Available online at www.sciencedirect.com
ScienceDirect
Behavior Therapy 38 (2007) 86–94
Behavior Therapy
www.elsevier.com/locate/bt

Health Anxiety, Hypochondriasis, and the Anxiety Disorders

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Although clinical observations suggest that health-related anxiety is present, to some extent, in a number of anxiety disorders, this relationship has not been examined empirically. The present study therefore utilized the Short Health Anxiety Inventory (SHAI) to elucidate the structure of such symptoms among patients with anxiety disorders and to empirically investigate the presence of health anxiety in various anxiety disorders. Confirmatory factor analysis yielded equivalent support for either a 2-factor or 3-factor model of the SHAI's latent structure. The measure demonstrated good reliability, convergent validity, and discriminant validity. Comparison of SHAI scores across groups of patients with various anxiety disorders revealed elevated levels of health anxiety among patients with hypochondriasis and panic disorder relative to those with other anxiety disorders. Receiver operating characteristic analyses supported the utility of the SHAI as a diagnostic tool for screening patients with hypochondriasis utilizing empirically derived cut scores. Findings are discussed in terms of cognitive-behavioral models of anxiety disorders.

BECAUSE PHYSICAL WELL-BEING is essential to our survival, it is not surprising that most people experience health-focused thoughts and concerns from time to time (Looper & Kirmayer, 2001). Among those suffering from serious medical illnesses (and those at risk), health concerns serve an adaptive function as they motivate the person to attend closely to bodily sensations to ensure that serious signs and symptoms are dealt with in a timely fashion. In fact, as part of their self-care, at-risk patients are often instructed to monitor their bodies for possible symptoms. In other instances, intense health concerns (or health *anxiety*) develop in the *absence* of organic pathology, such as when individuals perceive themselves as seriously ill on the basis of a misinterpretation of benign bodily sensations (e.g., "This headache means I have a brain tumor," "My stomach pain is caused by a rare gastrointestinal disorder"). Hypochondriasis (HC) involves a pattern of intense health anxiety that is based on these sorts of misattributions. In HC, catastrophic overestimates of the probability and seriousness of medical conditions give rise to preoccupation with the suspected illness, selective attention to illness-related stimuli (Owens, Asmundson, Hadjistavropoulos, & Owens, 2004), and irresistible urges to seek medical advice and reassurance to the extent that it impairs psychosocial functioning.

HC is not the only psychological disorder that involves health concerns. Clinical observations and empirical research indicate that anxiety over health-related matters is a feature of several anxiety disorders. For example, individuals with panic disorder (PD) evidence higher levels of body vigilance (the propensity to attend to internal bodily cues) and anxiety sensitivity (the tendency to catastrophically misinterpret benign arousal-related bodily sensations as indicating a potential catastrophe) relative to nonpatients and those with other anxiety disorders (e.g., Deacon & Abramowitz, in press; Schmidt, Lerew, & Trakowski, 1997).

Health concerns are also observed in some presentations of obsessive-compulsive disorder (OCD; Abramowitz, Brigidi, & Foa, 1999; McKay et al., 2004). For instance, patients with

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0005-7894/06/086–094/$1.00/0

contamination fears evidence obsessional images of germs and fears of illnesses, passive avoidance of situations in which germs might be present (e.g., floors), and compulsive rituals focused on preventing illnesses (e.g., excessive handwashing). Individuals with generalized anxiety disorder (GAD) often display excessive and persistent worries about their health, along with other life events and circumstances such as safety, relationships, and finances (American Psychiatric Association, 2000). Finally, some types of specific phobias (i.e., illness phobia) involve irrational fear and avoidance of particular health-relevant stimuli and situations that are reminders of illnesses, or that are believed to increase the risk of becoming ill (e.g., hospitals, public bathrooms; Marks, 1987).

Despite the prominence of health concerns across a variety of conditions, no research has directly compared levels of health anxiety in groups of individuals with different anxiety disorders. For several reasons, understanding the degree to which health anxiety is present across the anxiety disorders is of particular interest. For instance, a clearer understanding of the role of health anxiety would inform unifying theories and transdiagnostic treatments of anxiety disorders (e.g., Harvey, Watkins, Mansell, & Shafran, 2004; Norton, Hayes, & Hope, 2004), which conceptualize these syndromes as heterogeneous presentations of the same underlying psychological mechanisms. Given that the innate function of anxiety is to protect the organism against injury and harm, it would not be surprising if health concerns emerged as a common denominator of many topographically diverse anxiety states. Research also indicates that the assessment of health anxiety is clinically valuable, over and above other variables (e.g., anxiety sensitivity), in the diagnosis of anxiety conditions (e.g., Schmidt, Joiner, Staab, & Williams, 2003) and that actual and perceived health *concerns* are associated with attenuated treatment outcome (e.g., Schmidt & Telch, 1997). Perhaps health anxiety is also a prognostic indicator for other anxiety disorders.

One explanation for the lack of research on health anxiety is that psychometrically sound measures of this construct have not been available. Recently, however, Salkovskis, Rimes, Warwick, and Clark (2002) introduced the Health Anxiety Inventory (HAI) and its abbreviated form, the Short HAI (SHAI). In an initial study, Salkovskis et al. (2002) reported that the 64-item HAI showed adequate internal consistency (α range = .71 to .92) and test-retest reliability (r = .90 over 1 week) in a sample of HC patients. The 18-item SHAI evidenced comparable reliability (α = .89) and validity, and thus (due to its brevity) is a more practical measure for clinical and research purposes. Salkovskis et al. (2002) reported that the SHAI consists of two factors assessing (a) the perceived likelihood of becoming seriously ill ("illness likelihood"), and (b) the perceived negative consequences of being seriously ill ("negative consequences"). They did not, however, report the pertinent factor analytic results (e.g., factor loadings) in their paper.

In a subsequent study evaluating the psychometric properties and factor structure of the SHAI in a nonclinical sample, we (Abramowitz, Deacon, & Valentiner, in press) also found evidence of sound psychometrics (α = .86). Exploratory factor analysis, however, revealed three factors assessing (a) the perceived likelihood of becoming ill, (b) the perceived negative consequences of becoming ill, and (c) body vigilance. The negative consequences factor overlapped entirely with that identified by Salkovskis et al. Taken together, these two studies indicate that health anxiety as assessed by the SHAI is multidimensional and suggest that further research is needed to elucidate the factor structure of this instrument.

The prominence of health concerns in various anxiety disorders highlights the importance of a reliable and valid measure of health anxiety in clinical samples. The present study therefore had two goals. First, we examined the factor structure, psychometric properties, and correlates of the SHAI in a large sample of individuals with clinical anxiety (including those with HC). After examining the SHAI's internal consistency and item-total correlations, we conducted confirmatory factor analyses (CFA) comparing the goodness of fit of competing factor models. The SHAI's convergent and divergent validity with respect to existing measures of anxiety-related psychopathology was also examined. Consistent with previous work, we predicted that the SHAI would (a) best fit either a two- or three-factor model including factors assessing illness likelihood, negative consequences of having an illness, and perhaps body vigilance, and (b) demonstrate a pattern of theoretically consistent relationships with measures of anxiety-related symptoms.

The second aim of the present study was to examine the phenomenon of health anxiety across several anxiety disorders. On the basis of previous conceptual and empirical work (Salkovskis et al., 2002), we predicted that patients with HC would evidence elevated health anxiety compared to those with anxiety disorders. We also examined the SHAI's utility as a diagnostic instrument for HC. The differential diagnosis of PD and HC can be complicated as both disorders are characterized by health-related fears, body vigilance, and efforts to avoid or seek assurance from medical sources (e.g., Hiller, Leibbrand, Rief, & Fichter, 2005).

Therefore, we specifically examined how well the SHAI distinguishes HC patients from those with PD.

Method

PARTICIPANTS

Participants were 157 adults (i.e., ≥18 years old) with a primary (principal) diagnosis of HC or an anxiety disorder (diagnostic and assessment procedures are described below) who were seeking evaluation and treatment. Forty-nine patients had a principal diagnosis of PD, followed by 32 with social phobia, 21 with GAD, 18 with OCD, and 16 with specific phobia. Twenty-one patients had HC. Many had additional Axis I diagnoses (42.0%), including 26 (16.64%) with depressive disorders. The mean age of the sample was 36.4 ($SD = 13.5$) and about half of the patients were women ($n = 93$, 59.2%). The sample was predominantly Caucasian ($n = 138$, 87.9%). Nearly all participants had earned a high school diploma (97.4%), and over half (52%) held at least a 2-year college degree. About half the sample was married (55.4%), and the median family income was between $50,000 and $60,000 per year.

MEASURES

Short Health Anxiety Inventory (SHAI; Salkovskis et al., 2002). The SHAI is a self-report measure that contains 18 items assessing health anxiety independently of physical health status. Items measure worry about health, awareness of bodily sensations or changes, and feared consequences of having an illness using a multiple-choice format. Salkovskis et al. (2002) identified two factors corresponding to (a) the feared likelihood of becoming ill, and (b) the feared negative consequences of becoming ill. The SHAI has demonstrated good reliability and validity in clinical and nonclinical samples (Abramowitz, Deacon, & Valentiner, in press; Salkovskis et al., 2002).

Body Vigilance Scale (BVS; Schmidt et al., 1997). The 4-item self-report BVS measures the tendency to attend to anxiety-related body sensations. Items assess (a) the degree of attentional focus, (b) perceived sensitivity to changes in bodily sensations, and (c) time spent attending to bodily sensations on 10-point scales. The fourth item involves separate ratings for attention to 15 different anxiety-related sensations (e.g., heart palpitations, dizziness). The BVS has good internal consistency and adequate test-retest reliability (Schmidt et al., 1997).

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. Respondents indicate their agreement with each item on a scale ranging from "very little" (coded as 0) to "very much" (coded as 4). Total scores range from 0 to 144. The ASI-R has demonstrated excellent internal consistency and adequate validity (Deacon, Abramowitz, Woods, & Tolin, 2003; Taylor & Cox, 1998). Prior factor analytic research on the ASI-R has revealed lower-order dimensions pertaining to fear of respiratory, publicly observable anxiety reactions, cardiovascular, and cognitive dyscontrol that may have implications for different disorders relative to the total score (Deacon et al., 2003). Thus, we elected to calculate subscale scores consistent with the four ASI-R factors rather than the ASI-R total score.

Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990). The PSWQ is a 16-item self-report inventory designed to capture the generality, excessiveness, and uncontrollability dimensions of pathological worry without regard to its specific content. Each item is rated on a 1 (*not at all typical of me*) to 5 (*very typical of me*) Likert-type scale (e.g., "My worries overwhelm me"). The PSWQ possesses good internal consistency and test-retest reliability in clinical samples and is at least moderately correlated with other measures of trait worry (Molina & Borkovec, 1994).

Obsessive-Compulsive Inventory–Revised (OCI-R; Foa et al., 2002). The OCI-R is an 18-item self-report questionnaire based on the earlier 84-item Obsessive-Compulsive Inventory (Foa, Kozak, Salkovskis, Coles, & Amir, 1998). Respondents rate the degree to which they have been bothered or distressed by 18 common symptoms of OCD in the past month. The OCI-R assesses six symptom domains: (a) washing, (b) checking/doubting, (c) obsessing, (d) mental neutralizing, (e) ordering, and (f) hoarding. OCI-R total scores have demonstrated excellent psychometric properties and validity (Foa et al., 2002).

Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988). The BAI is a self-report instrument that assesses 21 common symptoms of clinical anxiety (e.g., sweating, fear of losing control). Respondents indicate the degree to which they have recently 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 is a widely used 20-item

self-report measure of social anxiety. Items specifically assess cognitive, affective, and behavioral reactions experienced when meeting and talking with other people (e.g., "I have difficulty making eye contact with others") and are rated on a scale from 0 (*not at all characteristic of me*) to 4 (*extremely characteristic of me*). The SIAS has demonstrated good internal consistency and at least adequate convergent and discriminant validity (Mattick and Clarke, 1998).

PROCEDURE

All patients were assessed in a multidisciplinary anxiety disorders clinic housed within a large academic medical center. Prior to their evaluation, patients completed the self-report measures described above. The diagnostic assessment included a 1.5-hour interview performed by a psychologist who administered the anxiety and mood disorders sections of the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998) and conducted a functional analysis of the patient's anxiety problems. 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

RELIABILITY AND ITEM-LEVEL ANALYSES

The mean SHAI total score for the patient sample was 36.6 ($SD = 13.2$, range = 3–68). SHAI total scores were not significantly associated with age ($r = .06$, $p > .10$) or gender, $t(155) = -1.61$, $p > .10$. The SHAI demonstrated excellent internal consistency ($\alpha = .96$). Each of the 18 items evidenced acceptable corrected item-total correlations (range = .61 to .87) based on the criterion of .30 recommended by Nunnally and Bernstein (1994).

CONFIRMATORY FACTOR ANALYSIS OF THE SHAI

Using AMOS 5.0 (Arbuckle, 2003), we conducted a confirmatory factor analysis to test the goodness-of-fit of competing models of the latent structure of the SHAI. We examined the following models: (a) a single-factor model, (b) the two-factor model reported by Salkovskis et al. (2002), and (c) the three-factor model reported by Abramowitz et al. (in press). Each analysis was conducted using maximum likelihood estimation and was computed from the covariance matrix among the SHAI items. We estimated model fit via four commonly used indices: (a) chi-square, (b) root mean square error of approximation, (c) comparative fit index, and (d) normed fit index. Table 1 presents the results of these analyses.

Goodness-of-fit indices indicated that the single-factor model provided a poor fit to the data. Hierarchical chi-square tests confirmed the relative superiority of both the two-factor model, $\chi^2(1) = 178.19$, $p < .001$, and the three-factor model, $\chi^2(3) = 183.17$, $p < .001$. A comparison of the two-factor and three-factor models indicated adequate and similar model fit, $\chi^2(2) = 4.98$, $p < .10$. Indeed, the fit indices in Table 1 demonstrate that these factor models were essentially identical. On the basis of parsimony, we elected to use the two-factor solution reported by Salkovskis et al. (2002) for subsequent analyses.

Following Salkovskis et al., the two SHAI factors were labeled *Illness Likelihood* and *Negative Consequences*. The first factor was composed of 14 items relating to beliefs about the probability of acquiring a serious illness and attention toward body sensations. The second factor consisted of four items assessing catastrophic thinking regarding the burden and outcome of having a serious illness. Subscales assessing each factor demonstrated adequate internal consistency (αs = .96 and .87, respectively).

CORRELATES OF THE SHAI AND ITS SUBSCALES

We computed Pearson correlation coefficients to explore the associations between SHAI total and subscale scores and other measures of anxiety-related psychopathology. We elected to use subscale scores rather than factor scores due to their greater interpretability and to approximate the way the SHAI might be used in clinical practice. Table 2 presents correlations between the SHAI total score and anxiety-related psychopathology measures. As can be seen, the total score was highly correlated with measures of body vigilance, fear of cardiovascular symptoms, and worry. Moderate correlations were found between the SHAI total score and fear of respiratory symptoms and general anxiety, whereas weak correlations were found between the SHAI total score and measures of fear of

Table 1
Goodness-of-Fit Indices for Factor Models of the SHAI

Model	χ^2	*df*	*p*	RMSEA	CFI	NFI
Single factor	505.07	135	<.001	.13	.84	.80
Two-factor	326.88	134	<.001	.09	.91	.87
Three-factor	321.90	132	<.001	.09	.91	.87

Note. SHAI = Short Health Anxiety Inventory; RMSEA = root mean square error of approximation; CFI = comparative fit index; NFI = normed fit index.

Table 2
Pearson Correlation Coefficients Between SHAI Total and Subscale Scores and Related Measures

	SHAI Total	SHAI-IL	SHAI-NC
SHAI-IL	.94	-	
SHAI-NC	.76	.63	-
BVS	.59	.62	.19
ASI-R Respiratory	.39	.44	.12
ASI-R Social	.10	.08	.10
ASI-R Cardiovascular	.59	.61	.33
ASI-R Cognitive	.22	.25	.08
PSWQ	.51	.44	.33
BAI	.29	.30	.06
OCI-R	.14	.22	.13
SIAS	.06	.02	.07

Note. Correlations ≥ .20 are significant at $p < .01$. SHAI = Short Health Anxiety Inventory; SHAI-IL = Illness Likelihood subscale; SHAI-NC = Negative Consequences subscale; 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; PSWQ = Penn State Worry Questionnaire; BAI = Beck Anxiety Inventory; SIAS = Social Interaction Anxiety Scale.

cognitive dyscontrol, obsessive-compulsive symptoms, and social anxiety.

Correlations between the SHAI subscales and anxiety-related psychopathology measures are also presented in Table 2. The two SHAI subscales demonstrated specific and theoretically consistent patterns of convergent and divergent validity with the criterion variables. Specifically, Illness Likelihood was most highly correlated with the BVS and the ASI-R fear of cardiovascular sensations subscale. Moderate correlations were found between Illness Likelihood and the PSWQ and the ASI-R fear of respiratory symptoms subscale. The Negative Consequences subscale was significantly correlated only with the PSWQ and ASI-R fear of cardiovascular symptoms scale.

DIFFERENTIAL PREDICTION OF THE SHAI FACTORS

We conducted a series of multiple linear regression analyses to examine the extent to which anxiety-related psychopathology measures uniquely predicted the two SHAI subscales. In each regression equation, the BVS, all four ASI-R subscales, PSWQ, OCI-R, BAI, and SIAS were simultaneously entered as predictor variables. In the first analysis predicting Illness Likelihood, the predictor variables explained a significant portion of the variance, $R^2 = 0.56$, $F(9, 134) = 19.22$, $p < .001$. After controlling for other anxiety-related psychopathology variables, only the BVS (partial $r = .40$, $p < .001$), ASI-R fear of cardiovascular symptoms subscale (partial $r = .33$, $p < .001$), and PSWQ (partial $r = .19$, $p < .03$) accounted for unique variance in the Illness Likelihood subscale. In the second regression predicting the Negative Consequences subscale, the predictor variables accounted for 20% of the variance, $R^2 = 0.20$, $F(9, 134) = 3.74$, $p < .001$. The ASI-R fear of cardiovascular symptoms subscale (partial $r = .24$, $p < .004$) and PSWQ (partial $r = .22$, $p < .009$) explained significant, unique variance after controlling for the other anxiety-related psychopathology variables.

GROUP COMPARISONS OF THE SHAI AND ITS FACTORS

To examine the specificity of health anxiety to HC, we conducted a one-way analysis of variance (ANOVA) comparing SHAI scores among individuals with HC and the various anxiety disorders. Descriptive statistics for the SHAI total score for each diagnostic group are presented in Table 3. The significant main effect, $F(5, 151) = 9.58$, $p < .001$, was followed up by Fisher's LSD post hoc tests. These analyses revealed that patients with HC had significantly higher SHAI total scores than patients with PD, social phobia, GAD, OCD, and specific phobia ($ps < .01$). Patients with PD also had significantly higher SHAI total scores than those with social phobia, GAD, and specific phobia ($ps < .05$). However, patients with PD did not significantly differ from patients with OCD. No other significant group differences were found.

One-way ANOVAs comparing SHAI subscale scores across the anxiety disorder groups were also conducted. Descriptive statistics for the Illness Likelihood subscale for each group are presented in Table 3. The significant main effect, $F(5, 151) = 10.91$, $p < .001$, was followed up by Fisher's LSD post hoc tests. Patients with HC, PD, and OCD had significantly higher Illness Likelihood subscale scores than patients with social phobia, GAD, and specific phobia ($ps < .01$). However, patients with

Table 3
Means (M) and Standard Deviations (SD) for SHAI Total and Subscale Scores by Diagnostic Group

Diagnostic Group	SHAI total *M* (*SD*)	SHAI-IL *M* (*SD*)	SHAI-NC *M* (SD)
Hypochondriasis	49.90 (9.26)	38.95 (7.87)	10.95 (2.03)
Panic disorder	39.67 (12.28)	32.60 (10.10)	7.18 (3.14)
OCD	35.44 (16.07)	33.38 (10.03)	6.88 (3.00)
Specific phobia	32.93 (11.68)	25.17 (9.36)	7.43 (3.07)
GAD	31.09 (11.91)	24.47 (9.25)	6.83 (3.19)
Social phobia	29.62 (9.13)	23.36 (7.93)	6.81 (2.58)

Note. SHAI = Short Health Anxiety Inventory; SHAI-IL = Illness Likelihood subscale; SHAI-NC = Negative Consequences subscale; OCD = Obsessive-compulsive disorder; GAD = Generalized anxiety disorder.

HC, PD, and OCD did not significantly differ from each other. No other significant group differences were found. A similar analysis with the Negative Consequences subscale yielded a significant main effect, $F(5, 151) = 6.83$, $p < .001$, which was also followed up by Fisher's LSD *post hoc* tests. Patients with HC had significantly higher Negative Consequences scores than patients with PD, social phobia, GAD, OCD, and specific phobia ($ps < .01$). No other significant group differences were evident. See Table 3.

DIAGNOSTIC UTILITY OF THE SHAI

We examined the utility of the SHAI as a diagnostic instrument by determining the accuracy of different cutoff scores in distinguishing patients with HC from those with anxiety disorders in general and PD in particular. We conducted receiver operating characteristic (ROC) analyses using the Analyse-It add-in for Microsoft Excel. ROC analysis uses the association between sensitivity and specificity to estimate the area under the curve (AUC) to indicate how well a measure distinguishes between positive (i.e., a diagnosis of HC) and negative (i.e., an anxiety disorder diagnosis) cases. A value of 1.0 indicates perfect diagnostic prediction, whereas a value of .50 indicates the level of chance.

Diagnostic accuracy was evaluated by calculating the sensitivity, specificity, positive predictive power, negative predictive power, and overall hit rate of various SHAI total and factor scores. Sensitivity refers to the percentage of patients correctly classified as having HC (i.e., true positives), whereas specificity refers to the percentage of patients correctly classified as having an anxiety disorder (i.e., true negatives). Because sensitivity and specificity are independent of the base rate of the condition of interest, they cannot directly address the issue of whether or not a particular patient with a known test score has the condition (Elwood, 1994). Accordingly, we calculated estimates of positive and negative predictive power to take into account the base rate of HC in our sample (13.4%). In the present study, positive predictive power refers to the probability that an individual with a score at or above a given cutoff has a diagnosis of HC, while negative predictive power refers to the probability that an individual with a score below a given cutoff does have a different disorder. Finally, hit rate refers to the percentage of all patients correctly classified by a given cutoff score.

Differentiating HC from anxiety disorders. The SHAI total score evidenced excellent discriminatory power (AUC = .82, 95% confidence interval = .74 to .91). Table 4 presents diagnostic accuracy figures for selected SHAI total cutoff scores. A cutoff score of 45 provided the best balance between sensitivity and specificity in our sample, correctly classifying 85.7% of HC patients and 77.9% of those with anxiety disorders. A SHAI cutoff score of 63 was preferable from a positive and negative predictive power perspective, which takes the base rate of HC into account. At or above this cutoff, 85.7% of patients had HC, while 77.9% of patients below this cutoff had an anxiety disorder. To evaluate the relative specificity of the SHAI in distinguishing HC from anxiety disorders, we examined the diagnostic accuracy of other theoretically relevant measures. The BAI, ASI-R, and BVS failed to distinguish between these conditions at a level beyond chance (range in AUC = .40–.53).

Differentiating HC from PD. ROC analyses were also conducted to determine the utility of the SHAI in differentiating patients with HC from those with PD. The SHAI total score evidenced a high AUC indicating good discriminatory power (AUC = .73, 95% confidence interval = .61 to .85). As shown in Table 4, a cutoff SHAI total score of 47 provided the best balance between sensitivity and specificity, correctly classifying 81.0% of HC patients and 69.4% of those with PD. A cutoff score of 62 provided the best balance between positive and negative predictive power. At or above this cutoff, 75.0% of patients had HC, while 72.7% of patients below this cutoff had PD. As before, the

Table 4
Predictive Accuracy of Selected SHAI Total Scores: Differentiating Hypochondriasis (HC) From Other Anxiety Disorders and Panic Disorder

Cutoff Score	Sensitivity (%)	Specificity (%)	Positive Predictive Power (%)	Negative Predictive Power (%)	Hit Rate (%)
HC vs. Anxiety Disorders					
45	85.7	77.9	37.5	97.2	78.9
47	81.0	80.9	39.5	96.4	80.8
49	33.3	85.3	25.9	89.2	78.3
53	28.6	93.4	40.0	89.4	84.7
59	19.0	97.8	57.1	88.6	87.2
63	14.3	99.3	75.0	88.2	87.8
65	00.0	99.3	00.0	86.5	85.9
HC vs. Panic Disorder					
47	81.0	69.4	53.1	89.4	72.8
49	33.3	73.5	35.0	72.0	61.4
51	28.6	81.6	40.0	72.7	65.7
53	28.6	91.8	60.0	75.0	72.8
59	19.0	95.9	66.6	73.4	72.8
62	14.3	98.0	75.0	72.7	72.8
65	00.0	98.0	00.0	69.5	68.5

Note. SHAI = Short Health Anxiety Inventory. Calculations of positive predictive power and negative predictive power were based on a HC diagnosis base rate of 13.4%.

BAI, ASI-R, and BVS failed to demonstrate diagnostic utility (range in AUC = .32–.42).

Discussion

Clinical observations suggest that health anxiety is present in a variety of psychological disorders, yet very little empirical research on health anxiety exists in the literature. One reason for this dearth of research is that very few measures have been developed to assess the construct of health anxiety. The SHAI is a novel instrument that assesses the cognitive and behavioral features of health anxiety. It possesses good psychometric properties among individuals with HC and among nonclinicals. The present study, however, is the first to evaluate this measure in an anxiety disorder patient sample. It is also the first study to empirically consider the role of health anxiety in the anxiety disorders. Given that the innate function of anxiety is to protect the organism against injury and harm, it is no surprise that health concerns emerge as prominent foci of fear and worry across a number of these conditions. The results of the present study can therefore inform the conceptualization and treatment of clinical anxiety.

Confirmatory factor analyses provided equivalent support for two- and three-factor models of the SHAI reported in previous studies by Salkovskis et al. (2002) and Abramowitz et al. (in press). On the basis of parsimony, we elected to examine the two-factor model originally reported by Salkovskis et al. (2002) assessing (a) the perceived likelihood of acquiring a serious illness, intrusive thoughts, and body vigilance (Illness Likelihood) and (b) catastrophic beliefs about the anticipated burden of having a serious illness (Negative Consequences).

Our analyses revealed satisfactory convergent and divergent validity for the total SHAI and the two factors. Specifically, the total score and Illness Likelihood factor were moderately to strongly associated with theoretically overlapping constructs (i.e., body vigilance, fear of cardiovascular and respiratory symptoms, worry) and weakly related to constructs considered theoretically distinct from health anxiety (i.e., social anxiety, obsessive-compulsive symptoms, and fear of cognitive dyscontrol). The Negative Consequences factor demonstrated significant relationships (weak to moderate in magnitude) with fears of cardiovascular symptoms and worry. These results indicate that the SHAI possesses good reliability and validity in a clinical sample.

The findings from our regression highlight the triumvirate of anxiety sensitivity, body vigilance, and worry as integral to health anxiety and HC. This is consistent with cognitive-behavioral models of HC which posit that intense health anxiety arises as a result of the tendency to catastrophically misinterpret harmless bodily sensations as threatening. As a result of putting oneself on a heightened state of alert for signs of the feared illness, the individual becomes body vigilant. Such increased attentional focus on internal sensations raises the individual's awareness of normal bodily perturbations (body "noise"; e.g., ordinary fluctuations in gastrointestinal sensations, vestibular functioning, and so on), initiating a self-sustaining vicious cycle of catastrophic misinterpretation→anxiety→body vigilance→notice internal sensations, and so on. This has the long-term effect of strengthening the illness worry, which might be compounded by catastrophic thinking and an intolerance of uncertainty regarding the negative consequences of being ill (e.g., Langlois & Ladouceur, 2004).

The second aim of the present study was to examine the role of health anxiety in the psychopathology of anxiety disorders. Consistent with conceptualizations of HC as severe health anxiety (e.g., Taylor & Asmundson, 2004), patients with this disorder reported higher SHAI total scores relative to those with anxiety disorders. The finding that PD patients evidenced higher SHAI total scores relative to patients with other anxiety disorders is also consistent with formulations of PD as involving health anxiety (Schmidt et al., 2003). Although we found that patients with OCD did not show elevated SHAI total scores, OCD patients did not differ significantly from PD and HC patients in their beliefs about the probability of becoming ill. This is consistent with clinical and research observations that, like the concerns of patients with HC and PD, obsessional preoccupation in OCD often focuses on health and illness (Abramowitz et al., 1999). In contrast, patients with HC demonstrated elevated beliefs regarding the negative consequences of ill health relative to all of the other patient groups. This pattern of results suggests that whereas HC, PD, and OCD all involve preoccupation with body sensations and the probability of becoming ill, HC (more than these other disorders) involves catastrophic beliefs about the *consequences* of acquiring the feared illness.

These findings have direct relevance to the assessment and treatment of HC and anxiety disorders using cognitive-behavioral therapy. In particular, treatment providers should include assessments of health-focused anxiety when working with anxious patients, and consider the role of such concerns as antecedents of avoidance and safety-seeking behavior. Moreover, within the framework of available treatment manuals, cognitive therapy techniques can be incorporated to address

intolerance of uncertainty regarding illnesses and patient-specific overestimates of the probability and costs (especially in the case of HC) of having a serious disease. For example, one patient treated in our clinic held unrealistic beliefs about the costs of death, remarking that she was afraid to die because of how terrible she would feel (as if still conscious) missing out on special family events. Once assessed, this patient benefitted from cognitive restructuring that modified her dysfunctional belief that, if she actually died, she would wish that she was still alive.

The ROC analyses indicated that HC and the anxiety disorders, including PD, are distinguishable on the basis of total scores on the SHAI. A cutoff score of 45 correctly classified more than 75% of patients with HC and anxiety disorders. Likewise, a score of 47 correctly distinguished between HC and PD in greater than 70% of cases. Compared to the BAI, ASI-R, and BVS, only the SHAI demonstrated diagnostic utility. When taking the relatively low base rate of HC in our sample (13.4%) into account, higher optimal cutoff scores were preferable from a positive and negative predictive power standpoint. However, maximizing positive and negative predictive power produced unsatisfactory decreases in specificity, such that only 14.3% of HC patients scored at or above the optimal cutoff scores. Overall, our results indicate that the SHAI has considerable utility as a screening measure for HC in clinical settings. Our findings attest to the influence low base rates can have on the clinical utility of diagnostic instruments (Elwood, 1994).

The present study raises issues regarding the overlap of HC with anxiety disorders. Our findings suggest similarities in the psychological mechanisms involved in HC and those involved in most anxiety disorders; especially PD, OCD, and phobias. Specifically, overestimates of the likelihood and negative consequences of feared events are cardinal features in all instances. Patients with PD misinterpret arousal-related sensations as indicating medical emergencies (e.g., heart attack); those with OCD misinterpret innocuous internal and external (obsessional) cues as indicating responsibility for harm; and those with social phobia misinterpret ambiguous social cues from others as overly negative. HC appears to involve misappraisals of often vague, yet innocuous, bodily perturbations as indicating serious disease. These functional similarities have implications for psychological treatment. Indeed, the specific cognitive-behavioral techniques that are designed to reduce pathological fear (i.e., exposure therapy) are also effective in reducing HC symptoms (Taylor & Asmundson, 2004).

Finally, some limitations of the present study should be considered. First, because all of the symptom measures were self-report inventories, questionnaire-specific method variance might have inflated relationships among study variables. A multitrait-mutimethod approach should be considered for use in future studies. Second, the design of this study was cross-sectional and correlational, which precludes causal inferences. Although we have identified factors (i.e., worry, body vigilance, fear of cardiovascular symptoms) that are uniquely related to health anxiety, it cannot be determined from these data whether such factors are a cause or consequence of health anxiety. Future research incorporating experimental and longitudinal designs is needed to facilitate current understanding of variables contributing to the etiology of health anxiety and HC.

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Received: September 22 2005
Accepted: May 3 2006
Available online 23 October 2006