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Development and validity of cyberchondria tendency scale

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Abstract

Cyberchondria is the name given to individuals who research their existing or imaginary diseases online. We developed a scale for measuring individuals' cyberchondria tendencies. The 36-item test form produced was applied to 1,200 participants (694 male and 506 female) residing in different provinces, with health problems in the previous month and accessible via e-mail. The data obtained were then subjected to analysis. A structure consisting of 30 items and two dimensions, 'Reflection' and 'Information Seeking' was obtained with exploratory factor analysis. The relation between the entire scale and the subscales was investigated and the factors were determined to be positively and significantly correlated. The goodness of fit indices of the model was at acceptable levels. The validated scale can be used to determine whether or not both patients and Internet users in general regard the Internet as a basic source of information when health problems occur.

Keywords: Cyberchondria, cyberchondria tendency, scale development, instrumental study.

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1. Introduction

The Internet, an essential information tool, has also been employed in different and potentially hazardous areas, such as for researching and sharing health problems and therapies in recent years. The definition 'cyberchondria,' used to describe this phenomenon, more popularly known as Dr. Google was selected as word of the year by Webster's New World in 2008 (Loos, 2013). Cyberchondria can be explained as 'a form of anxiety characterised by excessive online health research, which may lead to increased levels of psychological distress, worry and unnecessary medical expenses' (McElroy & Shelvin, 2014). Another study indicated that cyberchondriac refers to people who have unsubstantiated concerns about common symptoms due to the Internet (White & Horvitz, 2009). On the basis of these definitions, cyberchondria may be defined as individuals' tendencies to research their health problems online and to self-diagnose.

The Internet is the broadest environment in which people can perform research in the area of health. The information obtained can assist people who do not work in the health field to understand their problems better or to find explanations of their symptoms (Aiken, Kirwan, Berry & O'Boyle, 2012). Individuals use the Internet to obtain information about a health problem, for reasons of privacy or cost, or to benefit from the experience of others with a similar problem (Starcevic & Berle, 2013). However, the Internet is not a diagnostic or therapeutic institution. The accuracy of the information it contains also cannot be verified on a constant basis (White & Horvitz, 2009). In addition, individuals without medical training may come to develop anxieties regarding a disease they do not actually have, to be misinformed or to focus on incorrect methods of treatment on the basis of information obtained from online search engines or forums (Fox, 2006; Goldberg, 2015; Loos, 2013).

Related studies show that the numbers of people defined as 'cyberchondria' are increasing dramatically (White & Horvitz, 2009; Goldberg, 2015). Cyberchondria, therefore, represents an area of health and information that requires significant attention. Adverse consequences of cyberchondria will inevitably be seen in the future (Fox, 2006; Goldberg, 2015; Loos, 2013; White & Horvitz, 2009). While the Internet allows access to a wide-ranging network of information, it is not an appropriate 'diagnostic' tool, because it does not take into account the user's age, sex, lifestyle and similar variables (Muse, McManus, Leung, Meghreblian & Williams, 2012).

Uninformed use of drugs or alternative therapies will obviously have an adverse impact on the treatment of a disease. It now needs to be established why individuals prefer the Internet to health centres in terms of their health problems (Norr et al., 2015). The first rule of threat prevention is to identify the danger. There may be various reasons why individuals choose to research their health problems online. The identification of these and the determination of why and to what extent Internet users employ the health information they obtain will represent a step toward supporting informed and healthy Internet use, in addition to permitting a healthy dialogue between physician and patient. Studies have focused on determining the relation between health concerns and online health research (Doherty-Torstrick, Walton & Fallon, 2016; Muse et al., 2012) or on the Cyberchondria severity scale (Barke, Bleichhardt, Rief & Doering, 2016; Fergus, 2014; McElroy & Shelvin, 2014; Norr et al., 2015). However, cyberchondria is a multidimensional construct (Alpaslan, 2016) and these scales are not appropriate for determining a tendency to cyberchondria or the dimensions thereof. The purpose of this study is therefore to develop a measurement tool for measuring Internet users' tendencies to cyberchondria and to reveal its factor structure. It is hoped that this research will contribute to a deeper understanding of cyberchondria from a different culture's perspective. In addition, the scale developed in the study may have significant effects on research into and treatment of cyberchondria.

2. Method

The stages of development of the 'Tendency to Cyberchondria Scale' as seen in Figure 1 and the characteristics of the sample group are set out below.

Figure 1. The development stages of the scale

2.1. Sample and data collection process

The sample consisted of 1,200 individuals living in Turkey, 694 males and 506 females. In order to select the sample group, we used purposeful sampling in the light of two sampling criteria: (1) age between 18 and 35 and (2) a history of any health problems in the previous 6 months. In terms of age, 980 (81.67%) subjects were under 24, 181 (15.08%) were aged 25–30 and 39 (3.25%) were aged 31–35. The sample was randomly divided into two subsamples, a pilot data set (N = 600) and the main data set (N = 600) due to financial issues and difficulty in reaching the participants. This can be seen as a limitation of the study. The pilot data set was used for exploratory factor analysis (EFA) to determine the underlying factors in a construct. The main data set was also used for confirmatory factor analysis (CFA) to confirm the factor structure based on the relationship between the observed measures and the underlying latent factors.

2.2. Study one: item generation

Three stages were followed in developing the scale. In the first stage, the literature concerning cyberchondria was examined in order to identify 'cyberchondria' characteristics. Informal interviews for determining cyberchondria sub-components were held with 30 patients (18 females, 12 males) presenting to different units in various hospitals (public, university or private) over the course of 1 month, and phraseology capable of use in the scale was identified. An item pool was created for cyberchondria based on the interview data. In the second stage, a form was sent to 10 specialist physicians from various fields in order to obtain feedback for examining the content validity of the item pool. A three-point scoring was used in order to elicit specialists' opinions. These specialists were asked to respond 'agree', 'partly agree' or 'disagree' to each item on the form. The specialist forms were then combined into a single form and the number of specialists approving each item was determined. The content validity of the items was determined using the content validity ratio (Veneziano & Hooper, 1997). The ratios were determined by dividing the total number of specialists responding positively to each item by the total number of specialists and subtracting (Loos, 2013). Based on the specialist physicians' feedback, items requiring removal or correction were identified. Items with a content validity ratio of less than 0.80 were removed from the study. Three questions were removed from the form in the light of the content validity ratios obtained, while four items were amended in order to improve their comprehensibility. A five-point Likert response scale test, ranging from 1 = Never to 5 = Always, and consisting of 36 items was thus established as a pilot scale.

For the data collection process, an online survey was created through Google Forms. The form consisted of the pilot scale items and a briefing text concerning the purpose of the study. All participants were invited to send the online survey link by e-mail. The criteria required for contacting appropriate participants for completing the scale were set out in the e-mail. All participants were volunteers and none received any payment for taking part. IP control was employed to prevent repeat responses. Each participant took about 15 minutes on average to complete the pilot scale.

2.3. Study two: development

Before starting factor analysis, data cleaning was conducted to deal with missing data and outliers and to check any entry errors. After data cleaning, we conducted EFA using the Maximum Likelihood method as a factor extraction method followed by orthogonal (varimax) rotations in order to explore the measurement model. In order to be able to perform factor analysis, the Kaiser–Meyer–Olkin (KMO) test was applied in order to test the data set suitability for factorisation. A KMO value of 0.95 was determined at the end of the analysis. In the light of that finding, the study group was identified as 'perfectly' eligible (Tabachnick & Fidel, 2014). Bartlett's Test of Sphericity results showed that the Chi-square value was significant (x^2 = 8295.624, df = 435, p < 0.01). On the basis of these findings, the data set was regarded as eligible for factor analysis (Thompson, 2004).

Maximum likelihood method was used in order to reveal the factor design of the tendency to cyberchondria scale, and the varimax rotation and scree test techniques were selected for ensuring clarity and significance in interpretation. We elected to employ the Maximum likelihood method since the aim here was to explain variance in terms of the variables measured. The first method used in dimension determination was the rule which states that eigenvalues greater than 1 define a factor technique. Analysis revealed that two components of the 30 items had eigenvalues greater than 1. The contribution to the total variance of these two components was 48.157%. This is defined as sufficient for multifactorial designs in the social sciences (Tavsancil, 2005). At EFA, 0.30 is regarded as a minimum size for factor loading values (Buyukozturk, 2006) although some experts suggest that this should be 0.40 (Doherty-Torstrick et al., 2016). A factor loading level of 0.40 was accepted in this study. In addition, it should contain at least three variables for stable factors and loading factors of items must be high (MacCallum, Roznowski & Necowitz, 1992). Following EFA, six items that did not have a primary factor loading of 0.40 or above were removed along with an item that had cross-loadings of 0.40 or above (Stevens, 2002). The first EFA result emerged with a five-factor measurement model although the scree plot did not support this. Based on the two-factor model indicated by the scree plot and theoretical background of cyberchondria, EFA was repeated with the number of factors being limited to two. Results from EFA of the scale are given in Table 1. The factor loading of the items in the first factor of the scale based on the two-factor analysis results ranged between 0.552 and 0.751, while those of the items in the second factor ranged between 0.466 and 0.766. The graph obtained from the scree test analysis is shown in Figure 2.

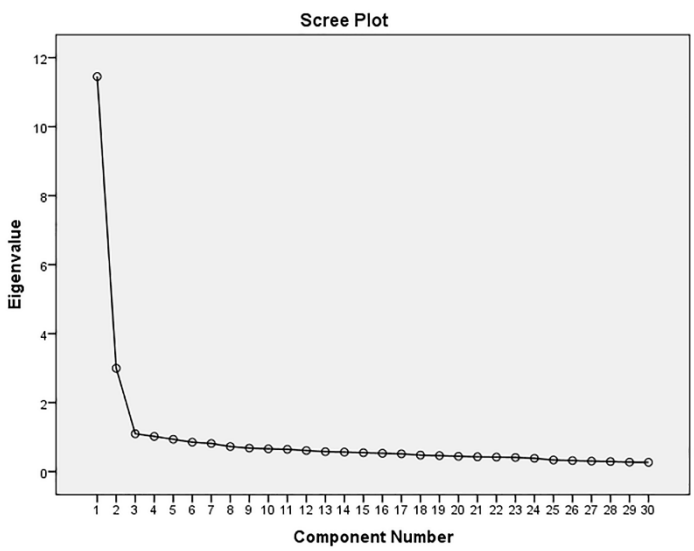

Figure 2. Scree-test graph

Table 1. Results from EFA of the scale

Items	Rotated factor loadings	
	1	2
I will share my health problems on the Internet	0.751	
I prefer to contact my doctor online rather than face-to-face	0.750	
I prefer to receive health services by phone rather than meet my doctor face to face	0.749	
I will use medications in the light of advice on the internet without consulting a doctor	0.739	
I will communicate online with people who have or have had similar health problems	0.719	
When I am ill, I apply remedies from the Internet rather than going to the doctor	0.707	
Due to the high cost of health services, I will turn to the Internet first	0.706	
I turn to the Internet because I have no time to visit the doctor	0.698	
I can solve my health problem by researching on the Internet without going to a doctor	0.689	
I will try to obtain information about my illness by contacting a doctor online (on forums, by e-mail, etc.)	0.674	
If I encounter negativity concerning tests recommended by a doctor following my researches online, I will not have that test performed	0.662	
I share interesting information about health on the Internet	0.638	
I would use the Internet to evaluate test results	0.620	
I would research tests the doctor asks me to have done on the Internet first	0.610	
I will recommend a doctor I trust on the Internet	0.602	
Even if a doctor says I am healthy, I will still continue my researches on the Internet	0.595	
I have no hesitations about following the advice of people who have experienced similar health problems to mine on online forums	0.594	
I will use medications prescribed by a doctor after researching them online	0.579	
I apply alternative therapies for my illness via the Internet	0.552	
I will research a health problem I experience online		0.766
I find it comforting to research my illness online		0.697
I will research my own or a relative's health problems online		0.685
No matter what my symptoms are, I will research them online		0.684
I do not trust the first information about health problems that I find online, and I will investigate more than one source		0.635
I will perform research online to investigate the accuracy of a treatment recommended by my doctor		0.603
I will take note of the experiences of other people with a similar health problem shared online		0.595
I will research alternative therapies for my illness online		0.542
I will investigate which doctor to go to online		0.501
I look at online forum sites about doctors		0.473
I will monitor news reports about my own health problems		0.466

Eigenvalues in the correlation matrix are calculated and a plot is then drawn from increasing to decreasing values (Fabrigar, Wegener, MacCallum & Strahan, 1999). Each point on the scree graph up to the breakpoint identifies a factor. In that context, a decrease occurs as of the 3rd point. A two-factor structure was thus obtained from EFA. The two factors were interpreted as 'Reflection' and 'Information Seeking'. A Cronbach Alpha coefficient was calculated for the scale sub-dimensions and their total reliability. The reliability of the 30 items was 0.941, with 0.940 for the reflection dimension and 0.870 for the information seeking dimension. Reliability of 0.9 or above is defined as perfect (George & Mallery, 2003). This also indicates that the results obtained from the scale possess high reliability.

2.4. Study three: validation

The measurement model explored by EFA was analysed through CFA using maximum likelihood estimation to examine construct validity. Model fit was assessed by a number of indices (x^2/df, root mean square error of approximation (RMSEA), comparative fit index (CFI), standardised root mean square residual (SRMR)) obtained from CFA results.

CFA was performed by again classifying the questions in the scale in order to assess the two-factor structure emerging as a result of the EFA. The findings obtained from the CFA are shown in Figure 3.

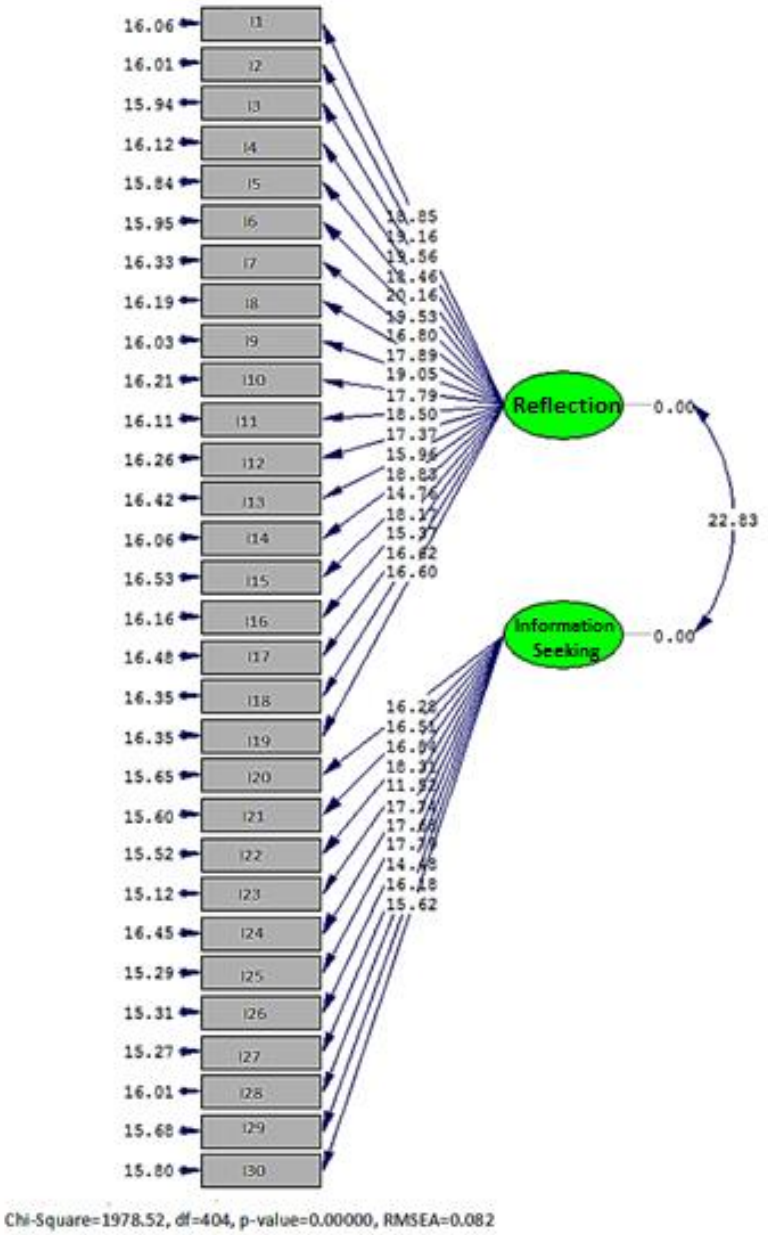

Figure 3. The two-factor model of the scale (*t*-values)

As shown in Figure 3, *t*-values were between 11.52 and 20.16 ($p < 0.05$). A Chi-square (x^2) divided by degree of freedom figure of less than 3 shows perfect fit and one of less than 5 indicates good fit (Kline,

2005). In our case, this was (1978.52)/404 = 4.89, indicating good fit. Table 2 provides the results obtained from CFA.

Table 2. CFA results

Index	Good fit	Acceptable fit	Output	Result
X2/df	0–3	3–5	4,89	Acceptable fit
RMSEA	0.00 ≤ RMSEA ≤ 0.05	0.05 ≤ RMSEA ≤ 0.10	0.082	Acceptable fit
CFI	0.95 ≤ CFI ≤ 1.00	0.90 ≤ CFI ≤ 0.95	0.96	Good fit
SRMR	0.00 ≤ SRMR ≤ 0.05	0.05 ≤ SRMR ≤ 0.08	0.079	Acceptable fit

CFA results shown in Table 2 indicate that the scale possesses good fit with an RMSEA value of 0.082 (Steiger, 1990), good fit with a CFI value of 0.96 (Hooper, Coughlan & Mullen, 2008) and acceptable fit with an SRMR value of 0.079 (Hu & Bentler, 1999). It was found that the modification indices did not suggest any significant points of strain in the two-factor model.

3. Discussion and conclusion

The objective of this study was to develop a scale for the purpose of determining the cyberchondria tendencies of Internet users aged 18–35. Following application of EFA and CFA, a five-point Likert-type scale two-dimensional tendency to Cyberchondria Scale consisting of 30 items was obtained.

Following investigation through various samples, the loading factor of the items was generally close to one. Since the main aim of the scale is to determine cyberchondria tendencies, each item must be scored between 0 and 4. The possible scores on the scale range from 0 to 120. Since there are no negative items on the scale, there is no need to reverse the results obtained from the items. Scores closer to 120 indicate a greater tendency to cyberchondria, while scores closer to 0 indicate a lower tendency to cyberchondria. The reflection dimension measures the information that Internet users obtain online up to the reflection stage. There are 19 items in this sub-dimension. Possible scores from this sub-dimension range between 0 and 76. A high score from this factor indicates a high tendency to apply information obtained online, while a low score indicates that the information will not be applied. The second, 'information seeking', sub-dimension consists of 11 items. The lowest possible score on this sub-dimension is 0 and the highest score is 44. A high score from this factor indicates a high tendency to seek a solution online when a health problem is encountered, while a low score indicates that the individuals unlikely to use the Internet for this purpose. Taking the scale as a whole, a score of 30–60 may be said to indicate low-level cyberchondria tendencies, a score of 60–90 to indicate moderate cyberchondria tendencies, while scores of 90–120 indicate high-level cyberchondria tendencies. In conclusion, on the basis of the validity and reliability studies, this scale can be applied in studies involving Internet users aged 18–35.

In previous studies on cyberchondria, an important effort has been made to measure cyberchondria level of individuals (McMullan, Berle, Arnaez & Starcevic, 2018). For multidimensional assessment of cyberchondria, McElroy and Shevlin (2014) developed a scale titled cyberchondria severity scale with five-factor model: Compulsion, distress, excessiveness, reassurance seeking and mistrust of medical professional. This scale was validated in a student sample and demonstrated good psychometric properties. Fergus (2014) validated the cyberchondria severity scale using a large sample of community adults. Although the results of the study supported the adequacy of the five-factor structure of the scale, 'mistrust of medical professional' factor as a dimension of the cyberchondria severity scale did not have a robust factor loading on the higher-order factor (Fergus, 2014). These results seem to be consistent with other research conducted by Norr et al. (2015). Their study found that 'mistrust of medical professional factor' did not belong to the cyberchondria structure asserted by McElroy and Shevlin (2014). These results indicated that it is necessary to further evaluate its psychometric properties of cyberchondria. Unlike other studies, our study revealed a two-factor model that measured

cyberchondria. The results of the current study do not support the previous research. A possible explanation for this might be that cross-cultural differences in using Internet and human behaviour may affect the structure of cyberchondria.

Cyberchondria is an important concept in 21st century society and one requiring careful consideration (Fergus, 2013). If the Internet, an indispensable feature of our time, is to be used effectively and without damaging public health, it is important to first determine the subcomponents under which individuals make use of it. The scale can be used to determine whether or not both patients and Internet users in general regard the Internet as a basic source of information when health problems occur. In addition, cyberchondria is known to have reached a point here it can lead to impairment of the patient-doctor relationship, to a decrease in trust in physicians and to the behavior known as 'doctor shopping' (McElroy & Shelvin, 2014). In order to be able to reduce these adverse effects, re-establish confidence between patient and physician and reduce wastage in health costs, it is important for users' cyberchondria tendencies to be known. We recommend that the cyberchondria levels of patients presenting to hospital and the presence of a relation that may needlessly occupy the physician should be investigated. We also recommend the investigation of factors affecting healthy Internet use by relating the scale to variables such as the use of social networks, computer use, Internet dependency, effective Internet usage and socio-economic level. Further replication study is needed to examine cyberchondria structure with a large-scale sample using more robust statistical analysis.

4. Copyright

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References

Aiken, M., Kirwan, G., Berry, M. & O'Boyle, C. (2012). The age of cyberchondria. *Royal College of Surgeons in Ireland Student Medical Journal, 5*, 71–74.

Alpaslan, A. H. (2016). Cyberchondria and adolescents. *Social Psychiatry, 62*(7), 679–680. doi:10.1177/0020764016657113

Barke, A., Bleichhardt, G., Rief, W. & Doering, B. K. (2016). The cyberchondria severity scale (CSS): German validation and development of a short form. *International Journal of Behavioral Medicine, 29*(5), 595–605. doi:10.1007/s12529-016-9549-8

Buyukozturk, S. (2006). *Handbook of data analysis* (6th ed.), Ankara, Turkey: Pegem Akademi Publishing.

Doherty-Torstrick, E. R., Walton, K. E. & Fallon, B. A. (2016). Cyberchondria: parsing health anxiety from online behavior. *Psychosomatics, 57*(4), 390–400. doi:10.1016/j.psym.2016.02.002

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C. & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological methods, 4*(3), 272.

Fergus, T. A. (2013). Cyberchondria and intolerance of uncertainty: examining when individuals experience health anxiety in response to Internet searches for medical information. *Cyberpsychology, Behavior, and Social Networking, 16*(10), 735–739. doi:10.1089/cyber.2012.0671

Fergus, T. A. (2014). The cyberchondria severity scale (CSS): an examination of structure and relations with health anxiety in a community sample. *Journal of Anxiety Disorders, 28*(6), 504–510. doi:10.1016/ j.janxdis.2014.05.006

Fox, S. (2006). *Pew internet and American life project: online health search 2006*. Retrieved December 11, 2015 from http://www.pewInternet.org/PPF/r/190/reportdisplay.asp

George, D. & Mallery, P. (2003). *SPSS for windows step by step: a simple guide and reference. 11.0 update* (4th ed.). Boston, MA: Allyn & Bacon.

Goldberg, J. (2015). *4 Signs you're a cyberchondriac*. Retrieved May 11, 2015 from http://www.besthealthmag. ca/best-you/health/4-signs-youre-a-cyberchondriac

Hooper, D., Coughlan, J. & Mullen, M. (2008). Structural equation modelling: guidelines for determining model fit. *Electronic Journal of Business Research Methods, 6*(1), 53–60.

Hu, L. T. & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal, 6*(1), 1–55.

Kline, R. B. (2005). *Principle and practice of structural equation modelling* (2nd ed.). New York, NY: The Guilford Press.

Loos, A. (2013). Cyberchondria: too much information for the health anxious patient?. *Journal of Consumer Health on the Internet*, *17*(4), 439–445. doi:10.1080/15398285.2013.833452

MacCallum, R. C., Roznowski, M. & Necowitz L. B. (1992). Model modifications in covariance structure analysis: the problem of capitalization on chance. *Psychological Bulletin, 111*(3), 490–504.

McElroy, E. & Shelvin, M. (2014). The development and initial validation of the cyberchondria severity scale (CSS). *Journal of Anxiety Disorders, 28*, 259–265. doi:10.1016/j.janxdis.2013.12.007

McMullan, R. D., Berle, D., Arnaez, S. & Starcevic, V. (2018). The relationships between health anxiety, online health information seeking, and cyberchondria: systematic review and meta-analysis. *Journal of Affective Disorders, 245,* 270–278. doi:10.1016/j.jad.2018.11.037

Muse, K., McManus, F., Leung, C., Meghreblian, B. & Williams, J. M. G. (2012). Cyberchondriasis: fact or fiction? a preliminary examination of the relationship between health anxiety and searching for health information on the internet. *Journal of Anxiety Disorders, 26*(1), 189–196. doi:10.1016/j.janxdis.2011.11.005

Norr, A. M, Albanese, B. J, Oglesby, M. E., Allan, N. P. & Schmidt, N. B, (2015a). Anxiety sensitivity and intolerance of uncertainty as potential risk factors for cyberchondria. *Journal of Affective Disorders, 174*, 64–69. doi:10.1016/j.jad.2014.11.023

Norr, A. M., Allan, N. P., Boffa, J. W., Raines, A. M. & Schmidt, N. B. (2015b). Validation of the cyberchondria severity scale (CSS): replication and extension with bifactor modeling. *Journal of Anxiety Disorders, 31*, 58–64. doi:10.1016/j.janxdis.2015.02.001

Starcevic, V. & Berle, D. (2013). Cyberchondria: towards a better understanding of excessive health-related internet use. *Expert Review of Neurotherapeutics, 13*(2), 205–213. doi:10.1586/ern.12.162

Steiger, J. H. (1990). Structural model evaluation and modification. *Multivariate Behavioral Research*, *25*(2), 173–180

Stevens, J. P. (2002). *Applied multivariate statistics for the social sciences* (4th ed.). New Jersey, NJ: Lawrance Erlbaum Association, Inc.

Tabachnick, B. G. & Fidel, L. S. (2014). *Using multivariate statistics* (6th ed.). USA: Pearson Education Limited.

Tavsancil, E. (2005). *Measuring attitudes and data analysis with SPSS*. Ankara, Turkey: Nobel Publishing.

Thompson, B. (2004). *Exploratory and confirmatory factor analysis: understanding concepts and applications*. Washington, WA: American Psychological Association.

Veneziano, L. & Hooper, J. (1997). A method of quantifying content validity of health related questionnaires. *American Journal of Health Behavior*, *21*, 67–70.

White, R. W. & Horvitz, E. (2009). Cyberchondria: studies of the escalation of medical concerns in web search. *ACM Transactions on Information Systems, 27*(4), 1–37. doi:10.1145/1629096.1629101