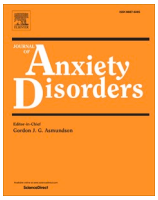
Journal of Anxiety Disorders 102 (2024) 102798

Contents lists available at ScienceDirect

Journal of Anxiety Disorders

journal homepage: www.elsevier.com/locate/janxdis



Is cyberchondria specific to hypochondriasis?

Stefanie M. Jungmann [a,*], Maria Gropalis [b], Sandra K. Schenkel [a], Michael Witthöft [a]

[a] Department of Clinical Psychology, Psychotherapy, and Experimental Psychopathology, Johannes Gutenberg-University Mainz, Mainz, Germany
[b] Mental Health Services of Johannes Gutenberg-University Mainz, Mainz, Germany

ARTICLE INFO

Keywords:
Cyberchondria
Cyberchondria severity scale
Health anxiety
Hypochondriasis
Illness anxiety disorder

ABSTRACT

Cyberchondria (i.e., excessive health-related Internet search linked to psychological distress) is usually associated with health anxiety, but relationships with other psychopathological symptoms were also found. However, studies are lacking in patients with hypochondriasis, and it remains unclear whether cyberchondria and its subfacets are specific to hypochondriasis (i.e., higher levels in hypochondriasis compared to other mental disorders). Patients with hypochondriasis ($N = 50$), a clinical ($N = 70$), and a healthy comparison group ($N = 51$) completed two questionnaires on cyberchondria whose combined 17 subscales were reduced to three relevant cyberchondria subfacets by second-order factor analysis. The cyberchondria subfacet emotional distress/negative consequences linked to health-related Internet searches showed significantly higher scores in patients with hypochondriasis than in the two comparison groups ($d \geq 1.7$) and was the only predictor of dimensional health anxiety ($\beta = .58$, $p \leq .001$). The two subfacets type/extent of health-related Internet searches and characteristics of the Internet (e.g., attitude toward unreliability, vast amounts of information) were less specifically associated with hypochondriasis. The results are consistent with models of cyberchondria and hypochondriasis, particularly on the anxiety-reinforcing vicious circle and maintaining factors. Based on the findings, practical implications are discussed.

1. Introduction

The Internet offers fast and unlimited access to an abundance of information. Since health is one of the most important determinants in life, health-related information is one of the most frequently searched topics on the Internet (Pew Research Center, 2003). About three-quarters of adult Internet users search online for information on health topics (Fox & Duggan, 2013; National Cancer Institute, 2019). The number of searches on health in online search engines has increased significantly in recent years. For example, health searches on Google (Google LLC, 2020) in the United States showed a 57% increase between the time periods 2006–2008 and 2015–2017 (Sisense Inc, 2018). This development seems to progress even further in the course of the COVID-19 pandemic (Vismara, Varinelli et al., 2022). Thirty-one percent of a general population sample stated that they use the Internet 'more often' or 'much more often' to search for health-related information since the COVID-19 outbreak (Vismara, Vitella et al., 2021).

In addition to the numerous advantages of health-related Internet use (Lemire et al., 2008; McMullan, 2006; Powell et al., 2011), online health searches can also have adverse effects. Health-related Internet searches can be unsettling due to ambiguous and partly divergent information (Eysenbach et al., 2002) and can have an escalating character as inquiries with harmless physical complaints (e.g., headache) are often answered with serious illnesses (White & Horvitz, 2009a, 2009b). Online health searches can have both emotional (e.g., uncertainty, anxiety) and behavioral (e.g., use of the health care system, interruption of other activities) consequences (Baumgartner & Hartmann, 2011; Bessière et al., 2010; Jungmann et al., 2020; McManus et al., 2014; Norr et al., 2014; Singh & Brown, 2014). For example, a recent study showed a causal relationship between online search about the causes of symptoms (e.g., dizziness, tingling in the hands) and negative affect, health anxiety, and the desire to see a doctor (Jungmann et al., 2020).

In recent years, the term cyberchondria has been used for describing the emotional distress (mostly anxiety) associated with repeated and/or excessive health-related Internet use (Starcevic & Berle, 2013). This excessive or repetitive online health seeking can be triggered by uncertainty or anxiety in hopes of reducing it, but it often has an opposite anxiety-inducing or reinforcing effect (Starcevic & Berle, 2013). In

* Correspondence to: Johannes Gutenberg-University Mainz, Department of Clinical Psychology, Psychotherapy, and Experimental Psychopathology, Wallstraße, 355122 Mainz, Germany.
E-mail address: jungmann@uni-mainz.de (S.M. Jungmann).

https://doi.org/10.1016/j.janxdis.2023.102798
Received 14 October 2022; Received in revised form 2 November 2023; Accepted 1 December 2023
Available online 5 December 2023

cognitive-behavioral models explaining health anxiety and cyberchondria, health-related Internet search is seen as a form of safety-seeking behavior (Bleichhardt & Weck, 2019; Brown et al., 2019; Schenkel et al., 2021). Accordingly, searching the internet, similar to a doctor's visit, is used to reduce health anxiety and avoid negative emotions. Depending on the search outcome, online search can reduce or trigger/reinforce anxiety (White & Horvitz, 2009b). Notably, this intermittent reinforcement can lead to the maintenance of dysfunctional online search (Schenkel et al., 2021). In addition, metacognitions (positive metacognitions such as an assumed reduction of uncertainty or negative metacognitions such as a feared loss of control) seem to play a central role (Airoldi et al., 2022; Fergus & Spada, 2018).

In line with this conceptualization of cyberchondria, the relationship with health anxiety has been the most frequently investigated to date (Starcevic et al., 2019). Two meta-analyses found a moderate to strong positive correlation between cyberchondria and health anxiety ($r = .62$, $p < .001$; across ten studies, McMullan et al., 2019; $r = .63$, $p < .001$, across twelve studies, Schenkel et al., 2021). To assess cyberchondria, the Cyberchondria Severity Scale (CSS; McElroy & Shevlin, 2014) with five subscales (distress, compulsion, excessiveness, reassurance, and mistrust) is usually used, with all subscales except mistrust showing positive associations with health anxiety ($\beta \geq .44$, $p \leq .001$, Schenkel et al., 2021). This instrument is also available in a slightly modified version in which the items refer to an Internet search in the context of the COVID-19 pandemic (Jungmann & Witthöft, 2020).

Regarding the overlap with different constructs, cyberchondria was found to be most strongly associated with health anxiety. Nevertheless, substantial correlations with other constructs are also reported. Further studies found positive (mostly weak to moderate) relationships between cyberchondria and obsessive-compulsive symptoms (Bajcar & Babiak, 2019; Fergus, 2014; Fergus & Russell, 2016; Norr et al., 2015), problematic Internet use (Mrayyan et al., 2022; Seyed Hashemi et al., 2020; Vismara, Vitella et al., 2021), symptoms of Internet addiction (Durak et al., 2018; Durak Batıgün et al., 2021; Selvi et al., 2018; Vismara, Vitella et al., 2021), anxiety and depressive symptoms (Arsenakis et al., 2021; Vismara, Vitella et al., 2021), as well as bodily symptom distress (Barke et al., 2016; Durak et al., 2018; McElroy & Shevlin, 2014; Peng et al., 2021).

Although cyberchondria and health anxiety clearly overlap, current research suggests that cyberchondria is a distinct construct that is associated to varying degrees with different domains of psychopathology (Mathes et al., 2018; Schenkel et al., 2021; Starcevic et al., 2019). In this context, cyberchondria is also conceptualized as a 'transdiagnostic' syndrome (i.e., it is not only related to health anxiety, but also to other pathological symptom domains such as problematic Internet use and symptoms of obsessive-compulsive disorder) (Vismara et al., 2020). Starcevic et al. (2019) conducted a network analysis on a sample of $N =$ 751 persons from the general population with health-related Internet use in the last three months and found that cyberchondria can be distinguished from psychopathological characteristics such as health anxiety, obsessive-compulsive disorder symptoms, depressive symptoms, and intolerance of uncertainty. Thus, cyberchondria was found to be related to various symptoms of psychopathology, most strongly to dimensionally conceptualized health anxiety (i.e., health anxiety in the general population). At the same time, cyberchondria and health anxiety clearly represent distinguishable constructs. For explanatory models, but also for clinical practice, it appears highly relevant to close the research gap on whether/which subfacets of cyberchondria are more strongly related to clinically relevant hypochondriasis compared to other mental disorders (i.e., are specific to hypochondriasis) and which subfacets are about equally related to different mental disorders (i.e., associations of anxiety and depressive disorders with negative affect following Internet search, obsessive-compulsive disorder with repetitive nature of Internet search). In addition to the fact that little attention has been paid to the different subfacets of cyberchondria, previous research has been conducted almost exclusively in non-clinical samples (Vismara et al., 2020).

To our knowledge, only one study exists examining the presence of cyberchondria in individuals with a diagnosis of obsessive-compulsive disorder, anxiety disorder (panic disorder, generalized anxiety disorder, social anxiety disorder) or major depression (Vismara, Benatti et al., 2021). This study found that the severity of cyberchondria (especially CSS subscales compulsion and distress) was higher in patients (significantly higher in obsessive-compulsive disorder and anxiety disorder) compared to the healthy control group. However, the study did not examine individuals with diagnosed hypochondriasis or illness anxiety disorder, although previous studies had found the strongest associations between cyberchondria and health anxiety. In Newby and McElroy's study (2020) of over 80 patients with both, DSM-5 Somatic Stress Disorder (SSD) or Illness Anxiety Disorder (IAD), the focus was on comparing two treatment conditions (Internet-based Cognitive Behavioral Therapy, iCBT vs. an active control group). In this study, iCBT included specific components for the reduction of cyberchondria (psychoeducation, reducing health related internet search, behavioral experiments) in addition to proven cognitive and behavioral methods for the treatment of health anxiety and resulted in significantly greater reductions in cyberchondria and its subfacets.

The study of cyberchondria in clinical samples, especially in patients with hypochondriasis seems to be of particular importance to contribute to a better understanding of the construct of cyberchondria on the one hand and the development and maintenance of pathological health anxiety on the other. In particular, this research is also highly relevant in light of the COVID-19 pandemic, as the phenomenon of cyberchondria seems to have increased (Jokic-Begic et al., 2020; Starcevic et al., 2021).

The aim of the present study was to systematically investigate cyberchondria and its subfacets in terms of their specificity for hypochondriasis. For this purpose, individuals with hypochondriasis were compared with two groups, a clinical and a healthy comparison group. We expected that patients with a diagnosis of hypochondriasis would have significantly higher levels of cyberchondria compared to the other two groups. Given the large number of currently existing subscales of cyberchondria, we aim to reduce these to a relevant number and examine which cyberchondria subfacets are specific to hypochondriasis and which subfacets are relevant predictors of (dimensionally conceptualized) severity of health anxiety (also when controlling for group membership).

2. Methods

2.1. Participants and procedure

An a priori power analysis ($1 - \beta = .80$, $\alpha = .05$) revealed a total sample size of $N = 158$ (approximately $n = 53$ for each of the three groups) to identify a medium effect ($f = 0.25$). The two clinical samples were recruited from a university psychotherapy outpatient clinic (between October 2015 and July 2019). General inclusion criteria were age 18 years and older, sufficient German language skills, and the presence of at least one mental disorder according to the Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association, 2000). Exclusion criteria were acute suicidal tendencies, current substance use in addiction disorders, acute psychotic symptoms, and an organic brain disorder. The hypochondriasis group included patients who met the diagnosis of hypochondriasis according to the Structured Clinical Interview for DSM-IV (SCID; Wittchen et al., 1997). The clinical comparison group consisted of patients who fulfilled at least one mental disorder other than hypochondriasis according to the SCID. Participants of the healthy group were recruited from the general population via press releases. Included were individuals without a current mental disorder according to the SCID. Participants in each of the three groups first took part in the SCID and then completed the self-report questionnaires in paper-pencil format. Patients in the two clinical groups participated in the study after an initial interview at the university outpatient clinic (i.

Table 1
Sociodemographic data and diagnostic information for the three groups (hypochondriasis, clinical comparison group, and healthy comparison group).

	Hypochondriasis $n = 50$	Clinical group $n = 70$	Healthy group $n = 51$
Sex: *n* (%) female	29 (58.00)	52 (74.30)	33 (64.70)
Age: *M* (*SD*)	38.24 (10.99)	36.47 (10.32)	35.78 (12.31)
Years of education: *M* (*SD*)	11.32 (1.04)	11.56 (0.96)	11.75 (0.72)
Diagnoses according to DSM-IV (%)	Diagnosis 1 (100.0): 1. Hypochondriasis 100.0 Diagnosis 2 (54.0): 1. Affective 30.0 2. Anxiety 18.0 3. Somatoform 4.0 4. OCD 2.0 Diagnosis 3 (22.0): 1. Anxiety 6.0 2. Somatoform 4.0 3. Affective 4.0 4. Eating 4.0 5. OCD 2.0 6. Psychol. Factors/ Medicine 2.0	Diagnosis 1 (100.0): 1. Affective 42.7 2. Anxiety 31.4 3. Personality 7.1 4. OCD 4.3 5. PTSD 4.3 6. Adjustment 4.3 7. Somatoform 4.3 8. Eating 1.4 Diagnosis 2 (64.3): 1. Affective 21.4 2. Anxiety 24.3 3. Substance Use 4.3 4. Eating 2.8 5. Personality 2.9 6. Somatoform 2.8 7. ADHD 1.4 8. Sex. Appetence 1.4 9. OCD 1.4 10. Psychol. Factors/ Medicine 1.4 Diagnosis 3 (22.9): 1. Affective 7.1 2. Anxiety 5.7 3. Personality 4.2 4. PTSD 1.4 5. ADHD 1.4 6. Eating 1.4 7. Somatoform 1.4	

ADHD = Attention Deficit Hyperactivity Disorder, OCD = Obsessive-Compulsive Disorder, PTSD = Post-traumatic Stress Disorder.

e., psychotherapy sessions had not yet taken place). Table 1 shows the sociodemographic data and diagnostic information of the three groups (hypochondriasis $n = 50$, clinical group $n = 70$, healthy group $n = 51$). The three groups did not differ significantly in age ($F(2168) = 0.66$, $p = .52$, $\eta_p^2 = .008$), gender ($\chi^2(2) = 3.61$, $p = .17$, $\phi = .15$), and years of education ($F(2122) = 2.32$, $p = .10$, $\eta_p^2 = .037$). Table 1 also shows the distribution of diagnoses for the clinical groups (main diagnosis and up to two comorbidities). In the clinical group, affective and anxiety disorders prevailed as primary diagnoses (approx. 74%). All participants gave their written informed consent and received financial compensation (6€ per half hour). The study was approved by the local ethics committee of the department of psychology.

2.2. Measures

2.2.1. Cyberchondria

To assess cyberchondria, two questionnaires, the Cyberchondria Severity Scale (CSS; McElroy & Shevlin, 2014) and the Online Health-related Beliefs and Behaviours Inventory (OHBBI; Singh, 2013; Singh & Brown, 2014), were translated into German and checked using a retranslation procedure. The subscales, descriptions of the subscales, and sample items are included in the Appendix A. The CSS uses 33 items to assess five dimensions of cyberchondria: 'compulsion' (interruption of everyday activities due to health-related Internet search), 'distress' due to Internet research, 'excessiveness', 'seeking reassurance', and 'mistrust of medical professionals'. The statements are answered using a 5-point Likert scale from 1 'never' to 5 'always'. The CSS proved to be reliable (McElroy & Shevlin, 2014; in this study: Total $\alpha = .96$, compulsion $\alpha = .95$, distress $\alpha = .95$, excessiveness $\alpha = .85$, reassurance $\alpha = .86$, and mistrust $\alpha = .74$). The OHBBI lists 60 statements, to which individuals indicate their agreement on a 4-point Likert scale ranging from 1 'disagree a lot' to 4 'agree a lot'. In this study, the OHBBI total and twelve subscales showed adequate to sufficient levels of internal consistency (Total $\alpha = .94$, illness-related Internet use $\alpha = .90$, perceived unreliability of Online health information $\alpha = .81$, problematic use of the Internet for health purposes $\alpha = .89$, negative attitudes towards doctors $\alpha = .65$, health promotion-related Internet utilization $\alpha = .75$, illness-related Internet use: others $\alpha = .73$, post-search doctor utilization $\alpha = .88$, anxiety post-search/perceived adverse consequences of searching $\alpha = .92$, perceived Internet advantages $\alpha = .78$, perceived overabundance of online health information $\alpha = .60$, metacognitive beliefs concerning Internet use $\alpha = .87$, frequency and urgency of health-related Internet utilization $\alpha = .83$).

2.2.2. Health anxiety

To measure health anxiety, the Short Health Anxiety Inventory (SHAI; Salkovskis et al., 2002) in the German version (Bailer et al., 2013) was used. It consists of 18 items, whereby only the first 14 items (health anxiety subscale; SHAI-14) were used in the present study. The items capture symptoms of health anxiety (the other excluded four items measure perceived consequences of a serious illness). Each item provides four possible answers that are scored from 0 to 3. Research has found the SHAI to be valid (Abramowitz et al., 2007; Salkovskis et al., 2002) and reliable (Salkovskis et al., 2002). Internal consistency in this study was Cronbach's $\alpha = .96$.

2.2.3. Depression

The severity of depressive symptoms during the past two weeks was assessed using the German version of the Patient Health Questionnaire-9 (PHQ-9; Löwe et al., 2001). Items are rated on a 4-point Likert scale according to the frequency of occurrence ranging from 0 'not at all' to 3 'nearly every day'. The PHQ-9 has been demonstrated to possess a good convergent validity (Berle & Moulds, 2013). In this study, internal consistency was $\alpha = .89$.

2.2.4. Somatic symptom distress

The German version of the Patient Health Questionnaire-15 Somatic Symptom Severity Scale (PHQ-15; Löwe et al., 2001) was used to measure the severity of common somatic symptoms (including abdominal pain, headache, nausea) that might have occurred in the last four weeks. Each item refers to a physical symptom and is rated according to the severity on a 3-point Likert scale (from 0 'not at all distressing' to 2 'very distressing'). Scores on the PHQ-15 correlated positively with levels of dysfunction, disability, and symptom-related difficulties (Kroenke et al., 2002). In the present study, internal consistency was α = .84.

2.3. Statistical analyses

The statistical analyses were carried out using SPSS Statistics 23. To test the shared/unique variance and to reduce the number of subscales, a 2nd order factor analysis (first parallel analysis to determine the number of factors, factor analysis with principal component analysis) with a promax rotation was calculated. In the following, the term subscales refers to the subscales of the original CSS and OHBBI questionnaires, and subfacets refers to the factors resulting from the factor analysis. Group differences regarding the reduced cyberchondria subfacets were considered using a multivariate analysis of variance (MANOVA) and Bonferroni corrected post-hoc tests. A regression analysis was conducted to test which subfacets are the critical predictors of health anxiety and can explain incremental variance in addition to group membership (control variable): The group (hypochondriasis vs. no hypochondriasis) was entered as an independent variable in Step 1 and the cyberchondria subfacets from the factor analysis were additionally entered in Step 2. Supplementary, a MANOVA and post-hoc tests (Bonferroni corrected) for the original subscales of the CSS and the OHBBI are described in the Appendix (Appendix B, Fig. A1, Fig. A2).

Table 3
Partial standardized regression coefficients of the 2nd order Factor Analysis (promax rotation, pattern matrix).

Subscales	Factor 1	Factor 2	Factor 3
CSS			
1. Compulsion	**.66**	.23	-.12
1. Distress	**1.01**	-.18	.05
1. Excessiveness	.37	**.61**	-.02
1. Reassurance	**.75**	.07	-.04
1. Mistrust	**.48**	.24	-.20
OHBBI			
1. Illness-related Internet use	.36	**.69**	.10
1. Unreliability	-.19	.23	**.97**
1. Problematic Use	**.72**	.26	-.08
1. Negative Attitudes Towards Doctors	**.50**	.10	-.03
1. Health Promotion	-.33	**.81**	-.03
1. Illness-related Internet Use: Others	.26	**.53**	-.01
1. Post-search Doctor Utilization	**.90**	-.07	-.02
1. Anxiety Post-search	**.99**	-.39	.20
1. Internet Advantages	-.10	**.90**	-.08
1. Overabundance	.14	-.13	**.90**
1. Metacognitive Beliefs	.49	**.55**	-.02
1. Frequency/ Urgency	.02	**.87**	.29

Notes. CSS = Cyberchondria Severity Scale. OHBBI = Online Health-related Beliefs and Behaviours Inventory.

3. Results

3.1. Description of the samples in terms of psychopathology

Table 2 displays the mean values and standard deviations for the different measurement instruments. The three groups were first compared in terms of depressive symptoms, somatic symptom distress, and health anxiety. Concerning depressive symptoms (PHQ-9) and somatic symptom distress (PHQ-15), the patients with hypochondriasis and the clinical comparison group showed significantly higher scores

Table 2
Means and standard deviations for the different measurement instruments in the three groups.

Measurement instrument	Hypochondriasis $n = 50$ M (SD)	Clinical group $n = 70$ M (SD)	Healthy group $n = 51$ M (SD)	
CSS (total)	2.57 (0.69)	1.75 (0.51)		1.64 (0.46)
1. Compulsion	1.72 (0.83)	1.24 (0.45)		1.21 (0.39)
1. Distress	3.28 (0.90)	1.69 (0.69)		1.38 (0.57)
1. Excessiveness	2.82 (0.94)	2.42 (0.74)		2.28 (0.72)
1. Reassurance	2.57 (0.78)	1.71 (0.62)		1.73 (0.61)
1. Mistrust	2.23 (0.88)	1.61 (1.06)		1.55 (0.79)
OHBBI (total)	2.47 (0.45)	1.98 (0.45)		1.92 (0.39)
1. Illness-related Internet use	2.70 (0.84)	2.16 (0.77)		2.09 (0.73)
1. Unreliability	3.05 (0.57)	2.73 (1.56)		2.88 (0.63)
1. Problematic Use	1.90 (0.81)	1.27 (0.42)		1.28 (0.33)
1. Negative Attitudes Towards Doctors	2.02 (0.67)	1.64 (0.50)		1.57 (0.51)
1. Health Promotion	2.10 (0.79)	2.24 (0.71)		52.
			0.83)	
1. Illness-related Internet Use: Others	2.13 (0.80)	1.88 (0.70)		1.79 (0.77)
1. Post-search Doctor Utilization	2.52 (0.83)	1.51 (0.55)		1.37 (0.44)
1. Anxiety Post-search	3.05 (0.47)	1.87 (0.67)		1.51 (0.45)
1. Internet Advantages	2.07 (0.58)	2.05 (0.66)		2.14 (0.77)
1. Overabundance	2.78 (0.64)	2.38 (0.96)		2.20 (0.56)
1. Metacognitive Beliefs	2.51 (0.94)	1.85 (0.67)		1.79 (0.70)
1. Frequency/ Urgency	2.46 (0.98)	2.18 (0.93)		2.25 (0.65)
SHAI (Health anxiety subscale)	27.78 (5.86)	13.59 (7.72)		7.31 (4.51)
PHQ-9	8.24 (5.00)	9.69 (5.41)		2.16 (2.57)
PHQ-15	10.58 (5.27)	10.50 (4.31)		3.27 (2.88)

Notes. CSS = Cyberchondria Severity Scale. OHBBI = Online Health-related Beliefs and Behaviours Inventory. SHAI = Short Health Anxiety Inventory. PHQ-9 = The Patient Health Questionnaire –Depressive Symptom Module. PHQ-15 = The Patient Health Questionnaire – Somatic Symptom Severity Module.

compared to the healthy group (*ps* < .001, *ds* ≥ 1.53), with no significant differences between the hypochondriasis and the clinical control group (*ps* ≥ .279, *ds* ≤ 0.28). Regarding health anxiety (SHAI-14), all groups differed significantly from each other (*ps* < .001, *ds* ≥ 0.95), the hypochondriasis group having the highest levels and the healthy group the lowest.

3.2. 2nd order factor analysis and cyberchondria subfacets

The parallel analysis showed three empirical eigenvalues above the 95% percentile of randomly generated eigenvalues. Table 3 shows the partial standardized regression coefficients (promax rotation, pattern matrix) of each subscale (CSS and OHBBI) with the factors. In terms of item content, the three factors can be labeled: "(emotional) distress/negative effects linked to health-related Internet searches" (factor 1), "type and extent of seeking health information on the Internet" (factor 2), and "characteristics of the Internet regarding health searches" (factor 3).

The subfacets distress/negative effects linked to the health-related Internet search (factor 1) and type/extent of seeking health information on the Internet (factor 2) showed a high positive correlation of r = .65 (p <.001); while distress/negative effects (factor 1) and characteristics of the Internet search (factor 3) and type/extent of seeking health information on the Internet (factor 2) and characteristics of internet showed no significant correlations (r = .14/.04, p = .08/.65).

3.3. Group differences regarding cyberchondria subfacets

Group had a significant effect on the extent of the cyberchondria subfacets ($F(6, 334) = 21.60$, $p < .001$, $\eta_p^2 = .28$). The strongest effect size was shown for the subfacet distress/negative effects related to online health searches (factor 1; $F(2, 168) = 70.48$, $p < .001$, $\eta_p^2 = .46$), compared to type/extent of health searches (factor 2; $F(2, 168) = 3.63$, $p = .028$, $\eta_p^2 = .04$) and characteristics of the Internet (factor 3; $F(2, 168) = 3.06$, $p = .049$, $\eta_p^2 = .04$).

Bonferroni corrected post-hoc tests showed that patients with hypochondriasis reported significantly higher levels of distress/negative effects linked to health searches (factor 1) than the clinical (p <.001, d = 1.74) and healthy comparison (p <.001, d = 2.07) group, although the two comparison groups did not differ significantly from each other (p = .47, d = 0.29). Regarding the subfacet type/extent of health searches, patients with hypochondriasis indicated significantly higher values than the clinical comparison group (p <.04, d = 0.47), otherwise no significant group differences were found ($p \geq .09$, $d \leq 0.41$). No significant group differences were found regarding the subfacet characteristics of the Internet (factor 3) ($p \geq .09$, $d \leq .71$). Fig. 1 shows the means, standard errors, and significant group differences at the subfacet level.

Table 4
Hierarchical regression analyses for predicting health anxiety.

Dependent Variable: Health Anxiety		
Step 1		
Group: Hypochondriasis vs. no hypochondriasis	.75	<.001
R^2/R^2_{adj}	.56/.56	
ΔR^2	.56	<.001
Step 2		
Group	.35	<.001
Cyberchondria subfacets:		
Distress	.58	<.001
Extent	-.05	.40
Internet characteristics	.08	.06
R^2/R^2_{adj}	.72/.72	
ΔR^2	.17	<.001

3.4. Regression analysis to predict symptom severity

A regression analysis with health anxiety (SHAI) as the dependent variable showed that the cyberchondria subfacets explained incremental variance in health anxiety when controlling for group membership (diagnosis hypochondriasis vs. no hypochondriasis), with (only) the subfacet distress/negative effects of online searching being a significant predictor (see Table 4).

4. Discussion

The aim of the present study was to investigate which subfacets of cyberchondria are specifically associated with hypochondriasis and which subfacets may explain unique variance in the symptom burden. We therefore compared different dimensions and characteristics of cyberchondria in patients with hypochondriasis with a clinical and a healthy comparison group.

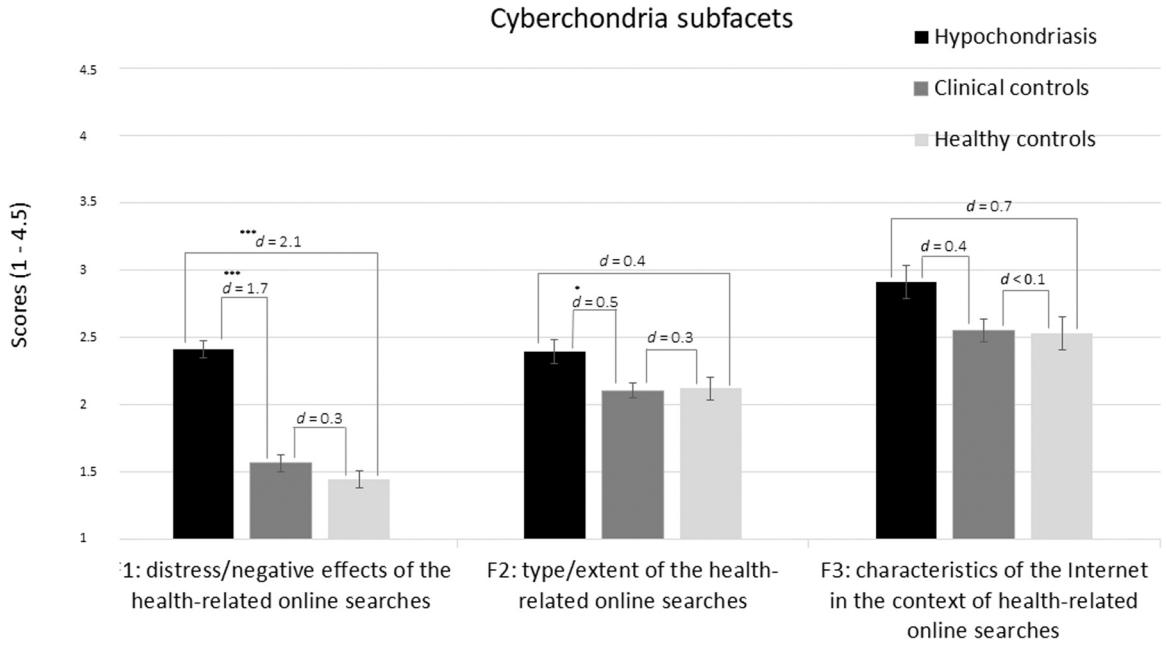


Fig. 1. Means, standard errors, and effect sizes (Cohen's *d*) for the cyberchondria subfacets and the three groups.

The second order factor analysis reduced the subscales to a relevant number of cyberchondria subfacets. The three subfacets: Distress/negative effects linked to health-related Internet searches, type/extent of health-related Internet searches, and characteristics of the Internet regarding health searches (unreliability, abundance) are consistent with a dimensional view of cyberchondria in general (Infanti et al., 2023; McElroy & Shevlin, 2014; Vismara et al., 2020). In addition, with regard to the first two subfacets, there is also conceptual overlap with the psychological characteristics (B criterion) of the Somatic Symptom Disorder according to the DSM-5 (distress and excessiveness).

Group comparisons (MANOVA and Post-hoc tests) and the regression analysis consistently showed that the cyberchondria subfacet (emotional) distress/negative effects linked to health-related Internet searches was most strongly associated with both the diagnosis of hypochondriasis and the (dimensional conceptualized) severity of health anxiety. Significantly higher levels were found in patients with hypochondriasis than in the comparison groups, which in turn did not differ significantly. This could suggest that the subfacet (emotional) distress/negative effects is relatively specific for hypochondriasis and it reflects models of cyberchondria (Brown et al., 2019; Schenkel et al., 2021), in which it is exactly the emotional distress and increase in anxiety that perpetuates the vicious cycle of Internet searches, increase in anxiety, and further Internet searches despite the negative emotional consequences. Since the distress/negative effects subfacet comprises four of the five subscales of the CSS (McElroy & Shevlin, 2014), this may also suggest that the CSS is well suited to capture hypochondriacal aspects of cyberchondria. Regarding the distress component of cyberchondria, the CSS distress subscale was also found to correlate most strongly with health anxiety (Schenkel et al., 2021).

The other two subfacets, such as type/extent and characteristics of the Internet, were less clearly associated with hypochondriasis. Some small to medium effects sizes were found, but mostly the extreme group differences missed the significance threshold and no significant association with health anxiety was found when group was controlled in the regression analysis. Presumably, the extent/frequency of health-related Internet searches and attitudes toward reliability and abundance of information are less specifically associated with hypochondriasis. Accordingly, these are also characteristics that may be generally associated with (health-related) Internet searches and less with a reinforcing vicious circle of health anxiety and the desire for reassurance (Brown et al., 2019; Schenkel et al., 2021).

To date, few (empirically validated) psychotherapeutic interventions exist to reduce cyberchondria, although this topic has become more relevant especially during the COVID-19 pandemic (Jokic-Begic et al., 2020; Starcevic et al., 2021; Vismara et al., 2020). Newby and McElroy (2020) demonstrated that Internet-based CBT can also reduce cyberchondria in patients with hypochondriasis. Here, CBT also included some components to reduce excessive online health searches (e.g., psychoeducation, behavioral experiments). Our study indicates that it is promising in the treatment of hypochondriasis to reduce cyberchondria, specifically the characteristics subsumed in the emotional distress/-negative effects subfacet such as uncertainty intolerance and anxiety, distrust of physicians, and maintaining factors such as reassuring doctor visits (as a consequence of Internet searches).

The selection of the samples is a major strength of the present work, as it enabled us to investigate and compare cyberchondria and its subfacets in patients with different characteristics. In terms of sample characteristics, patients with a hypochondriasis diagnosis studied here showed comparable levels of health anxiety (SHAI-14; mean score of the Health Anxiety scale) and other psychopathological characteristics (PHQ-9 and PHQ-15) to previous studies of Hypochondriasis (DSM-IV) and Illness Anxiety Disorder (DSM-5) (Bailer et al., 2016; Bailer et al., 2017; Mier et al., 2017; Newby, & McElroy, 2020). Although the comparison groups, especially the clinical group, are more difficult to compare with other studies due to their specific compositions, similar psychopathological severity levels have been found (Mier et al., 2017; Vismara, Benatti et al., 2021). Regarding cyberchondria assessed with the CSS, the scores in the clinical comparison group are similar to the mixed clinical group in Vismara, Benatti M = 1.9 for the total scale vs. this study M = 1.8) et al. (2021). Newby and McElroy (2020), who included only patients with hypochondriasis in their intervention study, found an average score of $M = 3.1$ for the total scale (before therapy); in this study, this was descriptively slightly lower at $M = 2.6$ (before therapy). Possibly, this could be explained by the sample characteristics. Patients with hypochondriasis in the study by Newby and McElroy (2020) were slightly younger ($M = 30$, $SD = 12$ vs. this study $M = 38$, $SD = 11$) and had a higher proportion of women (87% vs. this study 58%), whereas a previous study, for example, showed that women score higher on the CSS total scale than men (Barke et al., 2016). The OHBBI has not yet been applied in clinical samples.

To the best of our knowledge, this is the first study to do so by including a sample of hypochondriasis patients and comparing it with a clinical and a healthy control group. Therefore, this study started to close a gap in the previous literature and contributed to specifying the concept of cyberchondria especially in the context of hypochondriasis. In addition, another questionnaire for assessing this construct (the OHBBI), in addition to the widely used CSS, was translated and now can be used in German-speaking regions. Both measures of cyberchondria were validated in terms of associations with health anxiety, depression, and somatic symptom distress.

Besides these strengths, our findings should be considered in the context of several limitations. Our mixed clinical group is very heterogeneous in terms of diagnoses, with the majority suffering from anxiety and depressive disorders (affective disorders 43%, anxiety disorders 31%). The heterogeneity and small subgroups make it difficult to interpret whether cyberchondria is related to specific mental disorders and whether cyberchondria is more strongly related to hypochondriasis than to other specific mental disorders. The results should be considered in the context of the specific sample presented and cannot necessarily be generalized to other samples.

Regarding the questionnaires used, it should be noted that the CSS and OHBBI subscales often do not capture the same thing, even if the title of the subscale suggests they do (e.g., CSS excessiveness vs. OHBBI frequency). For this reason, the subscales of the two questionnaires are described in more detail in the Appendix A. It would also have been interesting to have more information about the Internet use (e.g., we did not ask more questions about the extent/how many hours per day the Internet is used) or the course of health-related Internet searches (e.g., whether Internet use has increased in recent months). Moreover, we used a self-translated version of the CSS as at the time of the survey no validated German version was available (whereby the present study may represent a validation). Meanwhile, another, now well-validated German form has been published (Barke et al., 2016) that is very similar in terms of wording and internal consistencies to our version.

5. Conclusions

This is the first study to compare patients with hypochondriasis, a clinical comparison group, and a healthy comparison group regarding cyberchondria and its subfacets. The study confirms that cyberchondria encompasses several dimensions, with the subfacet emotional distress/negative effects linked to health-related Internet searches being most strongly and specifically associated with both the diagnosis of hypochondriasis and the severity of health anxiety (compared with the subfacets type/extent and characteristics of the Internet searches). The construct of cyberchondria is associated with considerable burden at the individual and public health level (Mathes et al., 2018; Vismara, Benatti et al., 2021; Vismara et al., 2020). Given the general increase in Internet use and in times of uncertainty, such as the COVID-19 pandemic, the study of cyberchondria seems to be of great relevance currently and in the future.

Role of funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

All authors declare that they have no conflict of interest.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.janxdis.2023.102798.

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