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Validation of the Cyberchondria Severity Scale (CSS): Replication and extension with bifactor modeling

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ABSTRACT

Internet help seeking behaviors are increasingly common. Despite the positives associated with technology, cyberchondria, or the process of increased anxiety in response to internet medical information seeking, is on the rise. The Cyberchondria Severity Scale (CSS) was recently developed to provide a valid measure of cyberchondria across multiple dimensions. The current study sought to extend previous work on the CSS factor structure by examining a bifactor model. Participants ($N = 526$) from a community sample completed the CSS via online crowd sourcing. Results revealed that the bifactor model of the CSS provided superior fit to the data, suggesting that it is useful to conceptualize the CSS as containing a General Cyberchondria factor that is orthogonal to its subfactors. Similar to previous work, the CSS Mistrust factor does not appear to be necessary to this construct. Finally, results revealed unique relations between General and Specific Cyberchondria factors with lower-order health anxiety dimensions.

1. Introduction

With the growing impact of digital technology, more people are utilizing the internet as a source for health information. The estimated monthly prevalence of U.S. adults looking for health information online is 62%, making it the fifth most common online activity (Harris Poll, 2010; Pew Internet and American Life Project, 2012). Although a couple of studies have investigated positive outcomes related with online health information seeking (Huberty, Dinkel, Beets, & Coleman, 2013; Lemire, Sicotte, & Paré, 2008), the majority have focused on its detriments. For example, Lauckner and Hsieh (2013) demonstrated that online health information seeking can lead to negative emotional responses. Moreover, this practice may result in increased anxiety over one's physical health, or health anxiety (HA; Baumgartner & Hartmann, 2011; Muse, McManus, Leung, Meghreblian, & Williams, 2012; White & Horvitz, 2009) and increased risk for the development of anxiety disorders (Norr, Capron, & Schmidt, 2014). Recently researchers have coined the term "cyberchondria" to capture this process of increased anxiety about physical health due to excessive online health information seeking (see Starcevic & Berle, 2013 for review).

Unfortunately, research in this area has been hampered due to the lack of a well-validated measure of cyberchondria. In fact, most prior work utilized a single item to measure cyberchondria (Starcevic & Berle, 2013). Recently, in an attempt to standardize a self-report measure of cyberchondria that also addresses the multidimensionality of this construct, McElroy and Shevlin (2014) constructed the Cyberchondria Severity Scale (CSS). The CSS was developed on a sample of 190 undergraduates via an exploratory factor analysis (EFA) of 43 items selected based on a review of the cyberchondria literature. The EFA indicated a five-factor solution, after 10 items were removed because of low- or cross-loadings, or too little response variability. The Compulsion factor reflects ways in which online health research can interrupt activities, both online and off-line (e.g., "Researching symptoms or perceived medical conditions online interrupts my offline social activities."). The Distress factor reflects emotional states associated with online health research (e.g., "I have trouble relaxing after researching symptoms or perceived medical conditions online."). The Excessiveness factor reflects seeking out information across multiple sources and multiple occasions (e.g., "I enter the same symptoms into a web search on more than one occasion."). The Reassurance factor reflects anxiety leading from online searching behavior resulting in seeking expert opinions (e.g., "I discuss my online medical findings with my GP/health professional."). Finally, the Mistrust of Medical

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Professionals factor reflects whether to trust information found online more than information obtained from a medical professional (e.g., "I take the opinion of my GP/medical professional more seriously than my online medical research."). McElroy and Shevlin (2014) examined correlations across these factors and found moderate correlations between .52 and .67 across all the factors with the exception of Mistrust of Medical Professional, which correlated between −.04 and .23 with the other factors.

Although results of this EFA were promising, confirmatory factor analysis (CFA) of the CSS is needed to support its validity. In the only CFA of the CSS to date, Fergus (2014) examined the factor structure of the five proposed factors in a community sample of 539 adults, whose data were collected via the internet. Because the CSS was developed to be used as both a general scale as well as specific subscales, Fergus (2014) examined whether a second-order model of the CSS fit the data well, indicating that a general CSS factor subsumed the lower-order factors. It was reported that a second-order factor model of the CSS did not fit when the Mistrust of Medical Professional factor was included, but fit well when this factor was not modeled as part of the second-order factor. Factor loadings for this second-order factor model ranged from .74 to .87, indicating that between 55% and 76% of the variance of the lower-order factors could be accounted for by the general factor. The finding that the second-order model had superior fit when the Mistrust factor was excluded in addition with the small correlations found between the Mistrust factor and other factors has called into question the inclusion of the Mistrust factor in the CSS. In fact, Fergus (2014) concludes that the Mistrust factor should be considered separately, while arguing against its removal due to a unique, although modest (partial $r = .15$), relation with HA.

One approach that might improve on the modeling of the CSS is the use of a bifactor model (Chen, Hayes, Carver, Laurenceau, & Zhang, 2012; Reise, 2012). Using this approach, common variance, representing cyberchondria more generally, can be distinguished from variance specific to the lower-order factors. Bifactor modeling is distinct from second-order modeling, which has been used in previously with the CSS (Fergus, 2014). Second-order (or hierarchical) models create a General Cyberchondria factor on which the lower-order cyberchondria factors load. Thus, the lower-order and second-order factors cannot be concurrent independent variables in a model assessing relations between cyberchondria and other constructs as the second-order factor is composed of variance from the lower-order factors. Bifactor models would create a General Cyberchondria factor that is orthogonal to the lower-order factors, which would allow researchers to unambiguously examine the extent to which the general and specific facets of cyberchondria are uniquely related to external variables, providing additional support for or against the specific dimensions of cyberchondria (Chen, Hayes, Carver, Laurenceau, & Zhang, 2012). Additionally, bifactor modeling would allow for the examination of whether specific CSS items only load on the General Cyberchondria factor and not the lower-order factor, or vice versa, which could have implications for the scoring of the measure.

The development of the CSS has allowed for researchers to begin looking at how the different lower-order dimensions of cyberchondria help explain the documented relationship between online health information seeking, HA (e.g., Baumgartner & Hartmann, 2011; Muse, McManus, Leung, Meghreblian, & Williams, 2012) and other related variables. McElroy and Shevlin (2014) found significant correlations between the CSS total score and all subscale scores with general anxiety ($r = .14$ to .49) and stress ($r = .16$ to .37), but found that the mistrust subscale did not significantly correlate with depression ($r = .09$). Fergus (2014) found that the CSS total score and all subscale score significantly correlated more strongly with HA ($r = .21$ to .61) than obsessive-compulsive symptoms ($r = .11$ to .50). However, in the only analysis to investigate unique relationships, researchers found that only the Distress, Excessiveness, and Mistrust of Medical Professionals subscales accounted for unique variance in HA scores (Fergus, 2014). Additionally, no studies to date have investigated the relationships between the CSS and lower-order HA dimensions (e.g., Thought Intrusion and Fear of Illness; Alberts, Sharpe, Kehler, & Hadjistavropoulos, 2011). Based on these results it is clear that additional research is needed to further illuminate the unique relationships between the different lower-order dimensions of cyberchondria and HA.

1.1. The current study

There is limited research examining the factor structure of the CSS, as only two studies have done so, and one in an exploratory fashion (e.g., Fergus, 2014; McElroy & Shevlin, 2014). More studies are needed to validate the structure of the CSS, especially to determine whether the Mistrust of Medical Professionals factor should be considered a cyberchondria factor. In addition, no prior studies have considered whether the CSS might be better modeled as a bifactor model, partitioning variance into a General Cyberchondria factor and specific Compulsion, Distress, Excessiveness, Reassurance, and Mistrust of Medical Professionals factors. The primary aim of the current study was to examine the best-fitting model of cyberchondria as captured by the CSS. Given that the CSS was created as a measure both of general and specific components of cyberchondria and that the Mistrust of Medical Professionals did not relate highly to the other factors in prior studies (e.g., Fergus, 2014; McElroy & Shevlin, 2014), it was hypothesized that a model of cyberchondria comprising a separate Mistrust of Medical Professionals factor and a bifactor model consisting of a General Cyberchondria factor and orthogonal Compulsion, Distress, Excessiveness, and Reassurance would fit the data best. A secondary aim of the current study was to replicate the relations found between cyberchondria and HA using established lower-order dimensions of HA. Given that Fergus (2014) found the Distress, Excessiveness, and Mistrust of Medical Professionals factors to be uniquely related to HA, it was hypothesized that these three factors, as well as the General Cyberchondria factor would be significantly associated with the lower-order HA dimensions.

2. Methods

2.1. Participants

Participants included 526 individuals recruited through an online crowdsourcing marketplace. The sample was primarily female (69.2% female) with ages ranging from 18 to 72 ($M = 34.87$, $SD = 12.41$). 84.2% of the sample identified as Caucasian, 8.0% African American, 4.2% Asian, 1.1% American Indian or Alaskan Native, and 2.5% other (e.g., biracial). In addition, 6.5% of the sample identified as Hispanic or Latino. Regarding marital status, 36.3% were married, 35.9% single or never married, 15.2% cohabitating, 10.1% divorced, 1.1% widowed, 0.8% separated, and 0.6% other. Finally, 35.7% of the sample completed some college or had a 2 year degree 35.2% had a 4 year college degree, 12.9% completed high school or the equivalent, 11.4% completed graduate school, 3.6% completed a trade or technical school, and 1.2% completed some high school.

2.2. Procedure

Individuals were recruited through Amazon's Mechanical Turk (Mturk) to participate in an online survey examining risk factors associated with anxiety and related pathology. Previous research has indicated that data collected through Mturk is both diverse and high in quality (Buhrmester, Kwang, & Gosling, 2011; Paolacci