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The structure of emotional and cognitive anxiety symptoms

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ABSTRACT

A sample of 327 patients with primary panic disorder or social phobia completed a questionnaire comprising 77 emotional and cognitive anxiety symptoms from which 12 index scales were constructed. Explorative factor analysis yielded two factors, but confirmatory factor analysis indicated that the factor solution was not invariant across diagnoses. Nevertheless, the two-factor structures fitting data from patients with panic disorder and social phobia, respectively, had similarities in content. The first factor, emotions and cognitive-social concerns, comprised emotional expressions (sadness, fear, and anger), cognitions about cognitive dysfunction (difficulty concentrating, confusion, and loss of control) and social phobic cognitions. It was positively correlated with severity of bodily anxiety symptoms and with the neuroticism personality trait. The second factor, fear of physical sensations, was positively correlated with a cardio-respiratory dimension of bodily anxiety symptoms in panic disorder, lending support to the hypothesis of specific threat-relevant links between bodily symptoms and catastrophic cognitions.

1. Introduction

The cognitive model of panic proposes that catastrophic misinterpretations of bodily sensations serve to increase level of bodily arousal and cause panic attacks (Beck & Emery, 1985; Clark, 1986). Catastrophic cognitions in panic disorder were initially hypothesized to be physical or psychological in nature (Clark, 1986) but later studies have expanded the definition of catastrophic cognitions, including cognitions about physical, emotional, mental, behavioral, and social catastrophes (Austin & Richards, 2001).

Different dimensions of catastrophic cognitions have been obtained through factor analysis. A physical factor, containing symptoms such as fear of dying and fear of having a stroke, has been found in a number of studies using different questionnaire measures (Cox, Endler, & Swinson, 1995; Deacon & Abramowitz, 2006; Hicks et al., 2005; Khawaja & Oei, 1992, 1998; Lovibond & Rapee, 1993; Marks, Basoglu, Alkubaisy, & Senguen, 1991; Wenzel, Sharp, Brown, Greenberg, & Beck, 2006; Zvolensky et al., 2003). Less broad physical factors, such as fear of respiratory symptoms (Deacon & Abramowitz, 2006; Muris, 2002; Taylor & Cox, 1998) or fear of cardiovascular symptoms (Muris, 2002; Taylor & Cox, 1998), have also been found. Additionally, previous studies have extracted a number of other cognitive factors, for example an emotional factor (Khawaja & Oei, 1992, 1998; Wenzel et al., 2006), a mental or cognitive functioning factor (Deacon & Abramowitz, 2006; Hicks et al., 2005; Khawaja & Oei, 1992, 1998; Muris, 2002), a social factor (Deacon & Abramowitz, 2006; Hicks et al., 2005; Khawaja and Oei, 1992; Lovibond & Rapee, 1993; Muris, 2002; Wenzel et al., 2006), or combinations of these, such as social-cognitive concerns (Zvolensky et al., 2003), fear of psychosocial consequences (Marks et al., 1991), or fear of psychological symptoms (Cox et al., 1995). As results of prior studies do not provide a clear hypothesis about the structure of cognitive symptoms, further studies with an explorative approach to data collection and analysis are needed. Much of the variation in the number and nature of the factors derived could probably be ascribed to the very different symptom questionnaires used in previous studies. To extract diverse factors, diverse items must be factored, but most questionnaires used in prior studies have been constructed to measure a limited number of theoretically defined constructs. Including a wider selection of cognitive symptoms may result in a different factor structure.

Cognitive symptoms have often not been assessed, as they are experienced during anxiety or panic attacks, as questionnaires on cognitions have also been used to indicate a global tendency towards cognitive misinterpretation and worry (Lovibond & Rapee, 1993). Future studies focusing on cognitive anxiety symptoms as they are experienced during panic attacks or in anxiety provoking situations may enable a better differentiation between state and trait.

Studies of catastrophic cognitions have primarily examined cognitions of patients with panic disorder, while another line of research has investigated fears and cognitions in social phobia, such as fear of negative evaluation (Watson & Friend, 1969).

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However, some degree of shared etiology and neurobiology between panic disorder, characterized by spontaneous panic attacks, and social phobia, characterized by anxiety in social situations, has been suggested by several lines of evidence: overlapping first choice of treatment (Griez et al., 2001), possible overlapping genetic factors (Gelernter et al., 2004; Gratacos et al., 2001), large comorbidity (Alonso et al., 2004; Goodwin & Hamilton, 2001; Schneier et al., 1992), and similarities in response to physiological challenge agents, such as CO_2 (Caldirola et al., 1997; Gorman et al., 1990) and caffeine (Tancer et al., 1994). Furthermore, the factor structure of bodily anxiety symptoms has been found to be invariant across panic disorder and social phobia (Kristensen et al., submitted for publication). The two disorders may also share a number of cognitive and emotional symptoms. Patients with panic disorder may have cognitions concerning social ridicule and criticism (Khawaja & Oei, 1992) or fear of observable anxiety reactions (Zvolensky et al., 2003), whereas patients with social phobia may also interpret ambiguous internal stimuli as harmful (Austin & Richards, 2006; Harvey et al., 1993).

A few prior studies have examined the relationship between bodily symptoms and cognitive symptoms using factor analysis. Chambless et al. (2000) found fear of physical and psychological symptoms to be specifically associated with related catastrophic thoughts but other studies, factor analyzing bodily and cognitive symptoms together, observed separate factors with relatively little cross-loading (Cox et al., 1995; Steptoe & Kearsley, 1990). Marks et al. (1991) factor analyzed bodily and cognitive symptoms separately. They found five physical factors and three cognitive factors. The first cognitive factor represented fear of physical illness, whereas the two other factors represented fear of psychosocial consequences. Subsequent regression analyses indicated that fear of physical illness was primarily related to cardiovascular and respiratory symptoms, but also to paresthesia. The other cognitive factors, representing psychosocial consequences, were primarily related to depersonalization and unsteadiness.

We have proposed a hierarchical model of bodily anxiety symptoms with a second-order factor, severity, and five first-order factors: cardio-respiratory, gastro-intestinal, autonomic, vertigo, and tension. The hierarchical factor structure was invariant across panic disorder and social phobia (Kristensen et al., submitted for publication). The cognitive theory proposes that patients with panic disorder are hypersensitive to bodily sensations, and that they often misinterpret these sensations in a catastrophic manner (Beck & Emery, 1985; Clark, 1986). If the experience of bodily symptoms leads to catastrophic misinterpretations that again lead to exacerbation of symptoms, catastrophic cognitions should be related to severity of symptoms if not to specific first-order symptom clusters.

Cognitive anxiety symptoms have been observed to be associated with certain personality traits (Khawaja & Oei, 1992; Zvolensky et al., 2003). The relationship between personality traits and cognitive anxiety symptoms has been a topic of debate, more so than the relationship between personality traits and bodily anxiety symptoms (Lilienfeld, Turner, & Jacob, 1993). As an example, the Anxiety Sensitivity Index (ASI) (Peterson & Reiss, 1987), which is a widely used questionnaire measuring fear of arousal symptoms, has been hypothesized to measure trait-like characteristics, since a high score on ASI precedes the development of panic attacks (Donnell & McNally, 1990) and predicts response to physiological challenges, such as hyperventilation (Donnell & McNally, 1989).

The aims of the present study were twofold: first, we wanted to explore the factor structure of cognitive and emotional anxiety symptoms and test its invariance across panic disorder and social phobia. If we were to find invariance of factor structure across diagnoses, it would speak to both the robustness of factors and to the comparability of scores on symptom questionnaires across diagnoses, as well as indicate similarity between the two disorders.

Second, we wanted to investigate associations between cognitive symptom dimensions and a hierarchical structure of bodily anxiety symptoms and between cognitive symptom dimensions and the five-factor model of personality. A differential relationship between symptom dimensions and personality traits, which have often been conceptualized as endophenotypes reflecting both etiological factors and clinical characteristics, may speak to usefulness of the symptom dimensions.

2. Method

2.1. Subjects

Two samples were recruited through advertisements, pamphlets, and the project's website. The first sample comprised 177 patients who in a lifetime perspective fulfilled the DSM-IV diagnostic criteria for panic disorder, agoraphobia, and/or social phobia before the age of 21. The mean age was 36.1 years (SD 12.1), and 72% of the participants were female. They were included as part of an etiological study conducted at the Centre for Psychiatric Research, investigating genetic and environmental risk factors of developing panic disorder, agoraphobia, and social phobia. Inclusion and exclusion criteria were defined to optimize investigation of genetic risk factors. Exclusion criteria were bipolar disorder, obsessive-compulsive disorder, schizophrenia or psychotic symptoms in a lifetime perspective; bipolar disorder or schizophrenia in first-degree relatives; abuse of alcohol or drugs prior to onset of the anxiety disorder; depression immediately prior to, concurrent with or immediately after onset of the anxiety disorder; mental retardation; language disabilities; ethnic background other than Danish; or being under 18 years of age. Of the 680 individuals who volunteered to participate in the etiological study, 491 were excluded as they did not fulfill the diagnostic criteria for panic disorder, agoraphobia, or social phobia before the age of 21 or because they fulfilled one or more of the exclusion criteria.

The second sample consisted of 150 patients who fulfilled DSM-IV diagnostic criteria for panic disorder, agoraphobia, and/or social phobia in a lifetime perspective, but were excluded from the first sample because of onset after the age of 20 (71%), ethnic background other than Danish (8%), and/or depression immediately prior to, concurrent with or immediately after onset of the anxiety disorder (44%). Patients with depressive pathology were only asked to participate if their anxiety disorder diagnosis was not limited to depressive episodes. The mean age was 40.5 years (SD 12.9), and women comprised 82% of this second sample. Data from the two samples were combined prior to data analysis.

2.2. Procedure

All volunteers were screened over the phone by two psychologists asking selected diagnostic questions from the Schedules for Clinical Assessment in Neuropsychiatry (SCAN) (Wing et al., 1990; Wing, Sartorius, & Üstun, 1998) to determine whether subjects fulfilled the inclusion or exclusion criteria.

The patients included in the first sample were additionally interviewed about present and prior psychiatric disorders using the full SCAN interview, which is a semi-structured diagnostic interview that allows diagnosing according to both the DSM-IV and the ICD-10. The interview took place either in the patient's home or at the Centre for Psychiatric Research. The interviewers were psychologists who had attended a 5-day SCAN training course at

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the WHO Centre in Aarhus. The interviewers had monthly meetings to ensure reliability of ratings. A report was written for each patient interviewed for the study. Each report was then reviewed by OM, and best estimate diagnoses were applied in accordance with the ICD-10 (World Health Organization, 1993) and the DSM-IV (American Psychiatric Association, 2000). Additionally, the interviews of 11 participants, each rated for two separate time periods, present time and at onset, were audio taped and independently rated by the other interviewer. Interrater reliability was satisfactory (Cohen's κ .93).

Participants included in the second sample were screened over the phone. Presence of a lifetime diagnosis of panic disorder, agoraphobia or social phobia was assessed on the basis of selected SCAN questions corresponding to the diagnostic criteria. The telephone screening procedure was the same for both samples. In the first sample, less than two percent of subjects, initially invited to participate in the study on the basis of telephone screening, were excluded from the study after the SCAN interview, suggesting fairly high validity of the screening procedure.

To examine the invariance of factorial structure across panic disorder and social phobia, participants from both samples were split into groups with primary social phobia and primary panic disorder, respectively. If both disorders were present in a lifetime perspective, primacy was determined on the basis of reported severity and duration. No cases of agoraphobia without either of the other disorders were included. All in all, 120 participants had a primary diagnosis of social phobia and 207 had a primary diagnosis of panic disorder.

The project has been approved by the regional ethics committee and by the Danish Data Protection Agency. Participation was unpaid. Participants were informed about the project and of their rights, both verbally and in writing, before signing the consent form. The study was conducted in accordance with the Helsinki Declaration.

2.3. Questionnaires

A symptom questionnaire was constructed, inspired by the lexical tradition of test construction. The lexical inductive approach has proven useful in the field of personality where large numbers of items have been factor analyzed to extract underlying personality dimensions (Wiggins, 1996). By reviewing literature and existing questionnaires on panic and anxiety symptoms, 110 bodily and 77 emotional and cognitive anxiety symptoms were found (American Psychiatric Association, 2000; Beck & Steer, 1990; Brown, Chorpita, Korotitsch, & Barlow, 1997; Cassano, Michelini, Shear, & Coli, 1997; Chambless, Caputo, Bright, & Gallagher, 1984; Clum, Broyles, Borden, & Watkins, 1990; Feske & de Beurs, 1997; Hamilton, 1959; Hoes, Colla, van Doorn, Folgering, & de Swart, 1987; Hoffart, Friis, & Martinsen, 1992; Hougaard, Rosenberg, & Nielsen, 2002; Kaplan & Sadock, 2000; Kenardy, Evans, & Oei, 1992; Lehrer & Woolfolk, 1982; McNally & Foa, 1987; Norton, Dorward, & Cox, 1986; Page, Bennett, Carter, Smith, & Woodmore, 1997; Peterson & Reiss, 1987; Sheehan, 1983; Stein & Hollander, 2002; Taylor and Cox, 1998Taylor & Cox, 1998; Wing et al., 1998; Wolman & Stricker, 1994; World Health Organization, 1993). The symptoms were presented as personal statements (for example: I fear having a heart attack). The patients were instructed to answer according to how often they experienced each symptom during panic attacks or in anxiety-provoking phobic situations on a 5-point Likert scale from never (0) to always (4). Only the factor structure of the cognitive and emotional symptoms was investigated in the present paper. The investigation of the structure of bodily anxiety symptoms has been presented elsewhere (Kristensen et al., submitted for publication).

The Revised NEO Personality Inventory (NEO PI-R) (Costa & McCrae, 1992) was administered. The NEO PI-R consists of 240 items assessing the personality dimensions of the five-factor model: neuroticism (N), extraversion (E), openness (O), agreeableness (A), and conscientiousness (C). The Danish version has been standardized and norm data published (Hansen, Mortensen, & Schiøtz, 2003). All NEO PI-R scales had high Cronbach alpha coefficients in our sample ($.87 < \alpha < .93$), reflecting high internal consistency.

2.4. Analysis

The 77 cognitive and emotional symptoms from the symptom questionnaire were divided into sets of 3–11 symptoms based on item content. Item analysis by graphical log linear Rasch models (Kreiner & Christensen, 2002) was used to examine whether the sets of symptom items were uni-dimensional and worked as valid index scales. The exogenous variables included were gender, sample, and diagnoses. Items fitting a graphical log linear Rasch model provide measurement that yields a sufficient total score (Kreiner & Christensen, 2007), and for each validated index scale, the average item score was included in subsequent factor analysis. Twelve index scales were derived and item scale scores were compared for the two diagnostic groups.

The index scale scores were submitted to exploratory maximum likelihood factor analysis with oblique (Promax) rotation. The number of factors to retain was determined on the basis of eigenvalues, scree test, and parsimony of factor structure.

To examine whether the second-order structure was invariant across diagnostic groups, two-group confirmatory factor analysis (CFA) based on the analyses of covariance structures was employed. Separate maximum likelihood CFA procedures were conducted to test the validity of the hypothesized structure for each of the two groups with primary diagnoses of social phobia and panic disorder. Presented with findings of inadequate fit, the model was respecified to include additional parameters identified by the Lagrange Multiplier Test. Finally, bearing in mind the issue of partial measurement invariance (Byrne, Shavelson, & Muthen, 1989), the hypothesized model was tested for factorial equivalence across diagnoses.

Multiple criteria were used in the assessment of model fit: the Comparative Fit Index (CFI) (Bentler, 1990), standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA). A cut-off value for CFI close to .95 has recently been suggested as indication of good fit (Hu & Bentler, 1999), although values higher than .90 were originally considered an indication of a well-fitting model (Bentler, 1992). Values close to .08 for SRMR and values close to .06 for RMSEA were taken to indicate a good fit (Hu & Bentler, 1999). The chi-square test was not used as goodness of fit index as it is sensitive to sample size and often indicates a poor fit, even with very small discrepancy between the sample and the fitted covariance matrix (Byrne, 2006; Hu & Bentler, 1999). Measurement invariance was tested by examining changes in CFI when invariance constraints were added, and Δ^{*}CFI of $<.01$ was considered an indication of invariance across groups (Cheung & Rensvold, 2002).

Seeing that the structure of cognitive symptoms was not the same across diagnoses, we calculated factor scores separately for panic disorder and social phobia, using the fitted models for each disorder. Factor scores for the bodily symptom dimensions were calculated on the basis of a fitted model common to panic disorder and social phobia (Kristensen, Mortensen, & Mors, 2009). To investigate the unique association between each first-order bodily factor and each cognitive factor, a series of partial correlation analyses were conducted, correlating each first-order bodily factor with each cognitive factor while controlling for the other first-order factors, both bodily and cognitive. Similarly, partial correlations were conducted, correlating each cognitive factor

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with NEO PI-R personality traits while controlling for the other cognitive factor.

Graphical log linear Rasch analyses were performed using the statistical software DIGRAM (Kreiner, 2003), explorative factor analyses were performed using SPSS 13.0 and STATISTICA 6.0, and confirmatory factor analyses were performed using EQS 6.1 (Bentler, 2005) and AMOS 16.0.

3. Results

Graphical log linear Rasch analyses were conducted. Of the 77 cognitive and emotional symptoms, 30 were excluded because of either differential item functioning (DIF) or substantial local dependence (LD) between items. Two items, "I am scared of dying" and "I fear that I may throw up," which did not fit into a model, were included in subsequent factor analysis as single items because they are diagnostic criteria. Fear of throwing up is an ICD-10 diagnostic criterion for social phobia. The remaining items fitted 12 graphical log linear Rasch models with weak to moderate LD (22 cases of LD with $\gamma < .39$). Scales and corresponding items are listed in Appendix A.

Average scores of the validated index scales and of the two individual items were compared for the two groups of primary social phobia and primary panic disorder (Table 1).

Differences between diagnostic groups were predominantly as expected. Patients with primary social phobia scored higher than patients with primary panic disorder on social phobic cognitions, whereas the opposite was found for scores on fear, hypersensitivity, fear of going crazy, fear of dying, fear of somatic illness, catastrophic cognitions, as well as fear of throwing up. The last difference may be the most surprising as fear of throwing up is an ICD-10 criterion of social phobia. All variables were endorsed by both patient groups, indicating that none of the cognitive or emotional variables were exclusive to one of the diagnoses.

Factor analysis of the 12 index scales and the two retained single symptoms yielded three factors with eigenvalues greater than 1 (eigenvalues of 5.32, 2.13, and 1.06). The scree test suggested that only two factors should be retained. The rotated two-factor solution is presented in Table 2. Two variables, social phobic cognitions and fear of going crazy, had loadings on both factors and one variable, fear of throwing up, did not load substantially on either factor.

We used the rotated factor solution to propose a CFA model with the purpose of comparing the factor structures of the diagnostic groups. Separate CFA procedures for the two groups with primary diagnoses of social phobia and panic disorder were conducted to test the validity of the proposed model, and the results are shown in Table 3. Mardia's normalized estimates of 5.19 for social phobia and 1.48 for panic disorder suggested normally distributed data for panic disorder, but possibly not for social phobia. Corrected fit statistics were used.

For both social phobia and panic disorder, goodness-of-fit for the hypothesized second-order model was less than adequate. In both instances, the Lagrange Multiplier Test indicated a better fit, if certain error terms associated with pairs of items were free to covary. We respecified the model to include the estimation of these parameters. For social phobia four error covariances and for panic disorder five error covariances were added to the respective models. One error covariance was common to both models. Furthermore, two cross-loadings were added to the model for

Table 1
Comparison of average item scores of index scales and of two individual items.

Variable	Social phobia		Panic disorder		Difference *p*-value
	Mean	SD	Mean	SD	
Difficulty concentrating	2.16	.86	2.03	.88	.194
Confusion	2.52	1.02	2.58	1.05	.660
Sadness	2.40	.96	2.41	1.07	.968
Restlessness	2.51	.81	2.47	.87	.681
Fear	2.24	.85	2.59	.97	.001*
Social phobic cognitions	2.83	.89	1.64	1.19	.000*
Anger	1.50	.95	1.26	1.00	.031
Loss of control	1.81	.85	2.08	.83	.005
Hypersensitivity	1.14	.70	1.41	.89	.003*
Fear of going crazy	1.22	.90	1.76	1.10	.000*
Fear of dying[a]	.60	1.02	2.56	1.54	.000*
Fear of somatic illness	.73	.75	1.72	1.06	.000*
Catastrophic cognitions	1.60	.98	2.49	1.10	.000*
Fear of throwing up[a]	.78	1.20	1.24	1.41	.003*

[a] Individual items.
* Statistically significant when corrected for multiple testing (.05/14 comparisons = .004).

Table 2
Rotated factor loadings for each variable.

Variable	Factor 1	Factor 2
Difficulty concentrating	**.82**	−.06
Confusion	**.76**	.00
Sadness	**.72**	.13
Restlessness	**.62**	−.01
Fear	**.56**	.28
Social phobic cognitions	**.56**	**−.40**
Anger	**.51**	−.10
Loss of control	**.46**	.21
Hypersensitivity	**.43**	.18
Fear of going crazy	**.40**	**.41**
Fear of dying	−.24	**.97**
Fear of somatic illness	−.09	**.86**
Catastrophic cognitions	.21	**.71**
Fear of throwing up	.12	.18
Eigenvalue	4.66	1.89
Variance explained	33.29%	13.47%

All loading larger than .35 are set in boldface.

Table 3
Summary of fit statistics for second-order model of factorial structure across diagnoses.

Model	S–Bχ^2	df	*CFI	SRMR	RMSEA	RMSEA 90% CI
Social phobia						
Hypothesized model	175.58	73	.825	.095	.110	.088, .130
Fitted model[a]	97.20	67	.948	.063	.062	.032, .087
Panic disorder						
Hypothesized model	243.29	73	.850	.089	.107	.092, .122
Fitted model[b]	12.58	67	.954	.052	.063	.044, .080

S–Bχ^2 = Satorra–Bentler scaled statistic; *CFI = Robust CFI; SRMR = standardized root mean square residual; RMSEA = Robust root mean square error of approximation; 90% CI = 90% confidence interval.
[a] A fitted model for social phobia with 2 cross loadings and 4 error covariances added.
[b] A fitted model for panic disorder with 1 cross loading and 5 error covariances added.

Table 4
Tests for invariance of symptom structure: goodness-of-fit statistics.

Model	S–Bχ^2	df	*CFI	SRMR	RMSEA	RMSEA 90% CI	Δ*CFI
Model 1	217.06	134	.951	.058	.062	.047, .077	
Model 2	318.78	151	.902	.106	.083	.070, .096	.049

S–Bχ^2 = Satorra–Bentler scaled statistic; *CFI = Robust CFI; SRMR = standardized root mean square residual; RMSEA = Robust root mean square error of approximation; 90% CI = 90% confidence interval. Model 1 was the baseline model without equality constraints. In Model 2, factor loadings, the correlation between the two factors, and the common error covariance were constraint.

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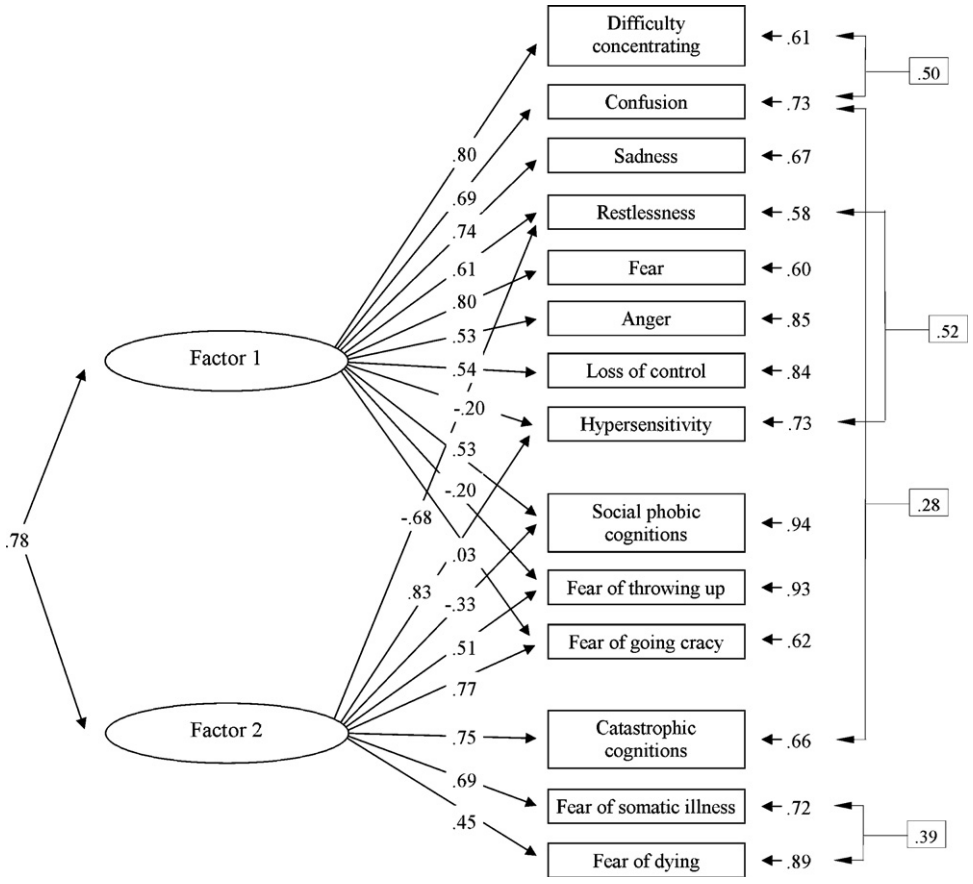

Fig. 1. Fitted model for emotional and cognitive symptoms for social phobia. Latent constructs are in circles, one-headed arrows represent standardized regression paths, numbers on the paths are standardized path coefficients, and two-headed arrows between error terms represent covariances. The two-headed arrow between the factors represent the correlation between factor. The variances of the residual disturbance terms with each first-order factor and the variances of the error terms with each indicator are also depicted.

social phobia: restlessness and hypersensitivity loaded on the second factor in addition to their loading on the first factor. One cross-loading was added for panic disorder: catastrophic cognitions loaded on the first factor in addition to its loading on the second factor. In both instances, the respecification of the model resulted in a substantially better fit (Table 3). Although the Lagrange Multiplier Test statistics indicated that additional improvement of the model could be obtained by adding further error covariances, we ceased further post hoc model fitting in the name of parsimony. The final, fitted models for both diagnoses fitted the data well.

Subsequently, the factor loadings, the common error covariance, and the correlation between the factors were constrained equal across diagnoses. The diagnosis-specific error covariances and cross-loadings were left unconstraint. Goodness-of-fit statistics and Δ^{*}CFI between the unconstrained model (Model 1) and the constrained model (Model 2) are presented in Table 4.

The symptom structure was found to differ between social phobia and panic disorder (Δ^{*}CFI = .049), although the constrained model still showed reasonable model fit on almost all fit statistics. Consequently, the cognitive factors for social phobia (Fig. 1) and the cognitive factors for panic disorder (Fig. 2) were separately correlated to bodily symptom factors and personality traits.

For social phobia, the variables that had moderate to large regression coefficients with the first factor were difficulty concentrating, confusion, sadness, restlessness, fear, anger, loss of control, and social phobic cognitions. The variables with moderate to high loadings on the second factor were hypersensitivity, fear of throwing up, fear of going crazy, catastrophic cognitions, fear of somatic illness, and fear of dying. Restlessness was negatively related to the second factor.

For panic disorder, the first factor comprised difficulty concentrating, confusion, sadness, restlessness, fear, anger, loss of control, hypersensitivity, social phobic cognitions, and fear of going crazy. Catastrophic cognitions loaded on both the first and second factor. The variables loading on the second factor were catastrophic cognitions, fear of somatic illness, and fear of dying.

We labeled the first factor "Emotions and cognitive-social concerns" and the second factor "Fear of physical sensations" for both social phobia and panic disorder to reflect the similarities of variables included. The first factor for panic disorder was more broadly defined than the first factor for social phobia, whereas the second factor for panic disorder was more narrowly defined than the second factor for social phobia.

Partial correlations between cognitive factors and bodily factors as well as between cognitive factors and NEO PI-R personality traits are presented in Table 5. The first factor, emotions and cognitive-social concerns, was correlated to the second-order bodily severity factor and the first-order tension factor for both social phobia and panic disorder. Additionally, emotions and cognitive-social concerns were slightly, positively associated with the first-order gastrointestinal factor for panic disorder. The second cognitive factor, fear of physical sensations, was positively associated with the bodily severity factor for social phobia, while positively associated with the cardio-respiratory factor and negatively associated with the gastrointestinal factor for panic disorder.

The emotions and cognitive-social concerns factor was positively correlated with neuroticism for both social phobia

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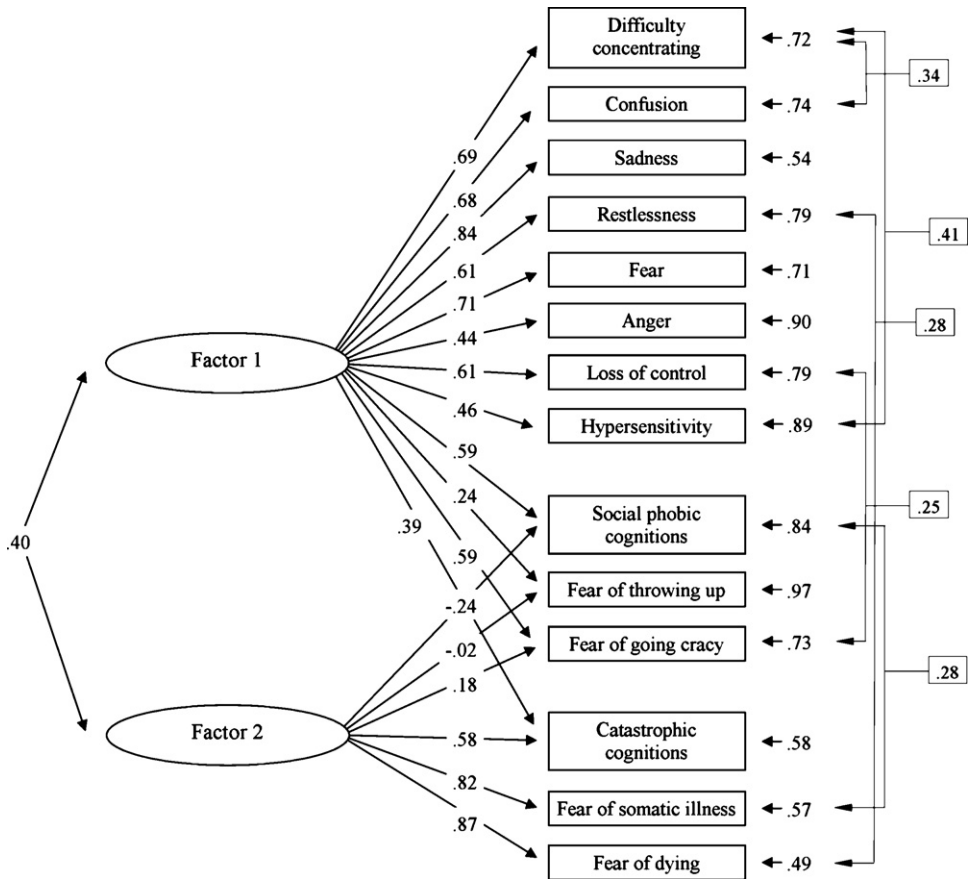

Fig. 2. Fitted model for emotional and cognitive symptoms for panic disorder. Latent constructs are in circles, one-headed arrows represent standardized regression paths, numbers on the paths are standardized path coefficients, and two-headed arrows between error terms represent covariances. The two-headed arrow between the factors represent the correlation between factor. The variances of the residual disturbance terms with each first-order factor and the variances of the error terms with each indicator are also depicted.

and panic disorder. The second factor, fear of physical sensations, was negatively correlated with conscientiousness in patients with social phobia.

4. Discussion

Cognitive factors found were not invariant across diagnoses and scores on the questionnaire are therefore not directly comparable. The fitted models for social phobia and panic disorder show a number of similarities, though. The first factor, emotions and cognitive-social concerns, comprises different emotional expressions (sadness, fear, and anger), thoughts about cognitive dysfunction (difficulty concentrating and confusion as well as loss of control) and social phobic cognitions. Fear of cognitive dysfunction and social fears have also been found to factor together in a few prior studies (Cox et al., 1995; Zvolensky et al., 2003), but

Table 5
Partial correlations of the cognitive factors with bodily factors and personality traits.

Bodily symptom factors	Factor 1: emotions and cognitive-social concerns		Factor 2: fear of physical sensations	
	Social phobia	Panic disorder	Social phobia	Panic disorder
Second-order factor: severity	.36***	.63***	.24**	.09
First-order factor: cardio-respiratory	.01	−.09	−.02	.25***
First-order factor: gastro-intestinal	.06	.17*	−.05	−.25***
First-order factor: autonomic	.18	.01	−.04	.04
First-order factor: vertigo	−.13	.06	.18	−.06
First-order factor: tension	.19*	.38***	.16	.06
NEO PI-R scales				
Neuroticism	.37***	.39***	.04	.06
Extraversion	−.02	−.10	−.05	.04
Openness	−.04	.11	.13	−.11
Agreeableness	.02	−.11	−.08	−.03
Conscientiousness	.11	−.06	−.32***	−.02

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

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neither of these studies has included the emotional expressions of sadness, fear, and anger that were included in the present study. The second factor, fear of physical sensations, has been widely recognized in prior studies (Cox et al., 1995; Deacon & Abramowitz, 2006; Hicks et al., 2005; Khawaja & Oei, 1992, 1998; Marks et al., 1991; Zvolensky et al., 2003; Wenzel et al., 2006), probably in part due to the emphasis put on this kind of catastrophic cognitions by the cognitive theory of panic disorder. The factors were moderately to highly correlated, which may indicate a higher-order factor. A hierarchical factor structure has been found in a few previous factor analytical studies of catastrophic cognitions (Taylor, 1998; Wenzel et al., 2006), giving all the more reason to control for confounding effects when examining the unique contribution from each first-order factor.

For panic disorder, the second factor, fear of physical sensations, was positively correlated to the cardio-respiratory factor and negatively correlated to the gastro-intestinal factor. Marks et al. (1991) likewise found that fear of physical illness was primarily associated with cardiovascular and respiratory symptoms. Such an association lends support to the cognitive theory hypothesis of specific threat-relevant links between bodily symptoms and related catastrophic thoughts. Fear of having a heart attack may arise specifically when cardiovascular symptoms are present or vice versa.

The first factor, emotions and cognitive-social concerns, was found to be related to the bodily severity factor and to neuroticism for both social phobia and panic disorder. Emotions and cognitive-social concerns are logically related to neuroticism. On the one hand, emotional expressions of sadness, anger, and anxiety are incorporated in both, but on the other hand, a heightened level of neuroticism reflects a heightened vulnerability towards experiencing negative emotional states. The bodily severity factor may be related to this state-trait duo of negative emotionality as it itself may reflect both a tendency towards experiencing and reporting many symptoms and a heightened attention towards negative experiences, but of a bodily kind.

Zvolensky et al. (2003) studied invariance of the structure of the revised Anxiety Sensitivity Index across six countries and found a two-factor solution to be the most replicable across cultures. The two factors, fear of physical sensations and social-cognitive concerns, were very similar in content to the factors found in our sample. In a subset of their sample, they correlated factor scores of the two factors with the personality traits of the revised Eysenck Personality Questionnaire and found both factors positively associated with neuroticism and negatively with psychoticism. Partial correlations controlling for the effect of the other factor indicated that only the factor of social-cognitive concerns showed unique association with neuroticism. Likewise, the State Trait Anxiety Inventory (STAI) which has a measure of state anxiety with similarities to neuroticism, has been found to be associated with the ASI (Taylor, Koch, & Crockett, 1991) as well as with dimensions of the ASI measuring emotional and social catastrophes (Khawaja & Oei, 1992). Initial correlation analyses in our sample (results not shown) also resulted in positive correlations between neuroticism and both cognitive factors, whereas partial correlations indicated that only the emotions and cognitive-social concerns factor was associated with neuroticism for panic disorder. Both were still correlated with neuroticism for social phobia, possibly reflecting the more broadly defined second factor for social phobia.

The present study did not examine the direction of the link between cognitions and bodily symptoms or between cognitive symptoms and personality traits. Either factor may precede the other, they may interact and develop concurrently, or both may be reflecting common antecedents without being causally related. Likewise, we did not control state-effects on the associations between personality traits and symptom factors, as we only assessed the presence of a current anxiety diagnosis in sample 1. Furthermore, our sample was recruited through advertisements, pamphlets and a website, all clearly indicating that we were looking for individuals who had had panic disorder, agoraphobia or social phobia before the age of 21 years. As this entails potential sampling bias, future studies should be conducted on more representative samples. However, the included patients had no comorbid bipolar disorder, obsessive-compulsive disorder, schizophrenia or psychotic symptoms, making it a pure anxiety disorder sample.

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Appendix A

Variable	Items
Difficulty concentrating	I feel disoriented I get overwhelmed by even trivial tasks I have difficulty concentrating I have difficulty remembering I have difficulty making decisions I am easily distracted
Confusion	My thoughts are racing I get confused I have trouble thinking clearly
Sadness	I feel that everything is hopeless I feel despair I feel sad
Restlessness	I am unable to relax I feel restless I get frantic
Fear	I am terrified I am anxious I have apprehensions I get worried
Social phobic cognitions	I fear appearing nervous I fear causing a scene I worry that people will stare at me I fear that people will laugh at me I fear mumbling or talking funny I get scared of making a fool of myself
Anger	I get angry I become particularly irritable I become agitated
Loss of control	I feel like I have lost control I fear that I may start screaming I worry that I won't be able to escape
Hypersensitivity	I am very sensitive to physical touch I become very sensitive to light I am uncomfortable with darkness I become very sensitive to heat and high humidity I become very sensitive to perfume and other scents I become very sensitive to noises
Fear of going crazy	I don't understand what is happening I fear becoming completely hysterical I am scared of going insane
Fear of dying	I am scared of dying

Appendix A (*Continued*)

Variable	Items
Fear of somatic illness	I fear that I may be seriously ill
	I worry that the panic attacks will damage my health
	I fear having a heart attack
	I fear that I have a brain tumour
Catastrophic cognitions	I am scared that it is never going to stop
	I fear that something terrible will happen
	I fear that something is very wrong
Fear of throwing up	I fear that I may throw up

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