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ORIGINAL ARTICLE

Explicit and Implicit Anxiety: Differences Between Patients with Hypochondriasis, Patients with Anxiety Disorders, and Healthy Controls

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Abstract Empirical research has found comparable levels of anxiety in patients with hypochondriasis and those with various anxiety disorders. However, the majority of these investigations were based exclusively on questionnaires (Q-data). In the present study, we included the implicit association task-anxiety (IAT-anxiety; Egloff and Schmukle in J Personal Soc Psychol, 83:1441–1455 2002) as an implicit test (T-data) of anxiety. Results showed that patients with hypochondriasis ($n = 36$) and those with anxiety disorders ($n = 25$) did not differ with respect to explicit (brief symptom inventory) or implicit measures (IAT-anxiety) of anxiety, with both groups exhibiting higher values than healthy controls ($n = 34$). For measures of hypochondriacal attributes (illness attitude scales), patients with hypochondriasis exhibited the highest values, and the values of patients with anxiety disorders lay between those of healthy controls and those of hypochondriacal patients. The results indicate a clear overlap between hypochondriasis and anxiety disorders with respect to explicit and implicit measures of anxiety.

Keywords Hypochondriasis · Anxiety disorders · Implicit association test · Health anxiety · Illness behavior

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Introduction

The fact that the main criterion for the diagnosis of hypochondriasis is fear of having a serious disease (APA 2000) indicates that there is a strong association between hypochondriasis and anxiety. Empirical research based on a variety of samples has demonstrated significant correlations between hypochondriacal fears, beliefs, and attitudes on the one hand, and anxiety on the other (Kellner et al. 1987). Such relationships have been found in psychiatric patients (e.g., Kellner et al. 1992) as well as in participants from the general population (e.g., Weck et al. 2009). It has further been found that 86% of patients with hypochondriasis have one or more additional anxiety disorders (Barsky et al. 1992). Typically, patients with hypochondriasis also exhibit symptoms of anxiety disorders such as panic disorder and obsessive compulsive disorder, although the symptoms are less pronounced (Deacon and Abramowitz 2008).

There is evidence of a broad symptom overlap between hypochondriasis and several anxiety disorders, in particular for panic disorder, generalized anxiety disorder, and obsessive compulsive disorder. Many studies have identified hypochondriacal characteristics in patients with these anxiety disorders (for an overview, see Noyes 1999). However, only a few studies have directly compared patients with hypochondriasis and patients with an anxiety disorder.

An early investigation conducted by Noyes et al. (1986) revealed a strong overlap between patients with hypochondriasis and those with panic disorder in terms of hypochondriacal attributes. The authors compared the Whiteley-Index values (WI, Pilowsky 1967) of patients with panic disorder to those of hypochondriacal psychiatric patients originally assessed by Pilowsky (1967) and

found comparable mean WI values for the two patient groups.

In contrast, Barsky et al. (1994) compared patients with hypochondriasis without a comorbid panic disorder and patients with panic disorder without a comorbid hypochondriasis and found phenomenological and functional differences between the two disorders. Patients with hypochondriasis had more hypochondriacal symptoms, somatized more, described themselves as more disabled, and were rated by their primary-care physicians as more help-rejecting than panic patients. Furthermore, hypochondriacal patients were less satisfied with the medical care they had received. In contrast to the study by Barsky et al. (1994), these results emphasize the differences between patients with hypochondriasis and those with a panic disorder.

More differentiated results were reported by Hiller et al. (2005), who examined patients with hypochondriasis without panic disorder ("pure" hypochondriasis), patients with panic disorder without hypochondriasis ("pure" panic disorder), and patients with comorbid hypochondriasis and panic disorder. The authors found no differences between the first two of these patient groups with regard to anxiety, but they did find differences using the illness attitude scales (IAS; Kellner 1986) and the WI—two measures of hypochondriasis; patients with hypochondriasis scored significantly higher on these measures. These results demonstrate the close relationship between anxiety disorders and hypochondriasis in terms of anxiety, at the same time as confirming that the clinical conditions are distinguishable with respect to hypochondriacal attributes.

In a study by van den Heuvel et al. (2005), patients with obsessive–compulsive disorder, patients with panic disorder, and patients with hypochondriasis performed a cognitive and an emotional Stroop task during functional magnetic resonance imaging. Results revealed a similar activation pattern for patients with hypochondriasis and patients with panic disorder, with increased activation being observed in the right amygdala and hippocampus. In contrast, patients with obsessive–compulsive disorders mainly showed activation patterns in ventral brain regions. These findings provide evidence of neuroanatomical similarities between patients with panic disorder and hypochondriasis.

Abramowitz et al. (2007) also compared patients with different anxiety disorders and those with hypochondriasis and found the greatest overlap in health anxieties between patients with hypochondriasis and those with panic disorder, but also found differences between hypochondriacal patients and patients with various anxiety disorders. Using the short health anxiety inventory (SHAI; Salkovskis et al. 2002), they specifically found higher total scores for patients with hypochondriasis than for patients with an anxiety disorder. Panic disorders proved phenomenologically most similar to hypochondriasis, followed by obsessive–compulsive disorders: patients with panic disorder and obsessive–compulsive disorder both had higher total SHAI scores than those with social phobia, generalized anxiety disorder, and specific phobias. The study thus indicated the greatest degree of phenomenological similarity between panic disorder and hypochondriasis and provided evidence of a further overlap between obsessive–compulsive disorders and hypochondriasis.

In order to examine the cognitive processes involved in different anxiety disorders and hypochondriasis, Deacon and Abramowitz (2008) compared patients diagnosed with hypochondriasis, obsessive–compulsive disorder, and panic disorder and attempted to identify possible overlaps in symptoms and cognitive processes. They employed a variety of questionnaires designed to assess cardinal symptoms and key cognitive biases (i.e., intolerance of uncertainty, anxiety sensitivity, and body vigilance). Patients with hypochondriasis and obsessive–compulsive disorders exhibited elevated and comparable levels of intolerance of uncertainty and hypochondriacal patients and patients with panic disorders showed elevated and comparable levels of body vigilance. Overall, the results revealed an overlap between the three patient groups with respect to certain cognitive processes that are thought to underlie the symptoms of these disorders. Despite the observed similarities, hypochondriasis was reliably distinguished from the other two disorders using discriminant function analysis.

Little is known about the similarities between generalized anxiety disorder and hypochondriasis. In the study by Barsky et al. (1992) mentioned above, the lifetime comorbidity rate of generalized anxiety disorder among patients with hypochondriasis proved highest at 71%. This result can be seen as evidence of the phenomenological similarities between these disorders. Other studies failed to find such a high rate of comorbidity for generalized anxiety disorder and hypochondriasis. Noyes et al. (1994), for example, examined 50 patients with hypochondriasis and found that none had a coexisting generalized anxiety disorder. As far as we are aware, however, there has been no direct comparison between hypochondriasis and patients with generalized anxiety disorders to date.

In summary, hypochondriasis and anxiety disorders share many characteristics which are typical of anxiety disorders. Relevant data remain limited, however, because most investigations have been based on questionnaires and participants' responses to questionnaire items are unfortunately often confounded by two classes of factors (see Greenwald et al. 2002): (1) *introspective limits* which might exist if participants are unable to accurately indicate their true score because they are unaware of their true state and (2) *response factors* (e.g., demand characteristics,

evaluation apprehension, or faking) which may mask the self-report when respondents are aware of their true state. For these reasons and in line with Cattell and Warburton (1967), assessment should not depend on one single form of data and questionnaire data (Q-data) should be supplemented with data from experimental tests (T-data). The aim of this study was therefore to compare patients with hypochondriasis, patients with an anxiety disorder, and healthy controls with respect to explicit anxiety measured using a questionnaire (Q-data) and implicit anxiety measured using an objective test (T-data). In addition, participants' hypochondriacal attitudes, fears, and beliefs as well as abnormal illness behavior were assessed by means of a questionnaire. For the assessment of implicit anxiety, a previously validated adaptation of the implicit association task (IAT; Greenwald et al. 1998) was used, namely, the IAT-anxiety (Egloff and Schmukle 2002). Implicit cognition, including implicit anxiety, can be defined as introspectively unidentified (or inaccurately identified) traces of past experience that mediate favorable or unfavorable feeling, thought, or actions (Greenwald and Banaji 1995).

We hypothesized that: (1) patients with hypochondriasis and anxiety disorders would not differ with regard to their explicit or implicit anxiety but would exhibit higher values as compared with healthy controls, (2) patients with hypochondriasis would show higher values on hypochondriacal measures than patients with anxiety disorders or healthy controls, and (3), in line with previous studies investigating the association between implicit and explicit measures, correlations between explicit and implicit measures of anxiety would be small.

Method

Participants

A total of 95 participants took part in the study. Sixty-one were patients seeking treatment for their mental problems at the outpatient unit of the Department of Clinical Psychology at the University of Mainz from January 2005 until November 2006. All patients were diagnosed according to DSM-IV criteria using the international diagnostic checklists for DSM-IV (IDCL; Hiller et al.1996). In previous studies (Hiller et al. 1993), the IDCL has been found to show good interrater reliability, with, for example, a Cohen's Kappa of .83 for affective disorders and .76 for anxiety disorders. Thirty-six of the patients had hypochondriasis and 25 had an anxiety disorder (without comorbid hypochondriasis). Eleven (44.0%) of the 25 patients with an anxiety disorder had panic disorder, 11 (44.0%) social phobia, two (8.0%) a specific phobia, and one (4.0%) obsessive–compulsive disorder. Ten (27.8%) of the patients with hypochondriasis and five (20.0%) of the patients with an anxiety disorder also had a comorbid anxiety disorder. Eleven (30.6%) of the patients with hypochondriasis and 12 (48.0%) of the anxiety patients suffered from comorbid depression. The occurrence of comorbid disorders among patients with hypochondriasis did not significantly differ from that found among anxiety patients ($\chi^2 = 0.31$; $df = 1$; $p > .10$). These two groups of patients did not display any differences in the number of comorbid anxiety disorders ($\chi^2 = 0.48$; $df = 1$; $p > .10$) or comorbid depression disorders ($\chi^2 = 1.91$; $df = 1$; $p > .10$).

The healthy control group comprised 34 participants. In order to exclude participants with a mental disorder, the structured clinical interview (SCID) was conducted (First et al. 1997). None of the participants were found to have a mental disorder. Recruitment and diagnostic interviews with the control group were carried out by a trained undergraduate. There were no differences between the three study groups in terms of sex ($\chi^2 = 0.22$; $df = 2$; $p = .90$), age ($F = .10$; $df = 2$; $p = .90$), or educational level ($\chi^2 = 4.2$; $df = 2$; $p = .12$). Table 1 provides an overview of the sociodemographic characteristics as well as the comorbid anxiety disorders and comorbid depression disorders in the three groups.

Measures

Questionnaires

Participants completed the German version (Franke 2000) of the brief symptom inventory (BSI; Derogatis and Melisaratos 1983), which is widely used to assess aspects of general psychopathology and consists of 53 items. Items of the BSI are assessed using a five-point scale ranging

Table 1 Sociodemographic characteristics, comorbid anxiety disorders, and comorbid depression disorders for the sample of patients with hypochondriasis, patients with anxiety disorders, and healthy controls

	Hypochondriasis $n = 36$	Anxiety disorder $n = 25$	Healthy controls $n = 34$
Female (%)	18 (50.0%)	14 (56.0%)	18 (52.9%)
Age (SD)	36.3 (11.9)	36.6 (11.9)	35.3 (12.2)
Qualification for university entrance (%)	24 (66.7%)	12 (48%)	25 (73.5%)
Comorbidity (%)			
Comorbid anxiety disorders	10 (27.8%)	5 (20.0%)	
Comorbid depression disorders	11 (30.6%)	12 (48.0%)	

from 'not at all' (0) to 'extremely' (4). The instrument consists of nine subscales: (1) somatization, (2) obsessive-compulsiveness, (3) interpersonal sensitivity, (4) depression, (5) anxiety, (6) hostility, (7) phobic anxiety, (8) paranoid ideation, and (9) psychoticism. In addition to these subscales, the inventory comprises three general distress measures, the most important of which is the *general severity index* (GSI), which is the mean item score. The BSI shows acceptable to excellent internal consistency for the subscales, with scores ranging from .70 to .96 (Derogatis 1993; Boulet and Boss 1991; Broday and Mason 1991). Test–retest reliability (for 1 week) ranges from .68 to .91 (Derogatis 1993). The BSI scales correlate with other measures which assess social support and quality of life (Franke 2000).

Participants additionally completed the German version of the IAS. Due to its high reliability, validity, and sensitivity, the IAS continues to be the gold standard for self-rated assessment of hypochondriacal attributes (Sirri et al. 2008). The German version of the IAS, developed by Hiller and Rief (2004), has also been shown to demonstrate good reliability and validity, with an alpha coefficient of .90 for the overall scale ($\alpha = .91$ for the subscale 'health anxiety' and $\alpha = .75$ for the subscale 'illness behavior'). The test–retest reliability of the overall scale lies between .89 (30-day retest interval) and .92 (50-day retest interval; Hiller and Rief 2004). Concerning validity, the IAS correlates with other measures which are associated with hypochondriasis and clearly discriminates between hypochondriacal and non-hypochondriacal patients (Hiller et al. 2002).

Anxiety-IAT

The IAT-anxiety (Egloff and Schmukle 2002) assesses the strength of implicit associations between the self and anxiety by comparing the response times of two combined discrimination tasks. Participants are presented with stimuli from the categories *self* (me, my, own, I, self) and *other* (they, your, them, you, others) as well as with stimuli from the categories *anxiety* (nervous, afraid, fearful, anxious, uncertain) and *calmness* (relaxed, balanced, at ease, calm, restful). Participants are required to sort stimuli from the four categories using just two responses, each of which is assigned to two of the four concepts. The basic assumption of the IAT is that if two concepts are highly associated (e.g., self and anxiety), then the sorting task will be easier (i.e., take less time) when the two associated concepts share the same response key (e.g., "A" on the left side of the keyboard) and more difficult (i.e., take more time) when the associated concepts share different response keys (e.g., "A" on the left side of the keyboard and number "5" from the numeric keypad on the right). The IAT procedure employed in the present study involved five blocks. In the first block of 20 trials (each item was presented twice), participants practiced discriminating between self and other items (target discrimination). In Block 2, the same procedure was performed for attribute discrimination, with participants sorting stimuli according to the categories of anxiety and calmness. Blocks 3 and 5 each consisted of 20 practice trials and 60 critical trials. In these trials, participants categorized items into one of two combined categories, with combined categories (e.g., *self* and *anxiety*) comprising an attribute and target concept which were assigned the same key. More specifically, the categories *self* and *anxiety* shared one response key (while the categories *other* and *calmness* shared the other response key) in Block 3, and the categories *self* and *calmness* shared a response key in Block 5. In Block 4, participants had 20 trials to practice using the switched key-assignment (from Block 3 to Block 5) for the categories *anxiety* and *calmness*.

IAT data were analyzed using an improved scoring algorithm, namely the D_1 measure (Greenwald et al. 2003). The size of the D_1 measure provides information regarding the implicit anxiety of the participant. The higher the IAT D_1 measure of a given participant, the more anxious his or her implicit self-concept. The Spearman–Brown adjusted split-half correlation of the IAT was .87. Validity of the IAT has been established in terms of its value in predicting several behavioral indicators of anxiety during a stressful speech (Egloff and Schmukle 2002). In addition, the IAT-anxiety has been shown to discriminate between socially anxious participants and participants from a healthy control group (Gamer et al. 2008).

Procedure

Patients completed the questionnaires and IAT-anxiety at the outpatient unit of the Department of Clinical Psychology shortly after first contacting the department and prior to the onset of psychotherapy. Participants in the control group received an appointment at the Department of Clinical Psychology for completion of the questionnaires and the IAT-anxiety.

Data Analyses

Analyses of variance were used to compare the mean values of the three different groups. Categorical variables were analyzed using chi-square tests. All post-hoc comparisons of differences between specific groups were analyzed using Tukey's post-hoc test. Effect sizes were determined using a formula for unequal samples developed by Cohen (1992). A conventional α significance level of .05 was applied.

Results

Internal Consistencies of the Scales and Psychopathological Characteristics of the Samples

Most of the BSI subscales demonstrated at least satisfactory internal consistencies (Cronbach's alpha): somatization ($\alpha = .77$), obsessive–compulsiveness ($\alpha = .81$), interpersonal sensitivity ($\alpha = .76$), depression ($\alpha = .83$), anxiety ($\alpha = .81$), phobic anxiety ($\alpha = .85$), and paranoid ideation ($\alpha = .75$). The BSI subscales hostility ($\alpha = .67$) and psychoticism ($\alpha = .66$) were the only scales which did not reach a satisfactory level of internal consistency. Internal consistencies of the IAS subscales health anxiety ($\alpha = .97$) and health behavior ($\alpha = .85$) as well as of the mean score ($\alpha = .97$) were good to excellent. Reliability of the IAT-anxiety was also good, with a Spearman-Brown adjusted split-half correlation of .85. Table 2 provides an overview of questionnaire scores (BSI, IAS) and the results of the IAT-anxiety for the three study groups. *T* scores of the BSI subscales are provided as an estimate of the degree to which samples exhibited clinically elevated scores. *T* scores were calculated based on a normative sample of 600 adults from the general German population which was assessed by Franke (2000). In contrast to healthy controls, patients with hypochondriasis and those with anxiety disorders exhibited elevated scores on most of the BSI subscales. Significant group differences were found for all BSI and IAS subscales as well as for mean scores. Significant group differences were also found for the D_1 measure of the IAT-Anxiety.

Hypothesis 1

To address Hypothesis 1, according to which patients with hypochondriasis and anxiety disorders would exhibit comparable values for their explicit and implicit anxiety but higher values than healthy controls, post hoc analyses were conducted. Tukey's test showed that patients with hypochondriasis and anxiety disorders differed from one another only with respect to the BSI subscales interpersonal sensitivity, phobic anxiety, and paranoid ideation. Hypochondriacal and anxiety patients showed comparable values on the BSI subscale anxiety (see Table 2). An effect size of $d = 1.51$ ($p < .001$) was yielded for the difference between patients with hypochondriasis and healthy controls on the subscale anxiety and an effect size of $d = 2.15$ ($p < .001$) for the difference between anxiety patients and healthy controls.

Table 2 Means and standard deviations of the brief symptom inventory (BSI), the illness attitude scales (IAS), and the D_1 measure of the IAT-anxiety for the sample of patients with hypochondriasis, patients with anxiety disorders, and healthy controls

	Hypochondriasis (A)		Anxiety disorder (B)		Healthy controls (C)		*F*-value	Group differences[a]
	M (SD)	*T* scores[b]	*M* (SD)	*T* scores[b]	*M* (SD)	*T* scores[b]		
BSI								
Somatization	0.99 (0.53)	73	0.89 (0.69)	69	0.25 (0.25)	49	20.84***	A–C, B–C
Obsessive-compulsiveness	1.13 (0.75)	64	1.39 (1.04)	70	0.59 (0.45)	52	8.91***	A–C, B–C
Interpersonal sensitivity	0.79 (0.68)	59	1.32 (0.88)	43	0.49 (0.48)	52	10.71***	A–B, B–C
Depression	0.81 (0.74)	64	0.97 (0.88)	69	0.26 (0.46)	49	8.96***	A–C, B–C
Anxiety	1.18 (0.79)	75	1.27 (0.66)	77	0.30 (0.19)	49	25.40***	A–C, B–C
Hostility	0.66 (0.50)	60	0.78 (0.68)	63	0.28 (0.27)	49	8.84***	A–C, B–C
Phobic anxiety	0.37 (0.47)	59	1.31 (1.05)	98	0.12 (0.23)	49	27.99***	A–B, B–C
Paranoid ideation	0.47 (0.57)	53	0.86 (0.74)	64	0.25 (0.26)	48	9.18***	A–B, B–C
Psychoticism	0.60 (0.57)	65	0.68 (0.65)	68	0.12 (0.20)	48	11.79***	A–C, B–C
Mean (GSI)	0.82 (0.47)	72	1.04 (0.62)	82	0.30 (0.21)	50	22.16***	A–C, B–C
IAS								
Health anxiety	49. 19 (10.34)		21.76 (12.22)		10.85 (7.34)		137.05***	A–B, A–C, B–C
Illness behavior	14.49 (4.15)		11.24 (5.95)		5.38 (3.05)		38.63***	A–B, A–C, B–C
Mean	63.68 (12.97)		33.00 (16.36)		16.24 (8.76)		125.30***	A–B, A–C, B–C
IAT-anxiety (D_1 measures)	−0.25 (0.27)		−0.20 (0.29)		−0.42 (0.32)		4.74*	A–C, B–C

BSI brief symptom inventory, *IAS* illness attitude scales, *IAT* implicit association task

[a] The letters indicate significant pairwise comparisons, e.g., "A–C" refers to significant differences between patients with hypochondriasis (A) and the healthy controls (C); all post-hoc tests were conducted using Tukey's test

[b] *T* scores were calculated based on a normative sample of 600 adults of the general German population which was assessed by Franke (2000)

* $p < .05$. ** $p < .01$. *** $p < .001$

Patients with hypochondriasis and anxiety disorders did not significantly differ with respect to the D_1 measure of the IAT-Anxiety ($d = .18$; $p = .78$). Effect sizes were $d = 0.57$ ($p = .049$) for the difference between hypochondriacal patients and the healthy control group and $d = 0.71$ ($p = .02$) for the difference between anxiety patients and the healthy control group.

The overlap between patients with hypochondriasis and anxiety disorders may be a simple consequence of the fact that 28% of the patients with hypochondriasis also had a comorbid anxiety disorder. To test this possibility, we excluded patients with a comorbid anxiety disorder and analyzed the remaining 26 "pure" hypochondriasis patients. Patients with "pure" hypochondriasis showed values which were comparable to the original hypochondriasis patient group for the BSI subscale anxiety ($M = 1.19$; SD = 0.86) and the D_1 measure of the IAT-Anxiety ($M = -0.24$; SD = 0.29). Moreover, patients with "pure" hypochondriasis did not significantly differ from patients with anxiety disorders on either the BSI subscale anxiety ($F = 0.74$; $p = .74$) or the D_1 measure of the IAT-Anxiety ($F = 0.66$; $p = .42$).

Hypothesis 2

To address our second hypothesis, according to which patients with hypochondriasis would show higher values on hypochondriacal measures as compared with patients with anxiety disorders or healthy controls, we analyzed the IAS total scores of the three groups using post hoc tests. With regard to their hypochondriacal attitudes, patients with hypochondriasis exhibited the highest IAS scores, and patients with an anxiety disorder scored between hypochondriacal patients and healthy controls (see Table 2). Effect sizes were $d = 2.12$ ($p < .001$) for the difference between hypochondriacal and anxiety patients and $d = 1.34$ ($p < .001$) for the difference between anxiety patients and the healthy control group. The difference between patients with hypochondriasis and healthy controls proved largest, with an effect size of $d = 4.26$ ($p < .001$). For the IAS subscales health anxiety and illness behavior, post-hoc analyses also revealed significant differences ($p < .001$ for all comparisons). The effect size for the difference between hypochondriacal and anxiety patients was $d = 2.46$ for the subscale health anxiety and $d = 0.66$ for the subscale illness behavior. Effect sizes for the differences between patients with hypochondriasis and healthy controls were $d = 4.25$ for the subscale health anxiety and $d = 2.49$ for the subscale illness behavior. Effect sizes for the differences between anxiety patients and healthy controls were $d = 1.12$ for the subscale health anxiety and $d = 1.30$ for the subscale illness behavior.

Hypothesis 3

To address Hypothesis 3, according to which correlations between explicit and implicit measures of anxiety would be small, we analyzed the total sample and found no significant correlations between the D_1 measure of the IAT-Anxiety and either mean BSI values or almost all of the BSI subscales. The BSI subscale anxiety was the only subscale to significantly correlate with the D_1 measure ($r = .26$; $p = 0.01$). No significant correlation was found between mean IAS scores and the D_1 measure of the IAT-Anxiety ($r = .16$; $p = .11$). More detailed analyses revealed a significant correlation between the D_1 measure of the IAT-Anxiety and the IAS subscale illness behavior ($r = .28$; $p = .005$) but not the IAS subscale health anxiety ($r = .12$; $p = .25$).

Discussion

The aim of the current study was to compare patients with hypochondriasis and patients with an anxiety disorder with respect to both explicit and implicit measures of anxiety. Results revealed that values on both measures (implicit and explicit) of anxiety were comparable for patients with hypochondriasis and patients with an anxiety disorder ("Hypothesis 1"). As expected, both patient groups exhibited significantly higher implicit- and explicit-anxiety values as compared to the healthy control group. In addition, the two patient groups significantly differed with respect to a measure evaluating hypochondriacal attitudes, fears, beliefs, and abnormal illness behavior. Significant differences were also found between all three groups regarding health anxiety and illness behavior ("Hypothesis 2"). These results can not be explained by differences in depressiveness or overall psychopathology, since patients with hypochondriasis and anxiety disorders exhibited comparable values on scales measuring these characteristics. Results further showed a stronger association between the implicit measure of anxiety and illness behavior as compared with illness anxiety. Correlations between explicit and implicit measures of anxiety were small in size ("Hypothesis 3").

Patients with hypochondriasis exhibited the highest values on scales measuring hypochondriacal attitudes, beliefs, and behavior but showed considerable overlap with patients with an anxiety disorder in terms of anxiety symptoms. We were able to demonstrate that not only explicit-anxiety but also implicit-anxiety levels were comparably high in patients with hypochondriasis and anxiety disorders ("Hypothesis 1"). Together with previous findings, these results call the validity of classifying hypochondriasis as a somatoform disorder into question. Other

authors have also suggested that hypochondriasis should be classified as an anxiety disorder based on phenomenological similarities between hypochondriasis and several anxiety disorders (Fava et al. 2007; Fava and Mangelli 2001; Noyes 1999; Olatunji et al. 2009; Salkovskis and Clark 1993; Schmidt 1994). However, since our study did not include patients with a somatoform disorder, conclusions concerning the similarities between somatoform disorders and hypochondriasis can not be drawn. Previous research has indicated that somatoform patients show lower scores in both self-reported and observed anxiety (García-Campayo et al. 1998), but it remains unclear whether these patients would also show lower scores on the IAT-anxiety. No study so far has investigated patients with different clinical diagnoses using the IAT-anxiety; it therefore remains unclear whether the instrument is able to differentiate between various clinical groups. Patients with a somatoform disorder may potentially show the same values as patients with hypochondriasis and patients with an anxiety disorder. The IAT-anxiety has, however, been shown to demonstrate adequate reliability (Egloff et al. 2005) and predictive validity (Egloff and Schmukle 2002) in addition to providing evidence of an overlap between the implicit anxiety-related self-concepts of patients with hypochondriasis and anxiety disorders in the present study. Taken together, these findings emphasize the need to continue discussions on the correct classification of hypochondriasis; further studies should focus on similarities and differences between hypochondriasis, anxiety disorders, and somatoform disorders.

With regard to the explicit measures of health anxiety and illness behavior, we found higher values for patients with hypochondriasis than for patients with an anxiety disorder ("Hypothesis 2"). In contrast, Noyes et al. (1986) found comparable WI values for patients with hypochondriasis and patients with panic disorder, although it should be noted that Noyes et al. (1986) compared a sample of panic disorder patients with a sample of hypochondriacal psychiatric patients which had been assessed by Pilowsky 20 years earlier (Pilowsky 1967). Differences in diagnostic procedures and several other study characteristics may explain these contrasting results. Furthermore, other studies, have found significant differences between patients with hypochondriasis and patients with anxiety disorders—in particular patients with panic disorder (Abramowitz et al. 2007; Deacon and Abramowitz 2008; Barsky et al. 1994; Hiller et al. 2005). Such studies suggest that hypochondriasis is distinguishable from various anxiety disorders, including, for example, panic disorder.

We found no or only small correlations between the IAT-anxiety and the administered questionnaires ("Hypothesis 3"). In line with this, previous studies have also found either no or at most moderate correlations between the IAT-anxiety and other questionnaires assessing anxiety (Egloff and Schmukle 2002; Egloff et al. 2005; Egloff et al. 2008; Gamer et al. 2008). A further interesting finding is that the implicit-anxiety measure correlated with the IAS subscale illness behavior but not with the IAS subscale health anxiety, despite the lower reliability of the former (Cronbach's $\alpha = .75$) compared with the latter (Cronbach's $\alpha = .91$). Other investigations have shown that implicit anxiety correlates more strongly with participants' behavior as compared with their consciously controlled self-reports (Egloff and Schmukle 2002). This may help to explain why correlations were found with illness behavior but not with health anxieties. Recent self-concept models assume that implicit and explicit measures target structurally distinct but nevertheless related components of an underlying personality trait (see Fazio and Olson 2003). Accordingly, the IAS and the IAT-anxiety may both be relevant for the appraisal of hypochondriasis, while validly assessing different aspects of the disorder.

Several limitations of our study should be taken into account. In particular, most previous investigations and the current analyses were based on a limited number of measures, especially with regard to the assessment of anxiety which was only addressed in the subscales of the BSI. Furthermore, two BSI subscales (hostility and psychoticism) failed to show satisfactory internal consistency. Results regarding these two scales must therefore be interpreted with caution. The investigation showed that patients with hypochondriasis and anxiety disorders had a comparable anxiety level at the same time as revealing differences between these patient groups. Hypochondriasis, for example, was not associated with phobic anxiety or social anxieties (measured by the subscales of the BSI). Deacon and Abramowitz (2008) also found differences between hypochondriasis, obsessive–compulsive disorder, and panic disorder using a more comprehensive assessment approach. Continued investigations of various anxiety disorders and hypochondriasis are necessary to gain deeper insight into the specific differences and overlaps between the disorders.

A further limitation was that 28% of the patients with hypochondriasis also suffered from an additional anxiety disorder; a fact which may partially explain the comparable anxiety values. In a study by Hiller et al. (2005), the investigated sample of hypochondriacal patients also showed high rates of comorbidity with anxiety disorders. The question is therefore raised as to whether the results can also be generalized to patients with hypochondriasis *without* comorbid anxiety disorders. In this context, our additional analyses of patients with "pure" hypochondriasis revealed no differences between pure and comorbid hypochondriasis patients—patients with hypochondriasis and a comorbid anxiety disorder do not seem to be more anxious than those with "pure" hypochondriasis.

In addition, it should be taken into account that the analyzed sample of hypochondriasis patients may have been an unrepresentative minority. The patients in our study all sought treatment for their problems. However, the majority of patients with hypochondriasis remains in medical settings and never enters psychological or psychiatric treatment. Our patients may therefore represent a special subgroup with especially high values of health-related anxiety. Investigations of hypochondriasis in medical settings should look to replicate the findings in order to ensure generalizability.

Our study demonstrated that it is possible to broadly differentiate between patients with hypochondriasis and patients with anxiety disorders. However, the sample of patients with an anxiety disorder was heterogeneous, comprising equal numbers of patients with social phobia and panic disorder. The observed differences between patients with hypochondriasis and patients with anxiety disorders on the IAS may potentially be due to the fact that social phobia is not associated with hypochondriacal attitudes. Further studies with larger samples should investigate whether hypochondriasis can be differentiated from other types of anxiety disorder. Until then, conceptual distinctions between these disorders remain unclear.

In summary, our findings provide evidence of a wide overlap in anxiety symptoms between patients with an anxiety disorder and patients with hypochondriasis. No differences in either explicit or implicit anxiety were found between these two groups. Together with the fact that patients with hypochondriasis and patients with an anxiety disorder differed on hypochondriacal measures, these findings demonstrate that hypochondriasis is very closely related to, at the same time as being clearly distinguishable from, anxiety disorders. This clarifies the need for further investigations focusing on the classification of hypochondriasis. The discussion as to whether hypochondriasis should be classified as an independent diagnosis among anxiety disorders in DSM-V should be continued.

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