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What Is Remembered?: The Recall of Health-related Information in Cyberchondria and Health Anxiety*

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Cyberchondria is excessive online seeking of health-related information followed by distress. We aimed to examine the effects of cyberchondria and the credibility of the health-related sources on recall, and to investigate cyberchondria as a mediator between health anxiety (HA) and recall. Participants (N = 194) read about an alleged disease from sources of various credibility (high, low, neutral), filled in the HA Questionnaire and the Short Cyberchondria Scale, and recalled the information. No effect of source credibility on recall was found. Participants with high cyberchondria recalled more information, even when HA was controlled. Better recall in high HA was mediated by cyberchondria. A direct effect of HA on recall was found only for distorted recall of health information. This indicates different recall patterns in people with high HA depending on their cyberchondria, probably due to elaborated health schemas in cyberchondria, and to the disregard of source credibility in persons with high HA and low cyberchondria.

Keywords: memory recall, memory distortion, source credibility, cyberchondria, health anxiety

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Ethics approval. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. An informed consent was obtained from all participants.

Data availability. The data that support the findings of this study are available from the corresponding author upon reasonable request

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Highlights:

- Similar recall in cyberchondria and health anxiety regardless of source credibility.
- Recall is higher and more accurate in high vs. low cyberchondria.
- Cyberchondria mediates the relation of health anxiety and recall.
- People with higher health anxiety are more prone to cyberchondria.

Cyberchondria is an excessive, time-consuming, and anxiety-amplifying online searching for one's symptoms. It is a coping strategy gone astray; although the main function of excessive search is to decrease anxiety over one's symptoms, it appears to do exactly the opposite (Starcevic & Berle, 2013). Reassurance model of cyberchondria (Starcevic & Berle, 2013; Starcevic et al., 2021) proposes that the Internet-symptom-searching rarely ceases because it results in the overflow of information from numerous sources, whose credibility level is difficult to determine. Such endless inquiries often raise initial anxiety and consequently distort information processing. Indeed, a recent review suggests that memory biases should be explicitly included in the conceptualization of health anxiety (HA) as its maintenance mechanisms (Leonidoua & Panayiotoua, 2018). Health anxiety is characterized by excessive worries about one's health in the absence of medical condition, which ranges from mild to pathological in a form of Illness Anxiety Disorder (DSM-5; American Psychiatric Association, 2013). HA is predictive of safety-seeking behaviors, higher self-rated disability, and somatic symptoms (Doherty-Torstrick et al., 2016). Cyberchondria is related to HA as either a risk or maintaining factor, i.e., in individuals with health-related fears arising from erroneous beliefs that bodily symptoms are a sign of severe illnesses, cyberchondria either provokes these beliefs or fosters their continuity (Mathes et al., 2018, te Poel et al., 2016, Asmundson et al., 2001).

Stronger attentional bias to health-related information and stronger binding of arousal and such information in working memory is well-known in HA (Witthöft et al., 2016). In endless online inquiries, regardless of source credibility, search details are being repeatedly encoded and retrieved, which is likely to affect later recall. Yet little is known about how *cyberchondria* affects cognitive processes and whether it has any additional implications above those brought by HA. The aim of this paper is twofold: 1) to examine the relation of cyberchondria and source credibility on later recall, and 2) to explore a possible mediating role of cyberchondria in the relation between HA and memory recall.

HA, Cyberchondria, and Memory

In HA, schemas for health-related information are broader, more elaborated, and accessible. Broader schemas have a higher chance of being activated by otherwise neutral cues so HA can support recall of health information. However, HA is also associated with memory distortions for health

information (e.g., Ferguson et al., 2007; Lim & Kim, 2005). Not only do anxious individuals show attentional bias for negative events, but they are also prone to negative interpretations of ambiguous events (Witthöft et al., 2016). Such interpretations, which may reflect personal thoughts and emotions, can in turn produce intrusions during recall. More precisely, anxious people, including those with high HA, have source monitoring difficulties (Hertel et al., 2008; Mitchell & Johnson, 2009; Durso et al., 1991). Overall, it seems that high HA might be related to a higher rate of accurate, as well as distorted memories for health-related material.

How could cyberchondria affect memory beyond HA? Health-anxious individuals have sought health information from encyclopaedias and their physicians long before the internet. Yet, there is one important distinction: the amount of exposure to health information. Medical consultations cannot go on indefinitely so cyberchondria implies exposure to a much greater amount of health information than HA. Moreover, HA is sometimes associated with avoidance of health-related material due to fear which results in less exposure which is not the case with cyberchondria (Warwick & Salkovskis, 1990).

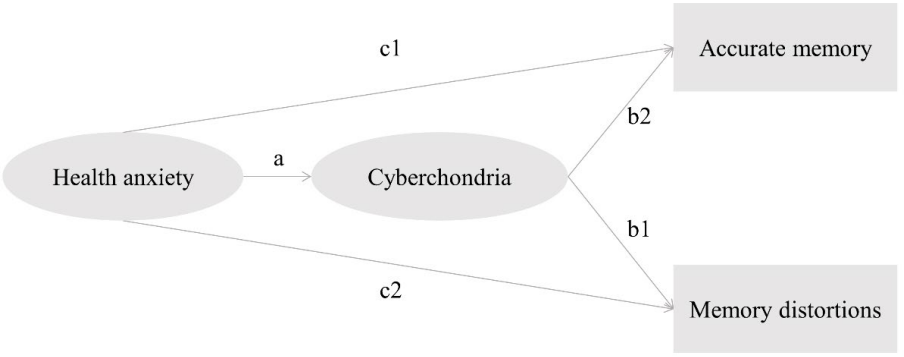
Source Credibility and Memory Recall

Online search implies information of varying quality and questionable credibility, which is less of an issue for traditional health information sources such as encyclopaedias or doctors. Source credibility describes individual perception of source's expertise and trustworthiness. It is usually processed heuristically thus placing a little load on cognitive system (Luo et al., 2013). Heuristic processing demobilizes cognitive resources, making them available for encoding and storing. Information from credible sources is accepted relatively automatically, especially if the source is highly trustworthy (Priester & Petty, 2003). However, when an important topic is delivered via a questionable source, a controlled and resource demanding processing occurs. With processing demands increased, fewer resources are available for further processing, which results in weaker memory of the content (Lang, 2000). Studies examining the relation between source credibility and memory generally suggest that questionable sources lead to lower recall (Appelman & Bolls, 2011; McDaniel & Vestal, 1975). Recall mechanisms in HA and cyberchondria might be similar when it comes to heuristic processing of health-information given by credible sources. Yet, with the sources of questionable credibility these conditions might bring about some cognitive differences. Questionable sources are rare in the case of HA in which medical experts and sources are consulted. Since internet search is the principal source of information in cyberchondria, more cognitive resources are allocated to deal with source credibility leading to less encoding capacities, and consequently to less accurate or more distorted recall.

Hence, we hypothesized that when information about a new illness is provided by a credible source, it will result in better recall of both health and non-health related information than when provided by a source of questionable credibility or an unknown source. Secondly, we hypothesized that after reading

about factitious illness, people with high cyberchondria, will recall more accurate health related information, as opposed to people with low cyberchondria, regardless of their HA level. Finally, we hypothesized that people with high cyberchondria will have more memory distortions of health-related information in comparison to those with low cyberchondria but this will be a product of an underlying HA, and thus, disappear when controlling for HA. We did not expect to find any differences between people with high and low cyberchondria regarding non-health information.

Figure 1
Proposed model of the relationship between HA, cyberchondria and two types of memory; accurate and distorted



The Aim of the Study

In sum, anxiety can lead either to a better recall – due to better within-schema integration and elaboration of information (e.g., Graf & Mandler, 1984), or to more memory distortions – due to attentional bias towards negative interpretations and poor source monitoring (Hertel et al., 2008; Mitchell & Johnson, 2009). Since cyberchondria can co-occur with HA and it may influence memory processes, we propose that cyberchondria may be a mediator between HA and the recall of health-related information (Figure 1; path a). To our knowledge, the relation between cyberchondria and accurate recall of health information has not been investigated, but it is plausible due to the more elaborated and accessible health-schemas in persons with cyberchondria (path b1). Corroborating on this, the relation between cyberchondria and distorted memory for health information seems probable due to less available resources, occupied by the demanding processing of source credibility in online searches (path b2). Finally, not all people with HA search for their symptoms on the internet, yet HA may exhibit similar effect on their memory; for example, due to rumination about health (Marcus et al., 2008). Therefore, we also presumed that HA would have a direct effect on accurate memory (path c1) and memory distortions (path c2).

Method

Design

To explore the role of cyberchondria and source credibility on the recall of health information, a 3x2 quasi-experimental design was used. Source credibility was used as a three-level independent variable (credible source − national health organization, questionable credibility – forum post, control condition – no information about the source). With respect to cyberchondria, participants were split into two groups based on a questionnaire score (high and low cyberchondria; see *Materials*). A delayed free recall task of a brief health-related text was used. Recalled information was either health or non-health related thus resulting in four dependent variables based on memory accuracy and the nature of information (see *Coding* section). A priori power analysis for MANOVA indicated that a sample size of 196 would be sufficient to detect a medium size effect ($f = 0.25$) with a power of .80 and an alpha = .05.

Participants

Participants were young adults from Croatia ($N = 292$, 60% female, mean age $M(SD)$ = 19.8(1.52), range 17−27), students of different faculties (psychology, history, engineering, and natural science). Participants were approached during the lecture with a request to participate in the study. Participants who agreed to participate have filled out the questionnaires after the lecture. Around 55% of participants reported searching for health information over the internet less than once a month, 21% once a month, 2% once a week, 1% 2−4 times a week, and less than 1% every day. They searched for: possible causes of symptoms (55%), health condition they were not diagnosed with (12%), other peoples' experiences with illness (11%), health condition they were diagnosed for (7%), treatment options (6%), health services (4%), or some other type of health information (5%). About 21% of participants reported they never search for health information over the internet.

Materials

A brief vignette about a fake illness *lienais*, featuring typical symptoms (e.g., stomach and intestinal pain, congestion, loss of appetite) and possible risk factors (e.g. low fibre diet, obesity, lack of exercise) was used (see Baumgartner & Hartmann, 2011). The vignette was presented using three different layouts: a) a webpage announcement of the national public health service (high credibility), b) an individual post on the largest national online forum (low credibility), and c) word document print-out, no source specified (control condition).

The Health Anxiety Questionnaire (HAQ; Lucock & Morely, 1996). A 21-item scale (4-point Likert), measuring health concerns, is reported to have a 4-factor structure: worry and health preoccupation, fear of illness and death, reassurance-seeking behaviour and the interference of symptoms with a person's life. In the present study its internal consistency was $\alpha = .89$.

The Short Cyberchondria Scale (SCS; Jokić-Begić et al., 2019). A 4-item measure of cyberchondria, with participants responding on a 5-point Likert scale regarding their Internet-related health behaviour (e.g., "After searching for health information, I feel frightened"), is a unidimensional scale measuring the same latent construct as a previously developed longer instrument – Cyberchondria Severity Scale (McElroy & Shevlin, 2014). It results in total range of 4−20. Internal consistency of SCS in this study was $\alpha = .78$.

Sociodemographic questionnaire covered the information regarding participants' gender, age, and study program. It also included questions on any previous or current acute or chronic illnesses, and the frequency and type of health information sought on the internet.

Procedure

Students were invited to participate in a study on health habits. All participants were given the following material in the booklet format: 1) informed consent, 2) vignette, 3) HAQ, 4) SCS, 5) sociodemographic questionnaire, and 6) a blank sheet of paper. Booklets containing different vignettes were randomly distributed among participants. Participants were given 3 min to read the vignette, which was then returned to the experimenter. Upon filling in the instruments, participants were asked to recall the vignette and write down everything they remember. The recall time was sufficient, yet limited (8 min, not disclosed to participants). Finally, participants were asked to rate the credibility of the source on a 5-point scale (*1 – completely non-credible*; *5 – completely credible*). The whole procedure took about 25 min and was followed by a debriefing.

Coding

Semantically meaningful unites (codes) were extracted from the vignette by two independent authors and one language expert and were classified into two categories: health (e.g., symptom) and non-health units (e.g., female name). Disagreements in classification were resolved by the third author (blinded). Accurate recall was observed with the recall of the exact word/phrase or its synonym (e.g., "physician" instead of "doctor"). Distorted recall resulted in incorrect recall (e.g., lenis instead of lienalis), semantic error (e.g., lienalis can be "cured" instead of "decelerated"), or confabulation (e.g., recalling what has not appeared in the text). Thus, four different types of recall were: accurate (*Ha*) and distorted (*Hd*) recall of health-related information and accurate (*Na*) and distorted (*Nd*) recall of non-health information. All individual protocols were coded by three independent coders who underwent training. They were familiarized with vignettes, codes, the coding process and scoring. The inter-coder agreement was calculated based on 226 analysed units of 15 randomly selected protocols using WinPepi software (Abramson, 2004). Coders showed a good level of agreement (κ = .61; $p < .001$; Altman, 1999).

Data Analysis

Two separate multivariate analyses of variance (MANOVA) were used to test whether participants differed in recalling different types of information depending on their level of cyberchondria and the credibility of the source. Independent variables in both MANOVAs were: 1) source of information (three levels: health related source, forum, and control condition), and 2) cyberchondria (two levels: high vs. low on the SCS, based on median split). The decision to dichotomize this variable was made since problematic online health information seeking (OHIS; cyberchondria) results in qualitatively different outcomes from non-problematic OHIS. As suggested by the reassurance model, cyberchondria results in more distress. It appears that cyberchondria is also associated with feeling less informed about health (Jungmann & Witthöft, 2020). Adaptive OHIS would result in feeling more informed and less distressed.

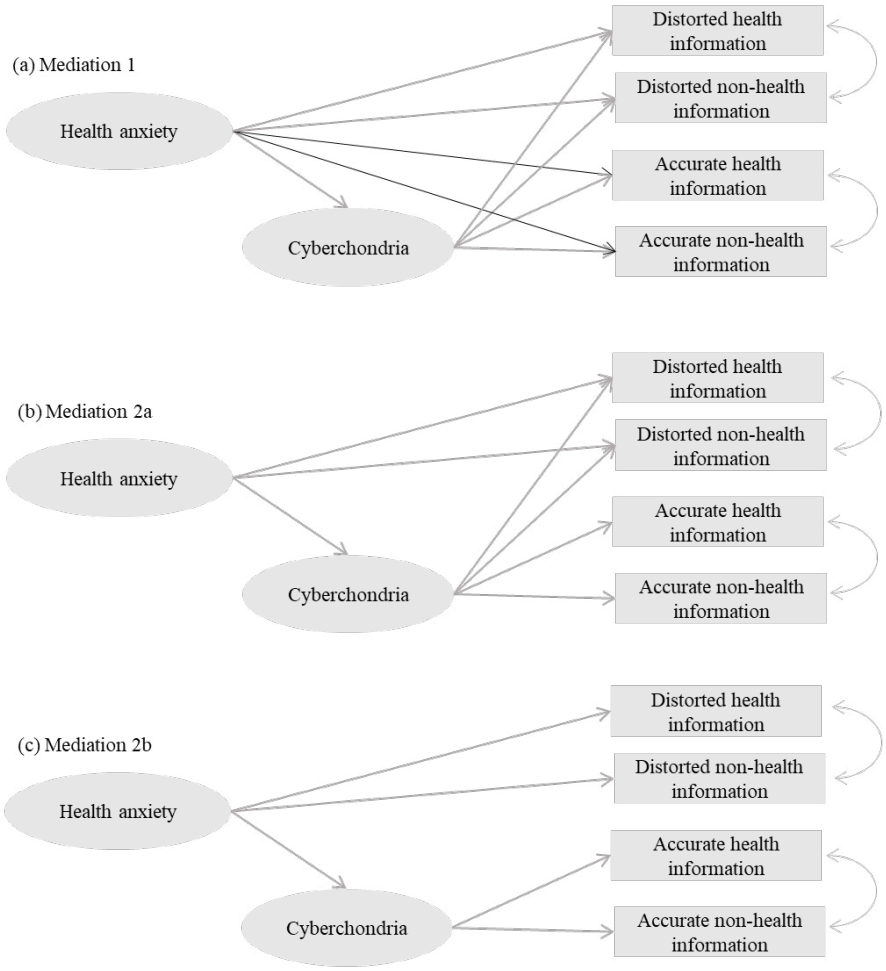
We performed separate MANOVAs (with Bonferroni correction as a post-hoc test) for two types of the memory recall: accurate and distorted. In the first MANOVA the number of accurately recalled health and non-health pieces of information were used as dependent variables and in the second MANOVA the number of distorted health and non-health pieces of information were used as dependent variables. Additionally, the same analyses were performed with HA as a covariate (MANCOVA).

To determine the mediating role of cyberchondria in the relation of HA and recall, structural equation modelling (SEM) was used. Latent variable HA was defined by four subscales of the HAQ, and the latent variable cyberchondria by 4 items of the CSS. Measures of four types of recall were used as manifest variables in the model. Cyberchondria was specified as a mediator between HA and four types of memory recall (Ha, Hd, Na, Nd). We

included non-health information in the model for two reasons. First, due to the lack of studies on cyberchondria and memory, we decided to take a more exploratory approach at this point. Second, non-health information was presented in a health context and possibly affected by it. An unanalysed relationship was presumed between two types of accurate recall (Ha and Na) and two types of distorted recall (Hd and Nd; Figure 2a). Two alternative mediation models were specified (Figure 2b and Figure 2c). In both models, along with indirect effects, HA had a direct effect on distorted recall (Hd and Nd). In mediation model 1, HA also had a direct effect on accurate recall (Ha and Na), while in mediation model 2a and 2b, these two paths were fixed to 0.

Figure 2

Tested models in which cyberchondria is a mediator between health anxiety (HA) and memory recall: (a) HA has direct effect on accurate recall of health (Ha) and non-health information (Na), and recall of distorted health (Hd) and non-health information (Nd), and indirect effect on Ha, Hd, Na, Nd; (b) HA has direct effect on Hd and Nd, and indirect effect on Ha, Hd, Na and Nd; (c)HA has direct effect on Hd and Nd, and indirect effect on Ha and Na



To determine the fit of two models to our data, several goodness of fit criteria were used and, to compare models, a chi square test was used. To directly test the mediation hypothesis, we bootstrapped confidence intervals for each of the mediation effects estimated for the accepted model, as suggested in the literature (Preacher & Hayes, 2008). A maximum likelihood estimation method was used with robust standard errors (Huber-White) and Yuan-Bentler test statistic (MLR). Analyses were conducted using SPSS 26 statistical software (IBM Corporation, 2019) and 'lavaan' package in R (version 3.4.3, *R* Core Team, 2013; Rosseel, 2012).

Results

Preliminary Analyses

We excluded participants who suffer from chronic illnesses ($N = 30$) and those who never searched health information on the internet ($N = 61$). Four participants with missing values on all recall variables and three univariate outliers (one in Nd ($z = 3.57$) and two in HAQ ($z = 3.61$ and $z = 3.83$) were excluded from further analysis as suggested in the literature (Kline, 2016). With no multivariate outliers found, the final sample reached $N = 194$ participants. Although the assumption of the multivariate normality of distribution was not met ($HZ = 1.47$; $p < .001$), MANOVA is robust to non-normality violation with over 20 or 10 participants per group (Mardia, 1971; Seo et al., 1995). Box's tests of equality of covariance matrices for both groups of variables used in MANOVA were not statistically significant ($F_{accurate}(15, 136071) = 0.91$, $p = .55$; $F_{distorted}(15, 136071) = 1.29$, $p = .20$), indicating equality of the observed covariance matrices of the dependent variables across groups.

The descriptive data for SCS are as follows: $M = 10.09$, median = 10.00, $SD = 3.34$, $TR = 4{-}20$, and for HAQ: $M = 37.78$, $SD = 8.10$, $TR = 25{-}67$. Descriptive data in respect with memory variables are shown in Table 1.

Table 1

Descriptive statistics for recall of accurate health information (Ha), accurate non-health information (Na), distorted health information (Hd), and distorted non-health information (Nd) for three experimental groups and two levels of cyberchondria (SCS) (N = 194)

Group	SCS	Ha	Na	Hd	Nd
	Level (*N*)	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*
High credibility	High (27)	2.74 (2.02)	4.15 (2.43)	6.15 (4.50)	2.07 (2.00)
	Low (37)	2.44 (1.64)	3.57 (2.10)	5.35 (3.61)	1.97 (2.02)
Questionable credibility	High (30)	2.52 (1.45)	4.60 (2.53)	5.73 (3.46)	1.83 (1.46)
	Low (39)	2.26 (1.20)	2.92 (2.31)	4.90 (2.77)	1.87 (1.47)
Control	High (36)	2.33 (1.27)	4.61 (3.12)	5.33 (3.25)	1.67 (1.31)
	Low (25)	2.45 (1.58)	3.54 (2.09)	5.92 (3.90)	1.46 (1.67)
Overall	High (94)	2.51 (1.56)	4.47 (2.73)	5.70 (3.69)	1.84 (1.58)
	Low (100)	2.37 (1.46)	3.31 (2.18)	5.31 (3.37)	1.81 (1.73)
	Both (194)	2.44 (1.51)	3.87 (2.52)	5.50 (3.53)	1.82 (1.66)

Note. high credibility source = national health organization; questionable credibility = forum post.

Participants in different experimental conditions differed in their estimates of source credibility ($F(2, 185) = 3.30$, $p = .04$). Post-hoc comparisons showed that national health organization source group estimated the source as more credible than did forum (*Mdiff* = .31; $p = .03$) and control group (*Mdiff* = .35; $p = .02$), which implies a successful experimental manipulation.

The Role of Information Source and Cyberchondria in Memory Recall

MANOVA for accurate recall showed neither significant interaction ($F(4, 373) = 0.70$, $\lambda = .99$, $p = .59$), nor the main effect of experimental group ($F(4, 373) = 0.37$, $\lambda = 0.99$, $p = .83$). However, main effect of the level of cyberchondria was statistically significant ($F(2, 187) = 6.30$, $\lambda = 0.94$, $p = .002$, multivariate $\eta^2 = .06$) indicating that regardless of the source, individuals with high cyberchondria generally recall more information than individuals with low cyberchondria. Cyberchondria had a medium sized effect on recall. Post-hoc comparison showed that participants with high cyberchondria outperformed participants with low cyberchondria in both, health-related information recall ($M_{high} = 10.76$, $SE_{high} = 0.45$; $M_{low} = 8.87$, $SE_{low} = 0.44$; $F(1, 188) = 9.17$, $p = .003$) and non-health information recall ($M_{high} = 4.45$, $SE_{high} = 0.26$; $M_{low} = 3.34$, $SE_{low} = 0.25$; $F(1, 188) = 9.43$, $p = .002$). MANOVA for distorted recall did not show significant interaction ($F(4, 389) = 0.66$, $\lambda = .99$, $p = .61$); and neither did it show the main effect of experimental group ($F(4, 373) = 0.85$, $\lambda = .98$, $p = .49$), nor the effect of the level of cyberchondria ($F(2,187) = 0.23$, $\lambda = .99$, $p = .80$).

MANCOVA for accurate memory recall with HA as a covariate did not affect the relation between cyberchondria and memory. While the interaction effect and the main effect of experimental group were not statistically significant ($F(4, 370) = 0.67$, $\lambda = .99$, $p = .61$; $F(4, 370) = 0.35$, $\lambda = .99$, $p = .84$, respectively), the main effect of the level of cyberchondria was significant ($F(2, 185) = 6.40$, $\lambda = .94$, $p = .002$, multivariate $\eta^2 = .07$) and medium in size. As in the previous analyses, when controlling for HA, participants with high cyberchondria still outperformed participants with low cyberchondria in both, health ($F(1,186) = 9.41$, $p = .002$) and non-health information recall ($F(1,186) = 9.49$, $p = .002$). Regarding memory distortions, when controlling for HA, no significant interaction was found ($F(4, 370) = 0.56$, $\lambda = .99$, $p = .69$). Neither the main effect of group ($F(4, 370) = 0.93$, $\lambda = 0.98$, $p = .44$), nor the effect of the level of cyberchondria were found ($F(2, 185) = 0.07$, $\lambda = 1$, $p = .94$).

Cyberchondria as the Mediator Between HA and Memory Recall

All group data were analysed together since no interaction effects between source credibility and cyberchondria (nor HA) on recall were expected, i.e., we did not expect the moderating effect of source credibility. Moreover, data from MANOVAs and MANCOVAs suggest that three groups are a part of the same population with respect to memory recall.

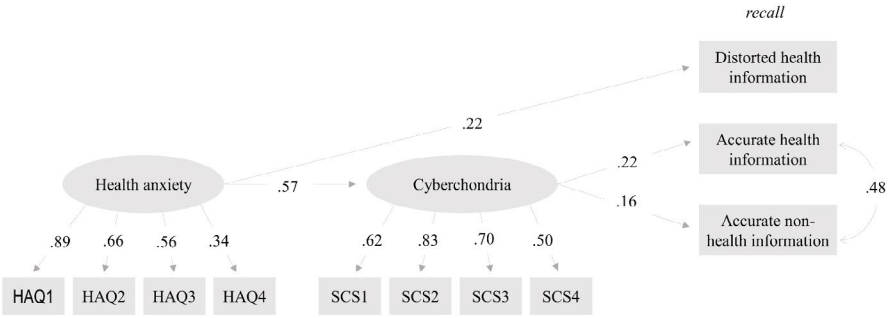
The initial mediation models 1 and 2 provided a good fit to data, but the variable Nd showed no significant paths – neither with HA, nor with cyberchondria in either of the models. Its only significant path was with Hd. Since *Nd* seems to be irrelevant in the context of HA and cyberchondria, it was excluded from further analyses. The resulting mediation models 1 and 2 both provided a good fit. Since the difference in their fit was not statistically significant ($\chi^2(2) = 4.14$, $p = .13$), we chose a more parsimonious mediation model 2. Non-significant paths from this model were dropped, resulting in a trimmed mediation model 2a. Since the fit of these two nested models was not significantly different ($\chi^2(3) = 4.15$, $p = .25$), mediation model 2a was accepted. Fit indices for all three of the models are shown in Table 2.

Table 2
Goodness of fit indices for the two alternative mediation models and the accepted trimmed model

Model	χ2 (df)	*p* (χ2)	SRMR	RMSEA (90% CI)	CFI	TLI	χ^2 /df
Mediation1	53.92 (39)	.06	.06	.04 (.00-.07)	.97	.96	1.38
Mediation2	57.95 (41)	.04	.06	.04 (.01-.07)	.96	.95	1.41
Meditation2a	58.08 (42)	.05	.06	.04 (.00-.07)	.97	.96	1.40

Note. SRMR – Standardized Root Mean Square Residual, RMSEA –The Root Mean Square Error of Approximation, CFI – comparative fit index, TLI – Tucker-Lewis index.

Figure 3
Mediating role of cyberchondria between health anxiety and recall of health and neutral information (N = 194)



Parameter estimates for the accepted model are shown in Figure 3. All indicators had significant and substantial saturations with their corresponding factor except the HAQ interference indicator that had a somewhat low saturation (.34). HA had an indirect effect on Ha and Na, through cyberchondria, and a direct effect on Hd. Bootstrapped confidence intervals for mediation effects suggest their significance (path HA-CH-Ha =.16 (CI 95% [0.05, 0.27]); path HA-CH-Na = .07 (CI 95% [0.001, 0.13]), although the effect on *Na* is barely significant. Both direct and indirect effects are small in magnitude.

This model suggests that people with higher HA recall more health and non-health information in an accurate manner, but this association can be explained through cyberchondria; people with higher HA are more prone to cyberchondria, while cyberchondria is associated with accurate recall of more health and non-health information presented in a health context. Higher HA is also associated with the recall of more distorted health information, which cannot be explained through cyberchondria.

Discussion

Studying memory mechanisms in cyberchondria can enable additional understanding of how online search for health information can result in excessive preoccupation with one's health. Contrary to the initial hypothesis, our results show that source credibility did not affect recall. Specifically, health and non-health information, both accurate and distorted, were recalled at the approximately same rate regardless of their source. Several explanations have been put forth by previous studies failing to find the effect of source credibility on memory (e.g., Corrie; 2003; Henkel & Mattson, 2011).

First, source credibility is multifaceted, and it might be that successfully manipulating the expertise, and not the trustworthiness, results in weak or no effect (Pornpitakpan, 2004). It is not unusual to find conflicting expert information, and, in such cases, perceived trustworthiness may be more important in assessing credibility. Future studies are advised to employ a more persuasive trustworthiness manipulation. Furthermore, familiarity might have played a role in assessing truthfulness of the vignette. Repeated exposure to same information can lead to the truth effect, i.e., perceiving the information as more convincing and accurate due to its familiarity, regardless of its source (Dechêne et al., 2010). Although people can initially discern credible form non-credible sources, memory of the source of information fades over time and the content can enter semantic knowledge as a fact, regardless of the initial assessment of its accuracy (Henkel & Mattson, 2011; Kumkale & Albarracín, 2004). Accordingly, if participants have previously encountered texts describing similar symptoms and risk factors as given in the vignette, they might have perceived it as true and credible due to familiarity, regardless of the source.

Our findings show that people with high cyberchondria recall more accurate health and non-health information compared to those with low cyberchondria. However, they do not exhibit more distortions even when controlling for HA. This confirms our first hypothesis and suggests a possible unique effect of cyberchondria on memory. The relationship between cyberchondria, HA, and memory is further explained by the model in which cyberchondria has a mediating role between HA and different types of memory recall. Results suggest that people with higher HA are more prone to cyberchondria and exhibit better recall of health and non-health material.

Studies have underlined heterogeneity of HA in terms of processing patterns; while some individuals have difficulty in disengaging with illness-related materials (monitors), others show early disengagement (blunters; Leonidoua & Panayiotou, 2018). These differences could be reflected in recall. We suggest that cyberchondriacs might represent a subgroup within HA, which is well health-informed, and can recall more accurate and less distorted health information. Cyberchondria features more elaborated health schemas due to the excessive consumption of health content. Consequently, more cues can activate recall, trigger anxiety and initiate a new search – a "better safe than sorry" strategy proposed by Brown et al. (2020). Elaborated health-related semantic network in high cyberchondria may enable better encoding and allocate more resources for encoding other presented non-health information.

We found that higher HA is not associated with accurate recall per se. Instead, individuals with high HA who are also prone to search online for health information showed better recall. As previously reported, direct effect of HA was found on distorted recall of health information (e.g., Ferguson et al., 2007; Lim & Kim, 2005). Distorted source monitoring might accommodate these findings; when confronted with arousing information, people with HA have problems with disassociating external information from its personal interpretation (Hertel et al., 2008) and can overreport and distort symptoms (Witthöft et al., 2016). No mediating effect of cyberchondria between HA and memory distortions was found. Differences in recall patterns might be explained by typical features of cyberchondria: 1) online search leads to repeated encoding and recall of similar information and reduces memory distortions (Frost et al., 2015), 2) continuous comparisons of symptoms with information found online, and the analysis of conflicting information from several online sources may enhance source monitoring (McManus et al., 2014; Hicks & Marsh, 1999). Caution is necessary in interpreting these findings for they need to be replicated by further studies which will include the analysis of metacognitive processing in cyberchondria.

Limitations

A non-clinical student sample presents a main limitation. Even though diagnostic criteria for cyberchondria are still not set (Vismara et al., 2020) including people with more severe HA and cyberchondria might have provided different findings. Second, a somewhat low reliability of memory variables might have limited regression coefficients and misinterpreted some paths as non-significant. Third, we used cross-sectional data, whereas mediation implies causal effects that develop over time. Furthermore, we used a median split to differentiate between high and low cyberchondria. Future studies need to deal with determining the possible clinical cut-off. In addition, participants read about a fictitious new disease and not the symptoms they are experiencing.

Consuming personally relevant information might have very different effects on memory. Finally, internet is an interactive medium so when searching online, people actively select, consult and compare several sources of information as opposed to reading a single preselected vignette.

The study investigated immediate effects of reading from sources of different credibility and not its long-term consequences. Online information seekers become skilled in evaluating sources over time and this enables heuristic processing and demobilizes resources for memorization (Lang, 2000). Still, Starcevic and Berle (2013) hypothesised that people with high cyberchondria have difficulties in discerning source credibility or may deliberately avoid credible sources. Credible sources lead to more anxiety because disturbing information cannot be easily disregarded (Baumgartner & Hartmann, 2011). Source preference thus shifts based on a search topic. More studies are needed to reveal which sources are chosen in cyberchondria, and whether their memory is dependent upon source credibility.

Practical Implications and Conclusion

Our findings show no difference in recall from sources of different credibility which implies that we may equally well remember online information given by doctor or laypeople on internet forums. This emphasizes the urge for better-quality information on the internet, but also the need to further develop access to verified health information. The effect of source credibility on memory is increasingly important in the digital age especially in the health domain. The context of COVID-19 pandemic has made the phenomenon of cyberchondria and source credibility even more relevant when people research about the new disease online, trying to discern credible content in the flood of misinformation (Starcevic et al.; 2021, Bagaric & Jokić-Begić, 2022). Furthermore, the differences found in recall patterns in HA and cyberchondria might have implications for treatment. HA individuals with low cyberchondria might benefit from source-monitoring training (e.g., Martell & Evans, 2005) and mindfulness training could aid in raising awareness of internal generation of information (e.g., Baer, 2003). On the other hand, HA individuals with high cyberchondria may benefit from limiting their search time, i.e., indirectly limiting the amount cues which trigger anxiety. These tentative implications would certainly need to be addressed in further empirical studies. To our knowledge this is the first study which has explored memory recall in cyberchondria. The analysis in which HA was controlled for has enabled identification of some unique aspects of cyberchondria. These findings may help understand the role of memory in the development of cyberchondria – a role often implied but not explicitly discussed and investigated.

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Šta ostaje u sećanju?: Prisećanje zdravstvenih informacija kod sajberhondrije i zdravstvene anksioznosti

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Sajberhondrija je preterano traženje informacija u vezi sa zdravljem na internetu koje je praćeno distresom. Cilj ovog istraživanja je bio da se ispitaju efekti sajberhondrije i kredibiliteta izvora zdravstvenih informacija na prisećanje (zdravstvenih informacija, prim.prev.), kao i da se ispita uloga sajberhondrije kao medijatora odnosa između zdravstvene anksioznosti (HA) i prisećanja (zdravstvenih informacija, prim. prev.). Učesnici u ovom istraživanju (N = 194) su čitali o navodnoj bolesti iz izvora različitog kredibiliteta (visokog, niskog, neutralnog), i popunjavali su Upitnik zdravstvene anksioznosti (eng. HA Questionnaire) kao i kratku skalu sajberhondrije (eng. Short Cyberchondria Scale), te su imali zadatak da se prisete informacija o kojima su čitali. Nije nađen efekat kredibiliteta izvora na prisećanje. Učesnici u istraživanju sa visoko izraženom sajberhondrijom su se sećali više informacija, čak i kada je nivo zdravstvene anksioznosti bio kontrolisan. Sajberhondrija je bila medijator boljeg prisećanja u kontekstu visoke zdravstvene anksioznosti. Direktan efekat (statistički, prim. prev.) zdravstvene anksioznosti na prisećanje je nađen samo za iskrivljeno prisećanje zdravstvenih informacija. Ovo ukazuje na postojanje različitih obrazaca prisećanja kod individua sa visokom zdravstvenom anksioznošću zavisno od nivoa njihove sajberhondrije, verovatno kao posledica razrađenih zdravstvenih shema koje su karakteristika sajberhondrije, kao i na zanemarivanje kredibiliteta izvora kod osoba sa visokom zdravstvenom anksioznošću i niskom sajberhondrijom.

Ključne reči: prisećanje, iskrivljenje sećanja, kredibilitet izvora, sajberhondrija, zdravstvena anksioznost

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