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Body Vigilance in Nonclinical and Anxiety Disorder Samples: Structure, Correlates, and Prediction of Health Concerns

Bunmi O. Olatunji, Vanderbilt University
Brett J. Deacon, University of Wyoming
Jonathan S. Abramowitz, University of North Carolina, Chapel Hill
David P. Valentiner, Northern Illinois University

The Body Vigilance Scale (BVS) is a measure developed to assess one's conscious attendance to internal cues. The present report investigated the structure, correlates, and predictive utility of the BVS in nonclinical (N=442) and anxiety (N=135) disorder samples. The findings of Study 1 suggest that the BVS is 1-dimensional in a nonclinical sample, and Study 2 replicated the factor structure of the BVS in an anxiety disorder sample. Correlations between the BVS and related (i.e., anxiety sensitivity) and unrelated (i.e., social anxiety) variables were consistent with predictions in both studies. Study 2 also showed that body vigilance is primarily elevated in patients with panic disorder relative to other anxiety disorders. Relative elevations in body vigilance were also observed for patients with hypochondriasis and generalized anxiety disorder. The BVS also demonstrated a specific association with medical utilization and health-related safety-seeking behaviors after controlling for related variables in nonclinical and anxiety disorder samples. The implications of our findings for the nature and measurement of body vigilance as a predictor of health concerns in anxiety disorders are considered.

BODY SENSATIONS ARE CENTRAL to the experience of anxiety and are important symptoms in different anxiety disorders. According to the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV-TR*; American Psychiatric Association, 2000), the reported experience of various bodily sensations (i.e., palpitations, sweating) should be considered in the diagnosis of panic disorder (PD). The experience of bodily sensations has also been implicated in posttraumatic stress disorder (PTSD) (Van Ommeren et al., 2002; Zatzick, Russio, & Katson, 2003), generalized anxiety disorder (GAD) (Hoehn-Saric, McLeod, Funderburk, & Kowalski, 2004; Joormann & Stober, 1999), obsessive-compulsive disorder (OCD) (Zinbarg, Barlow, & Brown, 1997), and social phobia (Mersch, Hilderbrand, Lavy, Wessel, & Van Hout, 1992). In some anxiety disorders, the *fear* of bodily sensations is a central feature (physical catastrophes in PD, social catastrophes in social phobia; Zinbarg, et al., 1997). The fear of bodily sensations may also have implications for health concerns observed in other anxiety conditions (Abramowitz, Brigidi, & Foa, 1999; Schmidt, Joiner, Staab, & Williams, 2003).

Emerging research suggests that the *perception* of bodily sensations, or body vigilance, is important in the experience of anxiety, especially in PD (Schmidt, Lerew, & Trakowski, 1997). This increase in the *awareness* of bodily sensations that is implicated in PD should theoretically contribute to panic attacks among those with PD and relate to anxiety sensitivity (AS; fear of arousal-related sensations) and subsequent medical utilization (e.g., Zvolensky & Forsyth, 2002) as well. For example, research on cardiac perception in PD has shown that participants with panic attacks report greater cardiac awareness and patients with PD perform better than controls on tests of heart rate perception (Ehlers & Breuer, 1992; Van der Does, Antony, Ehlers, & Barsky, 2000). It has also been shown that participants with good heart rate perception report more somatic

Address correspondence to Bunmi O. Olatunji, Department of Psychology, Vanderbilt University, 301 Wilson Hall, 111 21st Avenue South, Nashville, TN 37203, USA; e-mail: olubunmi.o.olatunji@vanderbilt.edu.
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concerns and anxiety sensitivity than those with poor heart rate perception (Eley, Stirling, Ehlers, Gregory, & Clark, 2004). These findings highlight the importance of heightened awareness of internal cues, or body vigilance, in the development of panic pathology. In an attempt to facilitate programmatic research on the role of body vigilance in PD, Schmidt et al. (1997) developed the 4-item Body Vigilance Scale (BVS), a self-report instrument that allows for the assessment of one's conscious attention to internal bodily sensations. The initial psychometric evaluation of the measure revealed good internal consistency in student (αs = .82 and .84), community (α = .82), PD (α = .82), and social phobia (α = .74) samples. The BVS also demonstrated adequate test-retest reliability in student (rs = .67 and .69) and PD (r = .58) samples across 5 weeks. Factor analysis of the BVS yielded a one-factor solution, and patients with PD scored significantly higher than patients with social phobia or nonclinical controls.

Given the ubiquity of body sensations and the fear of such phenomena observed across the anxiety disorders, it is also possible that body vigilance operates as a risk factor for a number of anxiety disorders (i.e., not just PD) by increasing the perception of disorder-specific bodily sensations. For instance, persons with social phobia may be vigilant for sensations such as trembling, blushing, and sweating during social situations. Vigilance for bodily sensations in various anxiety disorders may then lead to a variety of complications, including disorder-specific avoidance, AS, and health care utilization. There is considerable evidence that people with PD utilize the health care system more frequently than do controls (Rees, Richards, & Smith, 1998; Weissman, 1991). GAD is also a common diagnosis among patients presenting to the health care system with concerns of bodily sensations (e.g., Roy-Byrne, 1996). Indeed, intense anxiety can produce bodily sensations that mimic health problems, and there is increased awareness of the pervasiveness of various core health behaviors (e.g., smoking) in the anxiety disorders (Zvolensky & Bernstein, 2005). It has also been shown that enhanced bodily awareness is associated with greater somatic complaints (Eley et al., 2004). Excessive vigilance for bodily sensations may then predispose persons with various anxiety disorders to misinterpret their bodily sensations as signs of illness, thus reinforcing help-seeking behavior. Body vigilance has been found to be normally distributed in a nonclinical sample but related to a history of spontaneous panic attacks and high levels of fear of bodily sensations (Schmidt et al., 1997). Thus, vigilance for bodily cues may also be associated with health care utilization in a normal sample. The identification of a unique link between body vigilance and health care utilization in both nonclinical and clinical samples could have implications for interventions aimed at managing health care cost.

Given the limited research on the psychometric properties of the BVS, the present research first examined the factor structure and the construct validity of the BVS in nonclinical and clinical samples. It also attempted to elucidate the role of body vigilance in the maintenance of anxiety disorders, with particular reference to health concerns in nonclinical and clinical samples. We report two studies in the present article. In the first study, we examined the factor structure of the BVS, the convergence and discriminant validity of the BVS, and the utility of the BVS in predicting medical utilization and safety-seeking behaviors in a nonclinical sample. It was predicted that the BVS would yield a one-factor solution, demonstrate theoretically consistent relationships with measures of anxiety, and uniquely predict medical utilization and safety-seeking behaviors. In the second study, we attempted to replicate the findings of the psychometric properties of the BVS reported in Study 1 with a clinical sample of anxiety disorder patients. Study 2 also examined the utility of the BVS in predicting health care utilization as well as the specificity of body vigilance to PD and PD symptom severity. It was predicted that the BVS would also yield a one-factor solution in the clinical sample, demonstrate a specific association with PD and panic severity, and uniquely predict health care utilization.

Study 1: Body Vigilance in a Nonclinical Sample

METHOD

Participants. Four hundred and forty-two undergraduate students were recruited from introductory psychology courses at a university in the midwestern United States. The mean age was 19.6 years, and more than half of the participants (61.3%) were women. The sample was 64.5% Caucasian (n = 285), 18.8% African American (n = 83), 8.1% Hispanic (n = 36), 7.5% Asian American (n = 33), and included 5 participants of other or unreported ethnicities.

Measures. Body Vigilance Scale (BVS; Schmidt et al., 1997). The BVS measures the tendency to attend to panic-related body sensations. The measure consists of 4 items. Three items assess the degree of attentional focus, perceived sensitivity to changes in bodily sensations, and the average amount of time spent attending to bodily sensations. The fourth item involves separate ratings for attention to 15 bodily

sensations (e.g., heart palpitations) that include all of the *DSM – IV* physical symptoms described for panic attacks in accordance with the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*; American Psychiatric Association, 1994). Scores on Item 3 are divided by 10. Ratings for the 15 sensations are averaged to yield one overall score for Item 4. The BVS total score is the sum of items 1-4. As previously discussed, the initial validation study (Schmidt et al., 1997) revealed that the BVS has good internal consistency and adequate test-retest reliability. The BVS was also found to be normally distributed in a nonclinical sample but associated with anxiety and panic symptoms. The BVS was also elevated in patients with panic disorder. However, substantial reductions in BVS scores were also observed among panic disorder patients after treatment. Anxiety sensitivity was related to BVS scores and emerged as a significant predictor changes in BVS scores during treatment.

Short Health Anxiety Inventory (SHAI; Salkovskis, Rimes, Warwick, & Clark, 2002). The SHAI contains 18 items that assess health anxiety independently of physical health status. Items assess worry about health, awareness of bodily sensations or changes, and feared consequences of having an illness. The SHAI has demonstrated good reliability and validity in clinical and nonclinical samples (Abramowitz, Deacon, & Valentiner, in press; Salkovskis et al., 2002).

Anxiety Sensitivity Index-Revised (ASI-R; Taylor & Cox, 1998). The ASI-R is a 36-item, expanded version of the original ASI (Reiss, Peterson, Gursky, & McNally, 1986) and measures the fear of anxiety-related sensations based on beliefs about their harmful consequences. The ASI-R consists of four subscales assessing the fear of respiratory symptoms, the fear of publicly observable anxiety reactions, the fear of cardiovascular symptoms, and the fear of cognitive dyscontrol (Taylor and Cox, 1998). The ASI-R has demonstrated acceptable reliability and validity in clinical and nonclinical samples (Deacon, Abramowitz, Woods, & Tolin, 2003; Taylor & Cox, 1998).

Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988). The BAI assesses 21 common symptoms of clinical anxiety (e.g., sweating, fear of losing control). Respondents indicate the degree to which they have been bothered by each symptom during the past week. The BAI was designed to assess anxiety symptoms independently from depression symptoms and has good reliability and validity (Beck et al., 1988).

Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998). The SIAS measures 20 cognitive, affective, and behavioral reactions to social interactions and has demonstrated adequate psychometric properties and validity (Mattick & Clarke, 1998). This scale was included in the present study as a measure of divergent validity for the BVS.

Medical Utilization Questionnaire (MUQ). The MUQ (Abramowitz et al., in press) was constructed to assess two domains of health-related behaviors associated with severe health anxiety. First, respondents indicate whether or not they have utilized each of 20 medical services (e.g., student health service, emergency room, cardiologist, psychiatrist) in the past 6 months. For each utilized service, participants indicate the number of visits in the past 6 months. Total scores are calculated by summing the total number of visits across all providers seen. Second, participants rate the frequency with which they engaged in 10 safety-seeking behaviors (e.g., checking body for signs of illness, calling nurse help lines, accessing health material on the Internet) out of concern for their health during the past month. Responses were provided on a 5-point Likert scale ranging from 0 (*never out of concern for my health*) to 4 (*all the time out of concern for my health*). Scores on each item were summed to yield a total score, and the safety-seeking behaviors portion of the MUQ demonstrated adequate internal consistency ($\alpha = .76$).

Procedure. Participants completed a questionnaire packet containing informed consent and the above measures and received course credit for their participation.

RESULTS

Preliminary analyses. The mean BVS total score was 15.52 ($SD = 8.74$), and the measure demonstrated minimally adequate internal consistency ($\alpha = .64$). Each of the 4 items evidenced acceptable corrected item-total correlations (range = .62 to .83) based on the criterion of .30 recommended by Nunnally and Bernstein (1994). BVS total scores were not correlated with age ($r = -.02$, $p > .05$), and women ($M = 15.95$, $SD = 9.71$) and men ($M = 14.86$, $SD = 6.92$) did not significantly differ on BVS scores, $t(428) = -1.25$, $p > .05$.

Factor structure of the BVS. Given that only one published study at the time of this writing has reported a factor analysis on the BVS, we elected to use exploratory rather than a confirmatory factor analytic approach. We examined the factor structure of the BVS using principal components analysis (PCA). Means and standard deviations for all items are presented in the top portion of Table 1. The criteria for determining the number of factors to retain were (a) unrotated eigenvalues greater than 1, (b) a scree plot test, and (c) the interpretability or resulting factor structures. One factor emerged from the PCA

with all items loading ≥.65 (eigenvalue=2.24, accounting for 56.0% of the variance). The magnitude of the communalities (also presented in Table 1) suggests that the factor accounted for a moderately large portion of the variance in most items.

Correlations between the BVS and related measures. Correlations between the BVS, the four ASI-R subscales, and the SHAI, BAI, and SIAS are presented in Table 2 (below the diagonal). As expected, body vigilance was most strongly related to symptoms of health anxiety and the two ASI-R subscales assessing fears of physical sensations, suggesting convergent validity. Demonstrating good divergent validity, the BVS was only weakly related to symptoms of social anxiety and fears of publicly observable anxiety reactions.

Body vigilance in the prediction of medical utilization and safety-seeking behaviors. We conducted a series of multiple linear regression analyses to examine the extent to which body vigilance uniquely predicted medical utilization and health-related safety-seeking behaviors. In each regression equation, the BVS, four ASI-R subscales, SHAI, BAI, and SIAS were simultaneously entered as predictor variables. In the first analysis we examined the incremental validity of the BVS in predicting health care utilization over the past 6 months. Together the eight predictor variables explained a significant portion of the variance in medical utilization, $R^2=.10$, $F(8, 403)=5.60$, $p<.001$, and only the SHAI (partial $r=.17$, $p<.001$) accounted for significant, unique variance in medical utilization. We elected to repeat the analysis after removing the SHAI as a predictor variable to further examine the incremental validity of the BVS relative to the other remaining predictor variables. This second analysis accounted for significant variance in medical utilization, $R^2=.07$, $F(7, 404)=4.49$, $p<.001$. Both the BVS (partial $r=.14$, $p<.01$) and the BAI (partial $r=.11$, $p<.05$) explained significant, unique variance in medical utilization.

In the final analysis, we examined the incremental validity of the BVS in predicting health-related safety-seeking behaviors. The eight predictors explained 18.9% of the variance in safety-seeking behaviors, $F(8, 404)=11.80$, $p<.001$). Three variables emerged as significant, unique predictors: the SHAI (partial $r=.17$, $p<.001$), the BVS (partial $r=.14$, $p<.01$), and the BAI (partial $r=.14$, $p<.01$). Thus, after controlling for the influence of related variables, the BVS generally demonstrated a specific association with medical utilization and health-related safety-seeking behaviors.

Table 1
Body Vigilance Scale (BVS): Item means and standard deviations, factor loadings, and communalities (h^2) for the one-factor solution from study 1 (Undergraduate sample) and study 2 (Anxiety disorder sample)

BVS Item	M	SD	Factor Loading	h^2
Undergraduate sample[a]				
1	5.21	2.43	.84	.70
2	5.26	4.99	.65	.42
3	2.18	2.03	.76	.57
4	2.93	2.09	.74	.55
Anxiety disorder sample[b]				
1	6.73	2.87	.93	.86
2	6.79	2.94	.93	.87
3	3.37	3.11	.81	.66
4	3.91	2.45	.79	.63

Note. [a]The eigenvalues were 2.24, .78, .58, and .40; [b]The eigenvalues were 3.01, .49, .43, and .06.

DISCUSSION

Findings from Study 1 generally replicated those reported by Schmidt et al. (1997). Factor analysis of the BVS yielded a one-factor solution and the 4 BVS items demonstrated minimally adequate internal consistency. The BVS also demonstrated good convergent and discriminant validity. Specifically, it was most strongly related to health anxiety and the tendency to fear respiratory and cardiovascular-related sensations associated with anxiety, and it was only weakly related to symptoms of social anxiety and fears of publicly observable anxiety reactions. Evidence was also found for the predictive utility of the BVS. Body vigilance contributed unique variance to the prediction of health care utilization over the past 6 months and health-related safety-seeking behaviors after controlling for related variables. Importantly, the BVS did not significantly predict health care utilization when the SHAI was entered into to regression model. This suggests that the relation between body vigilance and health care utilization may be mediated by worry about health and feared consequences of having an illness. These findings suggest that the BVS may be a reliable and valid instrument for assessing conscious attention focused on internal bodily sensations in a nonclinical sample. However, the utility of the measure in a clinical sample cannot be adequately assessed, as there remains limited research to date evaluating the psychometric properties of the measure in clinical samples. Accordingly, we elected to examine the psychometric properties of the BVS in a sample of anxiety disorder patients.

Study 2: Body Vigilance in a Clinical Sample

METHOD

Participants. Study participants included 135 treatment-seeking patients with a primary anxiety

Table 2
Correlations between the body vigilance scale and related measures among undergraduate students (below the diagonal) and patients with anxiety disorders (above the diagonal)

Measure	Measure							
	1	2	3	4	5	6	7	8
1. BVS	–	.61	.13	.61	.32	.61	.49	.05
2. ASI-R Respiratory	.31	–	.20	.67	.37	.44	.46	.15
3. ASI-R Social	.18	.51	–	.18	.39	.06	.19	.52
4. ASI-R Cardiovascular	.31	.61	.38	–	.44	.55	.42	.10
5. ASI-R Cognitive	.23	.49	.39	.74	–	.23	.38	.37
6. SHAI	.49	.45	.36	.54	.48	–	.34	.04
7. BAI	.23	.45	.37	.46	.55	.42	–	.25
8. SIAS	.09	.22	.39	.32	.40	.31	.40	–
[a]Mean	20.57	16.85	14.30	13.29	7.62	37.45	22.93	32.92
[a]Standard Deviation	9.50	10.40	7.75	11.74	6.55	11.27	13.22	20.24
[b]Mean	15.52	8.76	7.97	2.76	2.19	10.79	10.45	21.86
[b]Standard Deviation	8.74	7.86	5.68	4.79	3.98	6.37	9.13	9.35

Note. Correlations ≥.18 below the diagonal are significant at $p<.001$. Correlations ≥.32 above the diagonal are significant at $p<.001$. BVS = Body Vigilance Scale; ASI-R = Anxiety Sensitivity Index–Revised; ASI-R Respiratory = fear of respiratory symptoms subscale; ASI-R Social = fear of publicly observable anxiety reactions subscale; ASI-R Cardiovascular = fear of cardiovascular symptoms subscale; ASI-R Cognitive = fear of cognitive dyscontrol subscale; SHAI = Short Health Anxiety Inventory; BAI = Beck Anxiety Inventory; SIAS = Social Interaction Anxiety Scale; [a]anxiety disorder sample; [b]undergraduate sample.

disorder diagnosis (diagnostic and assessment procedures are described below). Fifty patients had a principal diagnosis of PD, followed by 32 with social phobia, 22 with GAD, 17 with specific phobia, and 14 with hypochondriasis (conceptualized as severe health anxiety; Taylor & Asmundson, 2004). Many patients had additional Axis I diagnoses (52.6%), including 22 (16.2%) with major depressive disorder. The mean age of the sample was 36.5 (SD = 12.9) and about half of the patients were women (n = 77, 57.0%). The sample was predominantly Caucasian (n = 123, 91.1%).

Measures. Clinical participants completed the BVS, SHAI, ASI-R BAI, and SIAS as described in Study 1. Additionally, participants completed the Panic and Agoraphobia Scale (PAS; Bandelow, 1995). The PAS is a 13-item measure of PD symptoms that is available in an observer-rated version and the self-report version used in the present study. Items assess panic attacks, agoraphobic avoidance, anticipatory anxiety, disability and functional impairment, and health concerns. The self-report version of the PAS has been shown to possess good internal consistency, treatment sensitivity, and concurrent validity with other measures of panic (Bandelow, 1995; Bandelow et al., 1998).

Procedure. All patients received a *DSM-IV* anxiety disorder diagnosis in a multidisciplinary anxiety disorders clinic housed within a large academic medical center. Prior to their evaluation, patients completed informed consent and the self-report measures described above. A psychologist conducted a 1.5-hour diagnostic interview and functional assessment of the patient's anxiety symptoms and administered the anxiety and mood disorders sections of the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998). The assessment also included a 1-hour interview with a psychiatrist who examined the patient's medical and pharmacological history. Patients were only included in the present study if there was 100% interrater agreement (psychiatrist-psychologist) on the patient's principal diagnosis.

RESULTS

Preliminary analyses. The mean BVS total score was 20.57 (SD = 9.50) and the measure demonstrated adequate internal consistency (α = .89). Each of the 4 items evidenced acceptable corrected item-total correlations (range = .79 to .92) based on the criterion of .30 recommended by Nunnally and Bernstein (1994). BVS total scores were not correlated with age (r = –.06, $p>.05$) and did not significantly differ between women (M = 22.19, SD = 9.40) and men (M = 18.94, SD = 10.09), $t(133) = -1.97$, $p>.05$.

Factor structure of the BVS. Exploratory factor analysis was used to examine the factor structure of the BVS. Although confirmatory factor analysis is sometimes used in similar situations, the fact that our Study 1 constitutes the only investigations of the factor structure of the BVS indicates that an exploratory approach is the more appropriate analytic strategy. We analyzed the factor structure of the BVS for the anxiety disorder sample using the same procedures described in Study 1. Consistent with our findings with the nonclinical sample, one factor emerged from the PCA with all items loading ≥.79

(eigenvalue = 3.01, accounting for 75.4% of the variance). Item and means, standard deviations, factor loadings, and communalities are presented in the bottom portion of Table 1. The magnitude of the communalities suggests that the factor accounted for a large portion of the variance in most items. In order to examine the replicability of the one-factor solution, a coefficient of congruence (Gorsuch, 1983) was computed between the factor loadings from PCA in the present study and those reported in Study 1. This analysis yielded a coefficient of congruence of .99, indicating that the factor solutions for the nonclinical and clinical samples were essentially identical.

Correlations between the BVS and related measures. Correlations between the BVS, the four ASI-R subscales, and the SHAI, BAI, and SIAS are presented in Table 2 (above the diagonal). The BVS demonstrated good convergent and divergent validity and evidenced a similar pattern of correlations to that obtained in the undergraduate sample. The BVS was most strongly correlated with the SHAI and the ASI-R subscales assessing fears of physical sensations (all rs = .61, $p < .001$). The magnitude of these correlations was higher in the clinical sample than in the undergraduate sample. BVS scores were weakly related to symptoms of social anxiety and fears of publicly observable anxiety reactions.

Body vigilance in the prediction of medical utilization. Data on medical utilization were available for a subset of patients ($n = 50$), including 15 patients with social phobia, 17 with PD, 8 with specific phobias, 7 with GAD, and 3 with OCD. These individuals were predominantly female (66.3%) and Caucasian (91.6%) and had a mean age of 37.4 years ($SD = 14.3$). To assess medical utilization, an electronic chart review was conducted for the 12 months prior to each patient's evaluation. The number of medical visits, including nonpsychiatric outpatient medical specialty visits, emergency room visits, and primary and urgent care center visits, were tallied. These visits were limited to evaluation and follow-up appointments and did not include any appointments that were related to education, research, inpatient stays, or surgical procedures.

The average patient accrued 9.44 ($SD = 9.02$) nonpsychiatric outpatient medical visits in the 12 months prior to their anxiety disorders clinic consultation. Medical utilization was significantly correlated with only two study measures: the BVS ($r = .30$, $p < .05$) and the ASI-R fear of publicly observable anxiety reactions subscale ($r = -.29$, $p < .05$). We conducted a multiple linear regression analysis to determine whether the BVS uniquely predicted medical utilization after controlling for the four ASI-R subscales, BAI, and SIAS (the SHAI was excluded from this analysis because 10 of the 50 participants had missing data on this measure). The seven predictor variables explained a significant portion of the variance in medical utilization, $R^2 = .28$, $F(7, 42) = 2.28$, $p < .05$. When all independent variables were entered simultaneously into the equation, only the BVS explained significant, unique variance in medical utilization (partial $r = .36$, $p < .05$).

Specificity of body vigilance to PD. To examine the specificity of body vigilance to PD, we conducted a one-way ANOVA comparing BVS scores among individuals with different primary anxiety disorder diagnoses and undergraduate students. The significant overall $F(5, 559) = 17.80$, $p < .001$, was followed up by a series of Fisher's LSD post hoc tests. As depicted in Figure 1, these analyses revealed that individuals with PD ($M = 25.65$, $SD = 7.85$) had significantly higher BVS total scores than patients with social phobia ($M = 14.97$, $SD = 9.14$), GAD ($M = 20.66$, $SD = 8.76$), specific phobias ($M = 16.74$, $SD = 8.18$), and undergraduate students ($M = 15.52$, $SD = 8.74$) (ps < .05), but not patients with hypochondriasis ($M = 21.90$, $SD = 12.45$). Patients with hypochondriasis and GAD also had significantly higher BVS total scores than those with social phobia and undergraduate students (ps < .01). In general, individuals with PD obtained the highest BVS scores, whereas undergraduate students and patients with social phobia and specific phobias obtained the lowest BVS scores.

Body vigilance and PD symptom severity. To examine whether body vigilance was associated with a more severe form of PD, we conducted a multiple linear regression analysis in which the BVS and other study variables (ASI-R subscales, SHAI, SIAS) were entered simultaneously as predictors of PAS scores among the 50 patients with a primary diagnosis of PD. The BAI was excluded from this

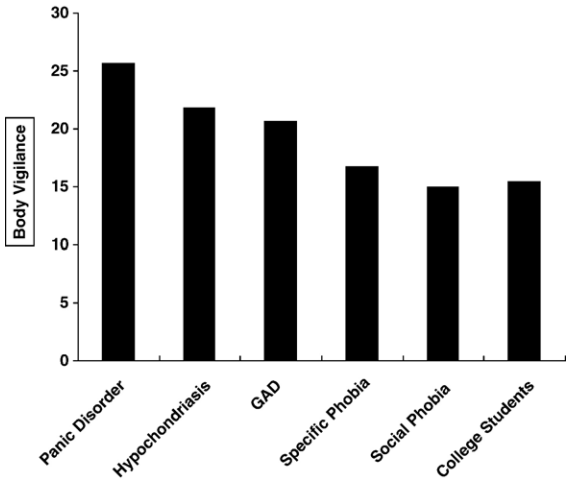

FIGURE 1 Body vigilance in undergraduate students and patients with anxiety disorders.

analysis because it is often regarded as a measure of panic symptoms (Cox, Choen, Direnfeld, & Swinson, 1996). The seven predictor variables explained a significant portion of the variance in PD symptoms ($R^2 = .44$), F (7, 42) = $p < .01$. The BVS emerged as the only significant, unique predictor of PAS scores (partial $r = .47$, $p < .01$).

DISCUSSION

Findings regarding the psychometric properties of the BVS were generally in line with those reported in Study 1. Factor analysis of the BVS yielded a one-factor solution, the 4 BVS items demonstrated adequate internal consistency, and supportive evidence was found for convergent and discriminant validity. Evidence was also found for the utility of the BVS in predicting medical utilization. Among related and unrelated variables, only the BVS explained significant, unique variance in total number of nonpsychiatric outpatient medical specialty visits, emergency room visits, and primary and urgent care center visits. In fact, anxiety sensitivity related to fear of publicly observable anxiety reactions was negatively associated with the number of nonpsychiatric outpatient. Consistent with prior studies (e.g., Schmidt et al., 1997), the findings of Study 2 also revealed that individuals with PD obtained the highest BVS scores, whereas undergraduate students and patients with social phobia and specific phobias obtained the lowest BVS scores. The BVS also emerged as the only significant, unique predictor of panic symptom severity among patients with a primary diagnosis of PD.

General Discussion

In the present study we examined the psychometric properties of the BVS in a nonclinical and in an anxiety disorder sample. The findings from Study 1 replicate those reported by Schmidt et al. (1997). Specifically, exploratory factor analysis revealed that the BVS evidenced a single-factor structure in a nonclinical sample. Exploratory factor analysis in Study 2 also revealed that the BVS is one-dimensional in an anxiety disorder sample. The BVS also demonstrated adequate internal consistency and good convergent and divergent validity in the nonclinical and anxiety disorder sample. For instance, the BVS was more strongly associated with AS related to fears of physical sensations than with measures of social anxiety symptoms in both samples. Schmidt et al. (1997) argued that worry about autonomic activity leads to vigilance for interoceptive threat cues. Thus, body vigilance should be related to AS, the fear of autonomic sensations (Reiss & McNally, 1985). Although social anxiety may be related to the fear of anxiety-related sensations (e.g., Rapee & Heimberg, 1997), vigilance for bodily sensations may not be a general trait associated with social fears. Alternatively, it is possible that the bodily symptoms assessed by the BVS do not include those that might be of greatest concern to individuals with social phobia (e.g., blushing, trembling).

Theoretical accounts of PD suggest that the act of perceiving bodily sensations facilitates the misinterpretation of those sensations leading to panic attacks (Clark, 1986; Rachman, Levitt, & Lopatka, 1987; Reiss & McNally, 1985). Given the centrality of bodily sensations to PD (e.g., Barlow, 1988), body vigilance may be a process specific to PD. Indeed, studies have shown that BVS scores decrease following treatment for PD (Klein and Richards, 2001; Richard & Alvarenga, 2002). Excessive body vigilance may occur as a natural consequence of AS (Schmidt et al., 1997). This model fits well with contemporary theories suggesting that persons with PD expect bodily events to be threatening as evidenced by exaggerated vigilance for potentially dangerous sensations (Bouton, Mineka, & Barlow, 2001). Indeed, Study 2 revealed that individuals with PD had significantly higher BVS total scores than patients with social phobia, GAD, specific phobias, and undergraduate students. However, PD patients did not significantly differ from patients with hypochondriasis in BVS scores. Patients with hypochondriasis and GAD also had significantly higher BVS total scores than those with social phobia and undergraduate students. This finding suggests that while attention to bodily perturbations may be elevated in PD, body vigilance may also contribute to other anxiety disorders.

Study 2 also revealed that only the BVS emerged as a significant, unique predictor of panic symptom severity among patients with a primary diagnosis of PD. This finding supports the notion that body vigilance may act as a risk factor for PD. It has been shown that participants who report greater physiological concerns also report higher levels of internal attentional focus (Zvolensky & Forsyth, 2002). Thus, the increased body vigilance in PD may be related to greater physiological reactivity in individuals with PD (Ehlers, 1993). Based on the notion that body vigilance stems from fears of bodily sensations, high body vigilance should also be found among those high in AS. Thus, the pattern of BVS scores across the anxiety disorders might be expected to mirror the pattern of ASI scores across the anxiety disorders (see Taylor, Koch, & McNally, 1992). However, given the fact that the BVS focuses exclusively on panic-related body sensations at the exclusion of other sensations (e.g., blushing, joint pain), it may be premature to conclude that indivi-

duals with anxiety disorders other than PD have low levels of body vigilance.

In addition to the development of AS, the dangerous perception of bodily sensations may also lead to health and illness concerns (e.g., Abramowitz, Schwartz, & Whiteside, 2002). Indeed, patients with PD have been reported to frequently use medical care services (Rees et al., 1998). Symptoms such as palpitations, tachycardia, and chest pain occur in many patients with PD who present to emergency rooms because of the fear that they are experiencing a heart attack. Patients with GAD (Roy-Byrne, 1996) and OCD (Fineberg et al., 2003) have also been reported to frequently use medical care services. Cognitive-behavioral models emphasizing dysfunctional beliefs about bodily sensations have been proposed to account for the development of health concerns in anxiety conditions (e.g., Warwick & Salkovskis, 1990). Although illness beliefs about bodily sensations may influence demands for medical services, attention to bodily sensations may represent a key component in subsequent utilization of health care services (e.g., Vervaeke, Bouman, & Valmaggia, 1999). Consistent with this notion, Study 1 revealed that body vigilance contributed unique variance to the prediction of health care utilization over the past 6 months and health-related safety-seeking behaviors in the nonclinical sample after controlling for related variables. Similarly, Study 2 showed that only the BVS explained significant, unique variance among related and unrelated variables in predicting utilization of medical services in an anxiety disorder sample. These findings suggest that interventions directly targeting vigilance for bodily sensations may be indicated for maximizing treatment gains and reducing excessive health care utilization. Cognitive interventions (i.e., distraction) may be particularly useful in this context as adjuncts to interoceptive exposure interventions that target the fear of bodily sensations.

An interesting finding that emerged in Study 2 was that body vigilance, but not AS, was associated with greater utilization of health care services in the anxiety disorder sample. This finding complements a prior study showing that although AS was significantly elevated among clinically referred patients relative to nonclinically referred patients, AS was negatively correlated with history of medical illnesses (Bravo & Silverman, 2001). Perhaps greater medical utilization results in a decrease in the fear of bodily sensations, while negatively reinforcing vigilance for bodily sensations and subsequent attempts to seek reassurance from medical practitioners. Although this is a likely explanation, the causal inferences that can be made based on these findings regarding the relation between body vigilance and AS are limited by our correlational design. That is, it is not clear from the present study if medical attention was sought as a result of increased body vigilance, or if body vigilance develops as a result of having to attend to symptoms due to actual illnesses. Additional prospective research with larger clinical samples appears warranted. An additional limitation of this study concerns the fact that only self-report data were included, and thus relationships between study variables may have been inflated as a result of questionnaire-specific method variance. To address this limitation, future research should employ a multitrait-multimethod approach to assessment, including experimental cognitive methods that tap into processes related to body vigilance (e.g., Ludwick-Rosenthal & Neufeld, 1985; Stewart, Buffett-Jerrott, & Kokaram, 2001). Furthermore, future research will be needed to examine if the demonstrated relation between body vigilance and health care utilization in the anxiety disorders is independent of medical illness given that maladaptive health behaviors often contribute to anxiety conditions (Zvolensky & Bernstein, 2005).

In summary, the present findings suggest that the BVS possesses good psychometric properties in both nonclinical and clinical samples. It appears to be one-dimensional in assessing one's conscious attendance to internal cues in nonclinical and anxiety disorder samples. However, concerns regarding bodily sensations have also been implicated in major depression (e.g., Taylor, Koch, Woody, & McLean, 1996). Also, we should point out that the absence of a PTSD group is a limitation of the present study because studies have shown that they tend to have high AS scores (Taylor, 2003) and would thus be expected to also have high BVS scores. Thus, the extent to which the structure of the BVS is invariant across other clinical populations will need to be assessed. The present study also found that the BVS was uniquely linked with health care utilization. This finding suggests that psychosocial intervention programs should focus on the conscious tendency to overattend to internal bodily sensations in order to better manage health care cost. Future research is also needed to identify processes that explain the relation between body vigilance and medical utilization in anxiety disorder samples. Prior research suggests that causal attributions about bodily sensations may determine help-seeking and patient's demands for health care services (MacLeod, Haynes, & Sensky, 1998). Perhaps heightened bodily vigilance intensifies anxiety disorder patients' tendency to make illness attributions. Continued research along these lines

may lead to more effective strategies for managing excessive body vigilance in the anxiety disorders as well as health care costs.

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