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6

General Discussion

The goal of this dissertation was to examine the relationship between online health information seeking and health anxiety with the idea to shed more light on the phenomenon of cyberchondria. Cyberchondria refers to an increase in anxiety about one's health as a result of searching for health information online, which, in turn, is driven by anxiety about health. Despite the increased attention for this phenomenon in recent years, empirical evidence is scarce and the focus mostly lies on theorising. This dissertation presents four empirical studies that were conducted with the overall goal to examine the relationship between online health information seeking and health anxiety. In the next sections I will summarize and discuss the results on the basis of seven key findings resulting from the empirical studies. Following, I discuss the theoretical and methodological implications of these findings and directions for future research. Thereafter, recommendations for practice are discussed after which the chapter concludes with my final remarks.

Key Findings

Key Finding 1: The Dutch Short Health Anxiety Inventory is a valid and reliable instrument to measure health anxiety in the Dutch general population

Key finding 1 is based on the findings from a psychometric evaluation of the Dutch Short Health Anxiety Inventory (D-SHAI) that are described in Chapter 2. Health anxiety is a dimensional construct. People who are overly health anxious, that is, who score on the high end of the continuum, are, mostly unnecessarily, preoccupied with health and illness (Ferguson, 2009; Salkovskis & Warwick, 1986). Several self-report measures have been proposed to assess health anxiety in the past (e.g., Kellner, 1987; Pilowsky, 1967;

Pilowski & Spence, 1975), of which the Short Health Anxiety Inventory (SHAI; Salkovskis, Rimes, Warwick, & Clark, 2002) is the most widely used assessment tool. However, the psychometric quality of the SHAI has not yet been extensively tested. Furthermore, a validated Dutch version of the SHAI was also not available. Chapter 2 provided this missing insight. The study described in Chapter 2 revealed that the D-SHAI is a valid and reliable measure to assess levels of health anxiety in the general Dutch population.

The SHAI was developed as a measurement tool to assess health anxiety in the general population (Salkovskis et al., 2002). As part of the study described in Chapter 2, the SHAI was translated from English to Dutch, and subsequently validated in a representative sample of Dutch individuals. A confirmatory factor analysis revealed a two-factor structure, relating to the latent constructs *Illness Likelihood* and *Negative Consequences of Illness*. The Illness Likelihood subscale proved to be predictive of reassurance seeking behaviours (i.e., online health information seeking and doctor visits). The Negative Consequences of Illness subscale predicted absence of doctor visits, and thus seems to be more closely related to avoidance behaviours.

Aside from the predictive validity, the study further revealed test-retest reliability and good internal consistency. Furthermore, the factor structure of the D-SHAI proved to be invariant, that is, robust over time, as well as across males and females and healthy and chronically ill people. Further analyses showed that chronically ill people and women scored higher on Illness Likelihood, but not on Negative Consequences of Illness.

On the basis of the findings from Chapter 2, and on the basis of recommendations by Alberts, Hadjistavropoulos, Jones, and Sharpe (2013), it is recommended to use the Illness Likelihood subscale to

assess health anxiety in future studies on health anxiety, respectively cyberchondria, as well as in clinical settings.

Key Finding 2: The higher the level of health anxiety that people experience, the more often they search for health information online, and vice versa.

Prior cross-sectional research has indicated that health anxious individuals go online more often to find health information (Baumgartner & Hartmann, 2011; Muse, McManus, Leug, Meghreblian, & Williams, 2012; Singh & Brown, 2014). In this dissertation this finding was replicated on a cross-sectional level (Chapters 2, 3 and 5) and further complemented by an examination of the relationship through a longitudinal multilevel approach (Chapter 4). The latter confirmed that health anxiety and online health information seeking are, amongst others, related at a between-person level. This means that at the population level, the amount of online health information seeking differs depending on health anxiety levels (and vice versa). In other words, on the basis of the current findings it can be concluded that individuals who are more anxious about their health search for online health information more than others.

Key Finding 3: Individuals who are overly health anxious do not excessively search for health information online

The phenomenon of cyberchondria emanates from the idea that overly health anxious people search the web *excessively* or repeatedly (Starcevic & Berle, 2013). This raises the question as to when behaviour such as online information seeking can be regarded excessive. According to Starcevic and Berle (2013) “excessiveness may imply that behaviour is time-consuming and/or recurrent, but it

may also refer to the amount of content accessed, and in some cases, the behaviour could be qualified as preoccupation” (p. 206). Singh and Brown (2014), for example, showed that online seeking may be a form of preoccupation, as in their study health anxiety was positively associated with time spent online, increased internet usage for health purposes, and feelings of restlessness if not being online.

In the present dissertation we assessed *how often* participants searched for health information online, but not for how long, or the amount of content they accessed. Results derived from our representative sample (see Chapter 3) showed that individuals with clinical levels of health anxiety searched for health information online approximately four to six times per two months, which at first sight does not seem excessive. Results further revealed that individuals with clinical levels of health anxiety searched online more often than people with non-clinical levels of health anxiety (see also Muse et al., 2012). I therefore conclude that overly health anxious people indeed search online more often for health information compared to people who experience normal levels of health anxiety, however, not in an excessive manner. Nevertheless, more detailed information about the search process of clinically health anxious individuals is needed to be able to further elucidate excessiveness in terms of, for example, time spent online or preoccupation.

Key Finding 4: Exposure to online health information induces mild distress in people; this distress is worse for individuals who experience higher levels of health anxiety

Results presented in Chapter 3 showed that searching for online health information is related to feelings of distress due to the health information found online. This is in line with prior research that

indicated that online health information may confuse or overwhelm people (Ahmad et al., 2006; Chung, 2013; Fox, 2006). Individuals in our study who searched more frequently for health information online, felt more confused, overwhelmed, frustrated and frightened by the health information that they encountered online. Individuals who searched more frequently online and at the same time also maintained higher levels of health anxiety, felt even more distressed due to the information they found (see also Baumgartner & Hartmann, 2011).

Although individuals thus seem to experience negative consequences of the online health information that they encounter online, this finding has to be interpreted with care, as the absolute levels of observed stress were quite low. As the results in Chapter 3 showed, individuals who maintained a health anxiety level above average felt distressed, but not very intensely distressed, after online health information seeking. Individuals who maintained a health anxiety level below average only felt a little bit distressed after searching.

Key Finding 5: For individuals who experience non-clinical levels of health anxiety, more frequent searching for online health information results in greater health anxiety. Among these individuals, this relationship is reciprocal: an increase in individual levels of health anxiety also predicts more frequent online health information seeking.

A central goal of the present dissertation was to examine the *reciprocal* relationship between health anxiety and online health information seeking in more detail (Chapter 4). This relationship was the focus of study in order to shed more light on the phenomenon of cyberchondria: online health information seeking is driven by

anxiety about health, and this seeking only exacerbates the anxiety. The cross-sectional nature of previous studies was unsuited to draw conclusions about this reciprocal relationship. Furthermore, since cyberchondria had previously been investigated in samples of individuals that were not necessarily clinically health anxious (e.g., Baumgartner & Hartmann, 2011; Muse et al., 2012; Singh & Brown, 2014), the question remained as to whether it is a phenomenon that merely pertains to overly health anxious individuals or that might also occur in the general (i.e., non-clinical) population. Therefore, for the first time, this mutual relationship was examined in a general population sample. The sample consisted of a larger group of individuals maintaining non-clinical levels of health anxiety at the start of the study, as well as a smaller subsample of respondents who reported clinical levels of health anxiety at the start of the study. The expected reciprocal relationship between health anxiety and online health information seeking was demonstrated in individuals with non-clinical levels of health anxiety.

A problematic aspect of online health information seeking thus seems to be that it increases anxiety about health in the general public. Increases in one's health anxiety are known to induce reassurance seeking (Abramowitz & Moore, 2007; Asmundson, Abramowitz, Richter, & Whedon, 2010; Rachman, 2012). Similarly, in the present study, in line with the idea of a reciprocal relationship, increases in health anxiety resulting from online health information searches probably induced the need for reassurance or clarification, thus also intensifying online health information seeking. Together, these relationships form a mutually influencing process. On the basis of these findings and the observation that online health information seeking can result in elevated levels of health anxiety in the general public, I argue that this mutually influencing process might establish

a vicious cycle in which levels of health anxiety may spiral up. More longitudinal research is, however, needed to determine whether this process eventually leads to clinical levels of health anxiety.

Key Finding 6: Online health information seeking appears to maintain health anxiety in clinically health anxious individuals.

Contrary to what was expected, the results presented in Chapter 4 revealed no support for a mutually influencing process in a subsample of individuals with clinical levels of health anxiety. For these people further increases in already high levels of health anxiety did not instigate more online health information seeking. Furthermore, for individuals who are already overly health anxious, online health information seeking does not seem to further increase levels of health anxiety in the long term. This finding could not be explained by a ceiling effect as respondents in this subsample did not score at the high end of the health anxiety scale. Moreover, health anxiety varied over time, indicating state variation, or in other words, the possibility of health anxiety levels to vary across time and situations (Hamaker et al., 2007).

A plausible assumption in light of the finding that health anxiety did not increase due to online health searches, is that online health information seeking, rather than being a reinforcing factor, *maintains* already existing elevated levels of health anxiety in clinically health anxious people. This does not necessarily mean that overly health anxious people can't feel more anxious after their online health search. Singh and Brown (2016), for example, showed that individuals with high levels of health anxiety felt even more anxious right after their search. However, this heightened anxiety was momentary and original levels of worry about health were maintained in the long term. I therefore argue that online health

information seeking is a behavioural factor that maintains health anxiety in people who are extremely worried about their health.

Key Finding 7: Higher levels of health anxiety are related to a threat-related bias in health information seeking.

In the study described in Chapter 5 it was examined whether the level of health anxiety was positively associated with a bias for threatening health information. The results of an online survey study with forced-choice paradigm showed that the degree of health anxiety was positively related to a preference for threatening search terms as well as search results. This seems to imply that people with a higher level of health anxiety are more frequently confronted with online health information that confirms their worries because of the specific search strategy they employ.

Theoretical Considerations

Towards a New Definition of Cyberchondria

The studies presented in this dissertation were designed to examine the relationship between online health information seeking and health anxiety, with the overall goal to shed more light on the phenomenon of cyberchondria. The definition that formed the basis for this line of research stated that cyberchondria is “an excessive or repeated search for health-related information on the Internet, driven by distress or anxiety about health, which only amplifies such distress or anxiety” (Starcevic & Berle, 2013, p. 206).

Cyberchondria in individuals with clinical levels of health anxiety

When scrutinizing the definition of cyberchondria in light of the findings presented in this dissertation, it becomes clear that for

clinically health anxious individuals only a specific part of this definition holds; online health information seeking seems to be driven by anxiety about one's health, but it does not further amplify this health anxiety in the long term. On the basis of the results presented in this dissertation I suggest that for individuals who are overly health anxious, online health information seeking constitutes a typical behavioural characteristic. It is a behaviour that occurs as part of health anxiety and that characterizes an individual's worries just like other reassurance seeking behaviours such as doctor visits or checking the body for signs of illness (Abramowitz & Moore, 2007; Salkovskis et al., 2002; Salkovskis & Warwick, 1986).

Reassurance seeking behaviours are behaviours that are believed to maintain elevated levels of health anxiety (Abramowitz & Moore, 2007; Asmundson, et al., 2010; Rachman, 2012), which is also suggested on the basis of the results presented in this dissertation (Key Finding 6). Abramowitz and Braddock (2011) point out that health anxiety is, amongst others, characterised by checking and reassurance-seeking behaviours such as "repeated Internet searches to find information about a certain symptom" (p. 3). Online health information seeking can thus be seen as a reassurance seeking behaviour and the assumption that it reflects a maintaining factor of health anxiety therefore seems plausible. I therefore suggest that empirical research and clinical practice should refrain from referring to cyberchondria for those who are overly anxious about their health, but rather treat online health information seeking as a typical symptom of clinical health anxiety.

Cyberchondria in the general population

For non-clinically health anxious individuals, individual changes in health anxiety predicted individual changes in online health

information seeking. More so, this relationship was reciprocal, that is, online health information seeking also proved to be a predictor of individual changes in health anxiety (see Chapter 4). On the basis of these results the definition of cyberchondria as proposed by Starcevic and Berle (2013) does hold; cyberchondria manifests itself in the general population by an increase in searching for health information online, driven by an increase in worries about health. This increase in searching for health information online, in turn, increases anxieties about one's health in the long term. I therefore propose that cyberchondria is a phenomenon that occurs in the general, non-clinical population (but not in populations with clinical levels of health anxiety).

The starting point of the reciprocal relationship

Another issue with the definition that we used as the basis for the studies in this dissertation concerns the starting point of cyberchondria. It is assumed that the cycle starts with an increase in anxiety about health (McElroy & Shevlin, 2014; Starcevic & Berle, 2013). On the other hand, some authors refer to online health information seeking as the starting point (e.g., Belling, 2006; Harding, Skritskaya, Doherty, & Fallon, 2008; Muse et al., 2012; White & Horvitz, 2009a). None of the prior studies that described cyberchondria were, however, suited to draw conclusions about the primacy of the relationship. This dissertation presents the first empirical study that provides insight in the directionality of the reciprocal process. The longitudinal results presented in Chapter 4 revealed that the cycle could start with either factor, that is, either with anxiety about health or with online health information seeking. This can be explained on the basis of a hypothetical example. It is possible that an increase in a person's health anxiety is triggered by,

for example, stress. This increase in anxiety may result in an online search about experienced bodily symptoms (i.e., any bodily symptom that one is more aware of due to a heightened level of health anxiety), which may subsequently result in even more anxiety. At the same time it is also possible that the cycle starts with an online search for health information about an unfamiliar bodily symptom. It is not inconceivable that experiencing bodily symptoms triggers curiosity rather than increased health concerns in individuals with otherwise 'normal' levels of health anxiety. The information found online may subsequently heighten a person's worries about his or her health. I therefore suggest that cyberchondria is not a phenomenon that merely pertains to situations in which anxiety results in online searches, but also refers to situations in which an online health search forms the starting point of the cycle.

Excessiveness of online health information seeking

In light of the results in this dissertation it must be noted that the earlier focus on excessiveness of online health information seeking is questionable. Basically all previous descriptions of cyberchondria refer to exposure to or review of online health information (see e.g., Muse et al., 2012; Fergus, 2017; Starcevic & Berle, 2013) and quite many include an aspect of excessive searching for health information online (e.g., Fergus 2013; Starcevic & Berle, 2013, 2015, 2017; Harding et al., 2008; McElroy & Shevlin, 2014). Nevertheless, this dissertation revealed that for both clinically and non-clinically health anxious individuals, online health information seeking did not seem to occur excessively. Excessiveness therefore does not seem to be a problematic aspect of cyberchondria.

A new definition of cyberchondria

In light of the empirical findings of this dissertation, I propose a new definition of cyberchondria that applies to the general, non-clinical population: *Cyberchondria refers to the reciprocal relationship between health anxiety and online health-related information seeking among the general (non-clinically anxious) population that is either initiated by anxiety about one's health or by online health-related information seeking.*

Distress due to Health Information Found Online

This dissertation revealed that cyberchondria is a phenomenon that occurs in individuals with non-clinical levels of health anxiety and that this, amongst others, entails that anxiety about health increases as a result of online health information seeking. Results revealed that almost one-third of the variance in health anxiety in individuals with 'normal' levels of health anxiety was due to changes at the individual level over time (see Chapter 4). This shows that health anxiety is not completely stable but that individuals may experience an increase (or decrease) in health anxiety over time. It has been previously argued that health anxiety can be caused by, for example, stress or exposure to mass media attention to diseases (Asmundson et al., 2010; Barsky & Klerman, 1983). Accordingly, it is likely that an increase in health anxiety may occur due to the distress caused by exposure to online health information. In the current dissertation distress refers to feeling confused, frustrated, overwhelmed and frightened by the information found online. Even though the distress one experienced may not have been high (see Chapter 3), it might have been sufficient in increasing levels of health anxiety in the long term and, consequently, triggering more frequent online health information seeking.

Building on this, an important result that comes from this dissertation refers to the fact that particularly people with higher levels of health anxiety experienced distress after seeking for health information online. This might be due to the search strategy that overly health anxious people apply and the type of information that is revealed due to this strategy. The results in Chapter 5 showed that health anxiety is positively related to a preference for threatening search terms and results. This is in line with previous research that showed that health anxiety is associated with sensitivity for threatening or illness-confirming stimuli (e.g., Owens, Asmundson, Hadjistavropoulos, & Owens, 2004). This threat-related bias can be explained by a deliberate search for or focus on (threat) confirming information (i.e., confirmation bias) on the one hand, and an unconscious preference for threatening information (i.e., attentional bias) on the other hand (Salkovskis, 1996). Consequently, this threat-related bias of overly health anxious people might cause their feelings of distress resulting from the health information they encounter online. When people pay more attention to threatening information or information confirming that something is wrong, it seems logical that they experience more distress. However, it seems that this does not lead to an increase in health anxiety in the long term in already clinically health anxious individuals (see Chapter 4). It is, however, not inconceivable that this distress causes an increase in anxiety about health in the short term (see also Singh & Brown, 2016). The momentary nature of this heightened anxiety further strengthens the previously discussed rationale that online health information seeking is a reassurance seeking behaviour that, in particular for overly health anxious individuals, maintains already present anxiety about health rather than reduce it (see Key Finding 6; Abramowitz & Moore, 2007; Asmundson et al., 2010; Rachman,

2012). On the basis of the empirical results presented in Chapters 4 and 5 and the existing literature regarding maintaining factors of health anxiety (Abramowitz & Moore, 2007; Asmundson, Abramowitz et al., 2010; Rachman, 2012), I propose that experiencing distress due to a threat-related bias may explain why already present levels of anxiety about one's health do not decrease but rather persist.

Methodological Considerations and Suggestions for Future Research

The findings presented in this dissertation should be interpreted in light of several methodological considerations that provide the basis for suggestions for future research. A first important methodological consideration pertains to the longitudinal study described in Chapter 4. Whereas previous studies have merely focused on cross-sectional relationships at an aggregate level, the study described in Chapter 4 is the first to study the phenomenon of cyberchondria over time and at an individual level. To do so, a random intercept cross-lagged panel model was applied that, through a multilevel approach, provided insight in individual changes of health anxiety and online health information seeking over time. This analytical procedure made it possible to disentangle within-person processes and between-person differences. This is of importance because relationships that are detected at the population level may not necessarily apply to a specific individual (Hamaker, Kuiper, & Grasman, 2015; Keijsers, 2015). In fact, applying findings from the population level to the individual level may result in incorrect assumptions (Curran & Bauer, 2011; Hox, 2010). Future longitudinal

studies aimed at examining cyberchondria, but also longitudinal studies in Communication Science and media studies in general, should take this into consideration and investigate change over time from a multilevel perspective. Moreover, results from cross-sectional studies or results on the basis of longitudinal data that were not differentiated in terms of variation within and between individuals should be interpreted as follows: they represent the difference between people, but cannot inform us about processes within individuals. For example, a cross-sectional positive association between online health information seeking and frequency of doctor visits informs us about the fact that overall those who search online more frequent to find health information also visit doctors more often (and vice versa). However, it does not tell us that *an individual* will visit the doctor more often when search behaviour increases. In reality it might be the case that this association does not exist on the individual level, or even occurs in the opposite direction, that is, an individual does not visit the doctor more often or maybe even less after seeking for health information online.

The second methodological consideration pertains to the samples in which the phenomenon of cyberchondria is examined in the current dissertation. All four studies described in this dissertation use data from non-clinical samples, that is, samples consisting of people who are, to the best of our knowledge, not diagnosed as clinically health anxious. Accordingly, some caution may be necessary when generalizing the results to a clinical population. However, because it is established that health anxiety is a construct that is continuously distributed and that it is similarly related to a variety of outcomes in both clinical and non-clinical samples (Ferguson, 2009), it is justifiable and also recommended to study health anxiety in general population samples (Ferguson, 2009;

Marcus, 1999). This also speaks for the argument that results of studies in this dissertation are generalizable to both clinical and non-clinical populations.

Extending on this, another methodological consideration pertains to the classification of health anxious individuals. Overall, health anxiety is treated as a dimensional latent construct in this dissertation, also making it highly suitable for correlational designs. However, treating health anxiety as a continuous construct prohibits clinicians from diagnosing patients with (clinical) health anxiety because a clear cut-off score that differentiates 'healthy' from 'ill' people is lacking. The focus of this dissertation was on examining the phenomenon of cyberchondria and it was investigated whether health information seeking, fuelled by anxiety about health, led to an increase in this anxiety about health. In light of this one might argue that, in particular for clinicians, it is useful to know whether online health information seeking poses a threat to a specific group of people, namely those who are overly (i.e., clinically) health anxious. In Chapter 4 this is brought to practice by using a cut-off score on the Dutch Short Health Anxiety Inventory to separately examine cyberchondria in samples with 'normal' levels of health anxiety and 'clinical' health anxiety, respectively. However, the results presented in Chapter 4 clearly revealed that the relationship with online health information seeking was different in these two samples. I therefore recommend that for research purposes health anxiety is treated as a dimensional construct, but that for clinical purposes it is relevant to also treat it as a dichotomous construct (i.e., diagnosing people as either clinically health anxious or not). Furthermore, when studying the relationship between health anxiety and online health information seeking it is important to take into account that this relationship differs between people with clinical and non-clinical

levels of health anxiety. Validated cut-off scores to categorize people as either clinically or not clinically health anxious would also aid estimations of the prevalence of people suffering from (clinical levels of) health anxiety in the general population. In line with Ferguson (2009) I recommend that future studies further elucidate the continuous nature of health anxiety and establish clear guidelines of what constitutes clinical health anxiety.

The next methodological consideration pertains to the use of self-reports in the studies described in this dissertation. In response to the finding that overly health anxious individuals do not demonstrate excessive online health information seeking (see Key Finding 3), one might argue that asking people how often they search online for health information is not the optimal method of measuring (excessiveness of) this behaviour. This problem links to the general debate about the validity of retrospective self-report assessments of media use in general (Prior, 2009) and use of the Internet in particular (Araujo, Wonneberger, Neijens, & de Vreese, 2017; Scharrow, 2016). First, it is possible that people don't accurately remember how often they actually went online to find health information. Therefore, in Chapter 5, online health information seeking was measured twofold; first by asking with an open-ended question how often respondents searched for health information online, and secondly by asking how often they searched indicated on an answer scale ranging from never to every day. Results revealed that these two measures were strongly correlated, indicating high convergent validity. Furthermore, the associations between the level of health anxiety and these two measures were identical. Both measures can thus be used to measure online health information seeking. However, both measures are also self-reports and the question remains whether respondents remember how often

they sought for health information online, particularly when asked about the last two months as was the case in this dissertation.

Previous studies have revealed that individuals are more likely to over- than under-report their media use, such as use of the Internet (see e.g., Araujo et al., 2017; Scharkow, 2016). It must be noted, however, that self-reports related to specific content, such as for example health information, are found to be more accurate than self-reports of, for example, generic Internet use (Scharkow, 2016). To overcome the possible problem of accuracy in self-reported online health information seeking, future studies may use the method of experience sampling to shed more light on actual online behaviour. With this methodological approach it is possible to ask respondents on a daily basis if they went online to look up information about health. Although this is still a method of self-report, the time between the actual behaviour and the measurement is much shorter, resulting in potentially more correct reporting of the behaviour. Another approach, examined by Araujo et al. (2017), is to ask respondents about their search for health information on a typical day or in a typical week. This mode of measurement led to less over-reporting compared to when respondents were asked about their Internet use in a specific time period (Araujo et al., 2017). A final alternative would be to log the online behaviour of users (on a given platform, like their private PC or mobile phone) and to content-analyse this data to derive an assessment of the extent of a person's online health information use. However, such a practice of course encounters ethical and privacy-related issues and also needs to wrestle with today's many access points to online information.

Extending on this it can also be argued that the self-report of distress (see Chapter 3) is less accurate than a direct measure of distress. In this dissertation distress was operationalised as feeling

overwhelmed, confused, frustrated and frightened by the health information found online. Although this level of distress was positively associated with level of health anxiety two months later, it is not unlikely that the self-report of distress will be more accurate when measured in close proximity to the online search itself, for example by employing the method of experience sampling as suggested above. Previous studies have furthermore focussed on different forms of distress after online searching, such as feeling tense (Singh & Brown, 2014) or anxious (Muse et al., 2012). These forms of distress, and also our measure of feeling frightened by the information found online, can be measured more direct with physiological measures such as heart rate, muscle activation or perspiration. I therefore suggest that future studies shed more light on convergent validity by comparing the self-report of distress to physiological measures.

The final methodological consideration is concerned with the sensitivity for threatening health information which was measured by asking respondents to choose from a selection of search terms and results (see Chapter 5). Although the results of this study provide some initial evidence for sensitivity for threatening online health information, it is less clear whether this is caused by a confirmation bias and/or attentional bias. I suggest that future studies employ eye-tracking designs combined with measuring dwell time, to provide more insight in where and how long overly health anxious people allocate their attention when confronted with search results.

Recommendations for Practice

This dissertation contributes to practice in several ways. A first clear recommendation pertains to doctor-patient communication. Results

(see Chapter 4) showed that for people who were not clinically health anxious, an increase in anxiety predicted an increase in online health information seeking. Moreover, an increase in seeking predicted an increase in health anxiety in these individuals. This means that online health information seeking may have adverse consequences for people who are not overly anxious about their health. Furthermore, results revealed that overall, people who are more anxious about their health also sought for health information online more often. I recommend that doctors respond to this by informing their patients about where and how to search for health information online. The doctor's office is ideally suited for this because previous research has shown that people who search the Internet for health information and people who maintain higher levels of health anxiety tend to visit doctors more often (see e.g., Eastin & Guinsler, 2008; Lee, 2008; Singh & Brown, 2014; Tanis, Hartmann, & te Poel, 2016). The emphasis of this 'education about search strategies' must be on the prevention of or coping with feelings of distress after searching. This may be achieved by informing patients about online sources that show evidence-based medical information. This information must also respond to situations in which the symptom(s) that a patient experiences are harmless, meaning that it includes reassuring information that explains that there is no need for worry. People should furthermore be made aware of the potential distressing effect of online health information and they should be informed about how to use online information to self-diagnose (and when visiting a doctor is necessary).

Thuisarts.nl, an initiative from the Dutch association for general practitioners (Nederlands Huisartsen Genootschap [NHG]; www.thuisarts.nl), is a good example of such an online source. This

website provides medical information on the basis of scientific guidelines followed by general practitioners in the Netherlands, and general practitioners recommend their patients to use this website for health-related questions. People can use this website to find reliable health information, explained in layman's terms, by searching with a specific search term. Future research may focus on examining how people respond to information found on websites like *thuisarts.nl*, with the overall aim of improving such websites so that individuals don't feel, for example, overwhelmed or confused by the information they find on it.

Although an obvious recommendation might be that doctors should inform their patients to not search for health information online at all, but rather ask their doctor for advice, this is not consistent with the current practice. First of all, the Internet is an easy accessible source of information, that is available 24/7 and that offers an anonymous environment (Cline & Haynes, 2001; Korp, 2006; Rice, 2006). It thus has several advantages compared to the regular doctor. In addition, healthcare costs increase and in particular general practitioners have to reduce healthcare use (Spoelman et al., 2016). Therefore, despite potential downsides of online health information for doctor-patient communication, such as for example less satisfaction with the consultation or disagreement about diagnosis or medication (Figueiredo de Oliveira, 2014; Gerber, 2001; Tanis, Hartmann, & te Poel, 2016), the Internet remains a cost-effective tool that can be used to reduce healthcare use. With regard to *thuisarts.nl*, for example, a time-series analysis revealed a 12% decline in consultations in the general population two years after the launch of this website (Spoelman et al., 2016).

The results presented in Chapter 3 showed that almost everybody who went online to find health information started their search at a

search engine like Google. Another recommendation therefore pertains to how search results in search engines are presented. Ranking of search results is not based on likelihood or importance of causes of a symptom that one searches for. However, people may interpret ranking of search results in this way, thereby thinking that the first search result portrays the most likely cause of the symptom they experience (White & Horvitz, 2009b). They furthermore seem to have a biased tendency to follow up on search results that are ranked higher in position (Pan, Hembrooke, Joachims, Lorigo, Gay, & Granka, 2007). Ranking of search results is, however, not matched with searchers personal information like illness history or other symptoms that are experienced, and is merely based on the search terms used in a query and algorithms that link these search terms to information that is available on the Web. Ranking is thus not based on diagnostic criteria. It is therefore likely that rare and threatening causes of a symptom are presented in a list of search results, while in reality the symptom is fairly harmless. Because overly health anxious people may be sensitive for threatening health information (see Chapter 5) they may become more distressed due to this portrayal of search results. Results from a study by White and Horvitz (2009a) furthermore revealed that the search results themselves might already distress people (e.g., because of frightening titles), regardless of whether they click on these results. The unorganised ranking of search results may further be the reason why people in general felt, for example, overwhelmed and confused by the information that they found online (see Chapter 3). Therefore, and in line with recommendations by White and Horvitz (2009a), I recommend that search engines are optimised. An example of this, discussed in Chapter 3, is a Google M-health application that shows reliable health information about a symptom that is entered, and this

information is strategically placed above the generic search results, which ensures that this is likely the first information that people see (Pan et al., 2007).

My final recommendation for practice concerns the treatment of clinically health anxious individuals. Treatment of health anxiety should include strategies on the basis of the cognitive behavioural model of health anxiety. On the basis of the empirical results discussed in Chapter 4, I conclude that online health information seeking is a maintaining factor of anxiety about one's health. Therefore, the first treatment recommendation (on the basis of the behavioural component of the cognitive behavioural model of health anxiety) is aimed at reducing this online search behaviour, that is, educating patients to not search for information when it is not helpful (e.g., not searching online for health information when experiencing a common cold). Treatment should not merely focus on educating patients about where to find evidence-based health information or about how to interpret ranking of search results. This will not provide a long-term solution because overly health anxious individuals are sensitive to health information that confirms that something is wrong. Even when they do, for example, find evidence-based medical information that assures that a symptom is harmless, they may read the information in such a way that it still confirms that they are ill. Besides aiming at reducing online health information seeking, treatment should therefore also focus on increasing awareness among health anxious patients about their bias in searching for health information (on the basis of the cognitive component of the cognitive behavioural model of health anxiety) and provide them with cognitive strategies that help them re-evaluate the conclusions they drew on the basis of health information they found online.

Concluding Remarks

This dissertation contributes to the growing body of literature on the phenomenon of cyberchondria by stepping away from theorizing and more closely examining the relationship between online health information seeking and health anxiety in large, generalizable samples. The empirical findings of this dissertation first imply that cyberchondria is a phenomenon that occurs in the general, non-clinical population, but not the clinical health anxious population. For people with normal levels of health anxiety cyberchondria can be defined as a reciprocal process of online health information seeking that may be fuelled by increases in health anxiety or that is initiated for other reasons and subsequently reinforces levels of health anxiety. Second, for clinically health anxious individuals, online health information seeking serves as a reassurance seeking behaviour that perpetuates the already present anxiety about health and it should be regarded a typical characteristic of overly health anxious individuals. Selectively attending to online health information that confirms the idea of being ill and experiencing distress after online health information seeking, are potential underlying mechanisms that may explain an increase in or maintenance of levels of health anxiety.

