



A loneliness model of hypochondriasis among older adults: The mediating role of intolerance of uncertainty and anxious symptoms

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ARTICLE INFO

Keywords:

Loneliness
Social isolation
Intolerance of uncertainty
Anxiety
Anxious symptoms
Hypochondriasis
Health anxiety
Older adults

ABSTRACT

Loneliness has been described as an epidemic and is associated with a number of adverse health and psychosocial outcomes. In this study, we proposed a loneliness model of hypochondriasis among older adults in which loneliness triggers a maladaptive threat response in which there is greater self-focus, leading to hypochondriasis through greater intolerance of uncertainty and anxious symptoms. Community-dwelling older adults ($N = 280$) participated in an interview survey. Results found that loneliness was associated with higher hypochondriasis even after controlling for perceived health status and relationship status. Loneliness had a serial indirect effect on hypochondriasis through higher intolerance of uncertainty and anxious symptoms. With intolerance of uncertainty and anxious symptoms in the model, the relationship between loneliness and hypochondriasis was no longer significant, suggesting full mediation. The results support a loneliness model of hypochondriasis among older adults. Health care professionals working with older adults suffering from hypochondriacal concerns may wish to consider social factors such as loneliness.

1. A loneliness model of hypochondriasis among older adults: the mediating role of intolerance of uncertainty and anxious symptoms

Human beings are a social species; our sense of safety and well-being are strongly tied up in our social relations (Pellmar, Brandt, & Baird, 2002). Today, humans live in closer proximity to each other, yet we are more socially isolated from each other (Cacioppo, Fowler, & Christakis, 2009; McPherson, Smith-Lovin, & Brashears, 2006) – this produces loneliness, which can be defined as discrepancy between one's actual social relationships and the desired quality of one's social relationships (Ong, Uchino, & Wethington, 2016). Loneliness has been described as an epidemic, and its prevalence is growing, with implications for adverse health and mortality outcomes (Holt-Lunstad, 2017). Hawkey and Cacioppo (2010; p. 3) propose the loneliness model: “perceived social isolation is tantamount to feeling unsafe, and this sets off implicit hypervigilance for (additional) social threat in the environment.” The heightened social threat creates an unconscious bias in which the world is perceived as a more stressful place (Cacioppo & Hawkey, 2005; Cacioppo, Grippo, London, Goossens, & Cacioppo, 2015; Cacioppo et al., 2016). In this study, we investigated the link between loneliness and hypochondriasis among older adults.

Hypochondriasis may be defined as the exaggerated concern an individual has about bodily symptoms and a misinterpretation of symptoms that leads the individual to believe they have a serious illness (Bravo & Silverman, 2001). Greater understanding of the relationship between loneliness and hypochondriasis may have implications with regards to older adults' health and well-being but also health care utilization as hypochondriasis has been linked with greater consumption of health care services among the general public (Puri & Dimsdale, 2011; Sunderland, Newby, & Andrews, 2013; Weiss, Rief, & Kleinstäuber, 2017) and among older adults (Boston & Merrick, 2010; Fergus, Griggs, Cunningham, & Kelley, 2017).

1.1. Loneliness among older adults

Loneliness affects 25–60% of older adults and is associated with lower quality of life (Musich, Wang, Hawkins, & Yeh, 2015). As individuals age, they experience increased loneliness and social isolation, which has been linked to various health issues and mortality (Ong et al., 2016). Loneliness increases as older adults age (Dykstra, Van Tilburg, & Gierveld, 2005; Pinquart & Sörensen, 2001). Loneliness is even more pronounced among older adults due to the increased risk factor of decreased social connections from retirement, loss of a spouse, or normal

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<https://doi.org/10.1016/j.archger.2019.03.027>

Received 28 January 2019; Received in revised form 27 March 2019; Accepted 27 March 2019

Available online 28 March 2019

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age-related health problems (Holt-Lunstad, 2017). Loneliness is a predictor of functional decline and death in older adults (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015; Perissinotto, Cenzer, & Covinsky, 2012) and has been linked with a variety of physical health conditions and mental health conditions (for review, see Ong et al., 2016; El-Gabalawy, Mackenzie, Thibodeau, Asmundson, & Sareen, 2013) as well as a reduction in gray matter (Kanai et al., 2012), slower cognitive function (Cacioppo & Cacioppo, 2014), and increased somatic complaints (Wei et al., 2014).

1.2. Loneliness and hypochondriasis

Loneliness has been linked with hypochondriasis among young adults (Brink & Niemeyer, 1993) and adolescents (Stickley et al., 2016). Some researchers have concluded that hypochondriasis in older adults may result from the lack of social contact, leading them to direct attention inward becoming worried and preoccupied with bodily symptoms which may then manifest as health anxiety (El-Gabalawy et al., 2013; Monopoli, 2005). Lonelier individuals often report concurrent anxiety (Beutel et al., 2017; Stickley et al., 2016). Van Balkom et al. (2000) found chronic somatic diseases had a linear association with a greater risk of anxiety and specifically generalized anxiety disorders in older adults. Additionally, research has found anxiety sensitivity (i.e., intense fear of bodily sensation associated with anxiety) is a strong predictor of hypochondriacal concerns among older adults (Bravo & Silverman, 2001; Gerolimatos & Edelstein, 2012). Furthermore, higher levels of anxiety sensitivity are associated with social isolation/loneliness (Narchal & McDavitt, 2017). In this study, we investigated intolerance of uncertainty and anxious symptoms as mediators between loneliness and hypochondriasis.

1.3. Intolerance of uncertainty

Intolerance of uncertainty is a dispositional characteristic that results from the negative appraisal of uncertainty, thereby triggering a maladaptive response (Buhr & Dugas, 2009). Intolerance of uncertainty is associated with anxiety (Carleton et al., 2012; Norr et al., 2013; McEvoy & Mahoney, 2012) as well as worry (Ladouceur, Gosselin, & Dugas, 2000; McEvoy & Mahoney, 2012; Norr et al., 2013), which are two components in hypochondriasis. Furthermore, among older adults, knowledge of aging has been found to directly affect worry and intolerance of uncertainty as well as intolerance of uncertainty was found to mediate the relationship between knowledge of aging and worry (Nuevo, Wetherell, Montorio, Ruiz, & Cabrera, 2009). Individuals can experience powerful bodily reactions to uncertainty including increased heart rate and blood pressure (Greco & Roger, 2003) and individuals with hypochondriasis have a heightened perception of somatic body sensations. Additionally, intolerance of uncertainty was associated with hypochondriacal concerns (Boelen & Carleton, 2012) and higher levels of intolerance of uncertainty was found in patients with hypochondriacal concerns (Deacon & Abramowitz, 2008).

1.4. The current study

In this study, we propose a loneliness model of hypochondriasis – that is, loneliness may exert greater effects on individuals with higher intolerance of uncertainty and increase anxiety, which in turn leads to an increase concern about one's health. Some researchers have found decreased social connections from retirement, marital dissolution through divorce or death, as well as health problems may be risk factors for loneliness (Biordi & Nicholson, 2013; Holt-Lunstad, 2017). Additionally, we propose that loneliness impacts hypochondriasis through greater intolerance of uncertainty and anxiety symptoms independent of physical health issues or relationship status. No extant research has examined intolerance of uncertainty and anxious symptoms as mediators between loneliness and health anxiety among older adults.

Loneliness has been linked to hypochondriasis (Brink & Niemeyer, 1993; Stickley et al., 2016); therefore, we hypothesized (H_1) that loneliness would be associated with higher hypochondriasis among older adults, even after controlling for physical health and relationship status. The loneliness model (Hawkey & Cacioppo, 2010) proposes that, for humans, feeling lonely is akin to feeling unsafe and that these feelings of threat cause individuals to begin scanning the environment for social threats, leading to a negative cognitive bias. Consistent with this model, we hypothesized that loneliness will impact hypochondriasis through greater (H_2) intolerance of uncertainty and (H_3) anxiety symptoms. Older adults who experience greater loneliness will perceive themselves as under threat and without social resources to respond to a threat, and therefore have greater intolerance of uncertainty and greater anxiety.

2. Method

2.1. Participants

Participants were community-dwelling older adults in the southern United States. Participants were recruited from retirement communities, senior centers, and civic centers and were entered into a raffle for one of several gift cards. A total of 337 older adults participated in this study. Of these participants, we eliminated 57 cases due to incomplete data (> 10% missing on any measure); the other cases were not missing any data. This left a final sample of 280 (64.4% female). The mean age was 76.08 ($SD = 7.59$), ranging from 65 to 95 years. Two-forty one identified as Caucasian (85.8%), 16 (5.7%) as African-American, 6 (2.1%) as Hispanic/Latinx, 7 (2.5%) as Asian/Pacific Islander, and 6 (2.1%) as another group.

2.2. Measures

2.2.1. Physical health

Physical health was measured with the SF-8 (Ware, Kosinski, Dewey, & Gandek, 2001), a widely used health survey created to health-related quality of life. The SF-8 has demonstrated good reliability in both clinical and non-clinical populations (Lefante, Harmon, Ashby, Barnard, & Webber, 2005). We used the physical component summary (PCS), which is an index comprised of 4 ordinal items assessing general health, physical functioning, role physical, and bodily pain. As per the standard scoring of the SF-8, regression coefficient weights are assigned to each item to produce a physical component score which ranges from 0 (*very poor health*) to 100 (*excellent health*).

2.2.2. Relationship status

Relationship status was measured by asking participants “*What is your current marital relationship status?*” Responses included “*Single – not in a relationship*”, “*Living with another*”, and “*Widowed/Widower*”. For this analysis, those who reported being in a relationship (i.e., married, single – in a relationship, living with another) were coded as 1 = *in a relationship*, whereas those not currently in a relationship, 0 = *not in a relationship*.

2.2.3. Loneliness

The Three-Item Loneliness Scale (TILS; Hughes, Waite, Hawkey, & Cacioppo, 2004) is a brief self-report measure of loneliness. The TILS consist of three items (e.g., “*How often do you feel left out?*”) to which individuals respond using a Likert-type scale ranging from 1 = *hardly ever* to 3 = *often*. Item scores were summed so that higher scores indicate a higher level of loneliness (in this study, Cronbach's $\alpha = .79$).

2.2.4. Intolerance of uncertainty

The Intolerance for Uncertainty Scale (IUS-12; Carleton, Norton, & Asmundson, 2007) is a 12-item self-report measure designed to assess reactions to ambiguous, or uncertain, situations (e.g., “*Uncertainty keeps*

me from living a very full life”). Individuals respond using a Likert-type scale ranging from 1 = *not at all characteristic of me* to 5 = *entirely characteristic of me*. Item scores were summed, with higher scores indicating less tolerance for uncertainty (in this study, $\alpha = .85$).

2.2.5. Anxious symptoms

The Geriatric Anxiety Scale (GAS-10; Mueller et al., 2015) is a 10-item self-report measure of somatic, cognitive, and affective anxiety symptoms in later life. Participants are prompted to indicate at what extent they experienced each symptom in the past week (e.g., “I worried too much”). Individuals respond on a Likert-type scale ranging from 1 = *not at all* to 4 = *all of the time*. Item scores were summed so that higher scores indicated greater anxiety (in this study, $\alpha = .80$).

2.2.6. Hypochondriasis

The Illness Attitudes Scale (IAS; Kellner, 1986; Kellner, 1987) is a 29-item instrument measuring attitudes, beliefs, and worry related to health anxiety and abnormal illness behavior. The IAS consists of 9 subscales, three items each (items 22 and 26 provide additional information but are not used in the scoring). This study utilized the IAS in its entirety; therefore, we retained all items for analysis. Items range on a Likert scale from 0 = *No* to 4 = *Most of the time*. These items were summed so that higher scores indicated greater illness anxiety (in this study, $\alpha = .85$).

2.3. Procedure

This study was approved by the university committee for the protection of human subjects. Informed consent was obtained from all participants. The study utilized a face-to-face interview survey format in which items were read aloud to participants, who responded verbally or by indicating their answer choice on the page.

3. Results

All analyses conducted used SPSS version 24. Descriptive statistics and bivariate correlations are displayed in Table 1. Overall, the sample was relatively healthy (PCS: $M = 47.00$, $SD = 10.09$) and approximately half of the respondents were in a relationship. Participants had relatively low levels of loneliness ($M = 4.30$, $SD = 1.57$), intolerance of uncertainty ($M = 26.57$, $SD = 7.59$), anxious symptoms ($M = 13.69$, $SD = 3.32$), and health anxiety ($M = 50.55$, $SD = 11.63$).

Mediation was investigated using the PROCESS macro, and a 10,000 bootstrapped sampling procedure (Hayes, 2013). Bootstrapping is nonparametric procedure which samples from an existing dataset to

Table 1
Means, standard deviations, and correlations among measures and physical health.

	1.	2.	3.	4.	5.	6.
1. Physical Health	–					
2. Relationship Status	.03	–				
3. Loneliness	–.20**	–.28***	–			
4. Intolerance of Uncertainty	–.19**	.02	.21**	–		
5. Anxious Symptoms	–.34***	.06	.33***	.31***	–	
6. Health Anxiety	–.34***	.09	.26***	.48***	.46***	–
<i>M</i>	47.00	.48	4.30	26.57	13.69	50.55
<i>SD</i>	10.09	.50	1.57	7.59	3.32	11.63
Possible Range	0 - 100	0 - 1	3 - 9	12 - 60	10 - 40	27 - 135

Note. Relationship status was coded to where 0 = *In a relationship*, and 1 = *Not in a relationship*. Possible range indicates minimum and maximum summed composite score for their respective scale.

** $p < .01$, *** $p < .001$.

create an empirical estimate of the distribution. Confidence intervals at 95% were generated based on this distribution to test the effects related to the mediational model. Physical health and relationship status were included in the model as covariates. Loneliness had a positive total effect on hypochondriasis ($\beta = .21$, $SE = .06$, $p < .001$, 95% CI [.09, .33]) and accounted for 16.84% of the variance in hypochondriasis. Loneliness had a positive effect on intolerance of uncertainty ($\beta = .19$, $SE = .06$, $p = .003$, 95% CI [.06, .31]) and on anxious symptoms ($\beta = .21$, $SE = .06$, $p < .001$, 95% CI [.10, .32]). Intolerance of uncertainty had a positive effect on anxiety symptoms ($\beta = .21$, $SE = .05$), $p < .001$, 95% CI [.11, .32]) and on hypochondriasis ($\beta = .34$, $SE = .05$, $p < .001$, 95% CI [.24, .44]). Anxiety symptoms had a positive effect on hypochondriasis ($\beta = .24$, $SE = .06$, $p < .001$, 95% CI [.13, .36]). (Fig. 1)

Loneliness had a positive total indirect effect on hypochondriasis ($\beta = .12$, $SE = .04$, 95% CI [.06, .20]). Loneliness has an indirect effect on hypochondriasis through both intolerance of uncertainty ($\beta = .06$, $SE = .02$, 95% CI [.02, .11]) and anxiety symptoms ($\beta = .05$, $SE = .02$, 95% CI [.02, .10]) as well as a serial indirect effect through intolerance of uncertainty and anxious symptoms ($\beta = .01$, $SE = .005$, 95% CI [.002, .023]). Including the mediators (i.e., intolerance of uncertainty and anxious symptoms) in the model meant that the direct effect of loneliness on hypochondriasis was no longer significant ($\beta = .08$, $SE = .05$, $p = .12$, 95% CI [–.02, .19]), suggesting that intolerance of uncertainty and anxious symptoms fully mediate the relationship between loneliness and hypochondriasis. Overall, the model accounted for 43% of the variance in hypochondriasis ($R^2 = .36$, $F(5, 269) = 29.95$, $p < .001$).

4. Discussion

The purpose of this study was to investigate the relationship between loneliness and hypochondriasis among older adults. Loneliness was associated with hypochondriasis even after controlling for physical health and relationship status, supporting H_1 . This suggests that older adults who are lonelier have greater health anxiety regardless of their perceived health status or relationship status. This result is consistent with previous research that has found links between loneliness and hypochondriasis (Brink & Niemeyer, 1993; Stickley et al., 2016). Loneliness was also associated with higher intolerance of uncertainty and with higher anxious symptoms. This suggests that lonelier older adults have more negative reactions to ambiguous situations and are more anxious. The finding that loneliness is linked with greater intolerance of uncertainty appears to represent a novel finding of the present study. The link between loneliness and anxious symptoms is consistent with the findings of previous studies (Beutel et al., 2017; Stickley et al., 2016). Intolerance of uncertainty was associated with higher anxious symptoms and hypochondriasis. This is consistent with previous research that has found links between intolerance of uncertainty and anxious symptoms (Carleton et al., 2012; Norr et al., 2013; McEvoy & Mahoney, 2012) and between intolerance of uncertainty and hypochondriasis (Boelen & Carleton, 2012; Deacon & Abramowitz, 2008; Gerolimatos & Edelstein, 2012). Loneliness had a positive indirect effect on hypochondriasis through intolerance of uncertainty and anxious symptoms, supporting H_2 and H_3 . Furthermore, once intolerance of uncertainty and anxious symptoms were included in the model, the relationship between loneliness and hypochondriasis was no longer statistically significant, suggesting that intolerance of uncertainty and anxious symptoms fully mediate the relationship between loneliness and hypochondriasis.

Overall, these results provide support for a loneliness model of hypochondriasis among older adults. The results are consistent with the notion that loneliness activates threat response systems, thereby increasing intolerance of uncertainty and anxiety, which in turn increases hypochondriasis. Previous research has found that loneliness may direct focus toward the self (El-Gabalawy et al., 2013), and it is conceivable to

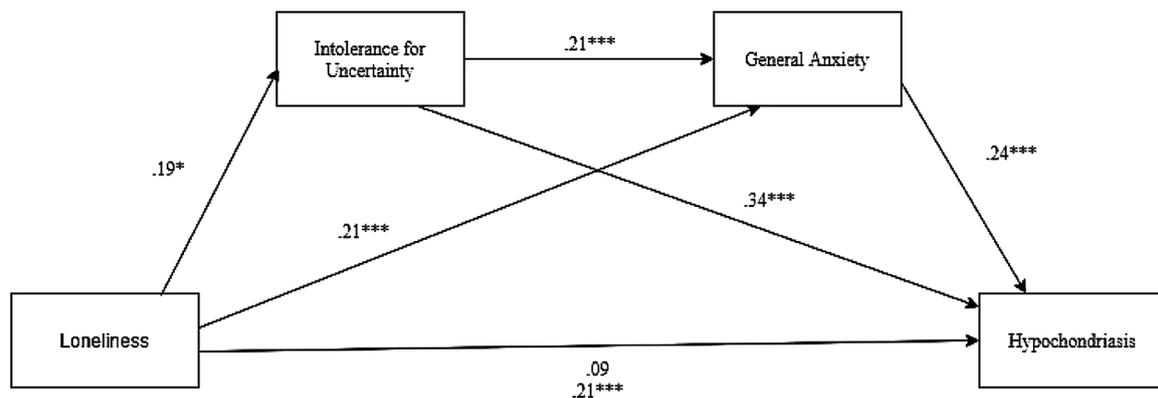


Fig. 1. Loneliness and hypochondriasis as mediated by intolerance for uncertainty and geriatric anxiety. Standardized coefficients are presented. * $p < .01$ ** $p < .001$.

think that among older adults this self-focus could result in greater concerns about bodily symptoms. This result adds to the research showing an association between intolerance of uncertainty and health anxiety (Boelen & Carleton, 2012; Deacon & Abramowitz, 2008; Gerolimatos & Edelstein, 2012). Additionally, anxiety sensitivity appears to be a common link among intolerance of uncertainty and hypochondriasis. Anxiety sensitivity can increase health anxiety and has been found to be a predictor of hypochondriasis in older adults (Bravo & Silverman, 2001; Gerolimatos & Edelstein, 2012). Additionally, the results of this study are consistent with the notion that loneliness among older adults can increase anxiety (Beutel et al., 2017). Other research indicates that loneliness can cause physical health conditions and mental health conditions (for review, see Ong et al., 2016; Richard et al., 2017).

Although this study has important implications for hypochondriasis among older adults, the study was limited in several ways. The sample of older adults was a relatively healthy, community-dwelling sample; thus, the results may not generalize to all older adults. Furthermore, having recruited older adults from retirement communities may further limit the generalizability and specifically may have resulted in a less lonely sample since older adults in these communities live near same-age peers and have regular meetings and social activities. The cross-sectional nature of the data limits conclusions that can be drawn about causality and directionality of results. For example, it is possible that older adults with greater hypochondriasis may limit their social activities out of health concerns and therefore be lonelier. The self-report nature of the questionnaires introduces possible response bias. The interview survey format may have amplified this in that older adults may have been less open to responding verbally to an interviewer.

Despite these limitations, we believe that this study suggests a number of directions for future research. Future studies could investigate these relationships among a more representative sample of older adults and employ longitudinal designs. Intervention studies that seek to impact individuals' level of loneliness would be helpful to confirm whether there is a causal relationship between loneliness and hypochondriasis. We would expect, based on the results of this study, reductions in loneliness to result in lower hypochondriasis.

This study also has practical implications for older adults. Loneliness is an epidemic with profound health and psychosocial consequences (Holt-Lunstad, 2017). The results of this study suggest that hypochondriasis may be one such consequence. Therefore, it may be beneficial for health care professionals to explore loneliness as a factor in older adults seeking treatment for unexplained medical symptoms or who are struggling with hypochondriacal concerns. Finding loneliness can increase hypochondriasis may help open new avenues of treatment and reduce over utilization of medical services. Clinical interventions aimed at reducing hypochondriasis and anxiety symptoms may tend to focus on specific symptoms as targets for cognitive restructuring.

However, these results suggest that social forces may be involved as well. Some older adults with hypochondriasis may be responding to an internal threat mechanism resulting from a deeper underlying sense of disconnection from others in society.

Conflict of interest statement

All authors declare that they have no conflict of interest.

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