Service Award (F31 MH073205-01) granted to Amit Bernstein.

References

