

# Linking Illness in Parents to Health Anxiety in Offspring: Do Beliefs about Health Play a Role?

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**Background:** The cognitive behavioural (CB) model of health anxiety proposes parental illness leads to elevated health anxiety in offspring by promoting the acquisition of specific health beliefs (e.g. overestimation of the likelihood of illness). **Aims:** Our study tested this central tenet of the CB model. **Method:** Participants were 444 emerging adults (18–25-years-old) who completed online measures and were categorized into those with healthy parents ( $n = 328$ ) or seriously ill parents ( $n = 116$ ). **Results:** Small ( $d = .21$ ), but significant, elevations in health anxiety, and small to medium ( $d = .40$ ) elevations in beliefs about the likelihood of illness were found among those with ill vs. healthy parents. Mediation analyses indicated the relationship between parental illness and health anxiety was mediated by beliefs regarding the likelihood of future illness. **Conclusions:** Our study incrementally advances knowledge by testing and supporting a central proposition of the CB model. The findings add further specificity to the CB model by highlighting the importance of a specific health belief as a central contributor to health anxiety among offspring with a history of serious parental illness.

*Keywords:* Health anxiety, hypochondriasis, illness anxiety disorder, somatic symptom disorder, parental illness.

## Introduction

A serious medical illness in a parent often results in family members facing challenges (e.g. observing the ill parent undergo medical procedures, hospitalizations, changes in roles and responsibilities, and potential death). Research suggests such events impact the patient and the patient's children such that offspring are at increased risk for psychological distress (Niemelä et al., 2012; Romer, Barkmann, Schulte-Markwort, Thomalla and Riedesser, 2002). For example, significantly elevated levels of anxiety are found in young adults with a parent diagnosed with cancer (Compas et al., 1994).

Less is known about the contribution of parental illness to health anxiety in offspring. Health anxiety refers to anxiety related to the misinterpretation of bodily sensations or changes

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as signs of serious illness (Salkovskis and Warwick, 2001). When health anxiety lasts for at least 6 months and is associated with excessive health-related behaviours or maladaptive avoidance, a diagnosis of illness anxiety disorder may be appropriate (American Psychiatric Association [APA], 2013). Alternatively, when high levels of health anxiety persist with somatic symptoms (e.g. fatigue), a diagnosis of somatic symptom disorder may apply (APA, 2013). In previous versions of the DSM, these diagnoses were referred to as hypochondriasis. Elevated health anxiety, whether meeting diagnostic criteria for one of these disorders or not, is important to study as it is associated with greater use of unnecessary medical diagnostic procedures and interventions (Barsky, Ettner, Horsky and Bates, 2001) and higher levels of functional impairment (Noyes, Carney, Hillis, Jones and Langbehn, 2005).

### *Cognitive behavioural model of health anxiety*

According to the cognitive behavioural (CB) model of health anxiety, maladaptive core beliefs about health and illness play a primary role in determining whether individuals develop health anxiety (Salkovskis and Warwick, 2001). Such beliefs are regarded as a product of an individual's learning experiences around illness. The model proposes witnessing a serious illness in a parent is one such experience that may lead to specific health beliefs and the development of health anxiety. For example, offspring who have observed their parents' long and difficult battle with cancer may begin to believe medical illnesses are awful and resistant to treatment. The CB model proposes that, when triggered, these types of beliefs result in the misinterpretation of harmless bodily sensations and changes, which in turn leads to increased health anxiety (Salkovskis and Warwick, 2001; Warwick and Salkovskis, 1990).

A review by Marcus, Gurley, Marchi and Bauer (2007) found elevated health anxiety is linked with health beliefs, with this relationship holding across clinical and nonclinical samples. To study health beliefs and healthy anxiety, Hadjistavropoulos et al. (2012) examined beliefs pertaining to the likelihood of illness, awfulness of illness, difficulty coping with illness, and inadequacy of medical resources in a healthy community sample and a sample who reported various medical conditions. Consistent with the CB model, these beliefs predicted health anxiety and poor response to reassurance in both samples. Health beliefs were also uniquely related to health anxiety after controlling for depression and general anxiety.

There are at least two studies suggesting past experience of family members or close friends with illness is associated with increased health anxiety. However, these studies have methodological limitations. In a study involving general medicine patients, chronic illness in a family member and serious illness in a close friend prior to age 17 were reported significantly more frequently by patients diagnosed with hypochondriasis vs. those without a diagnosis (Noyes et al., 2002). No differences were found in regards to having a parent who was seriously ill. In a similar study, exposure to extreme illness or injury in a close friend or family member before 17 years was reported significantly more frequently by participants who reported one month or more of illness worry in the past 12 months as compared to those who did not report such worry (Noyes et al., 2005). One limitation of these studies was that both examined health anxiety as a categorical variable. A preferable approach is to examine health anxiety as a continuous variable, given research suggesting health anxiety exists on a continuum, ranging from minimal worry about illness to excessive anxiety (Asmundson, Taylor, Carleton, Weeks and Hadjistavropoulos, 2012; Longley et al., 2010). Both studies also utilized relatively small samples: i.e.  $n = 162$  (Noyes et al., 2002) and  $n = 246$  (Noyes

et al., 2005). Research suggests sample sizes of >250 are required for stable estimates for correlations (Schönbrodt and Perugini, 2013).

### *The present study*

The purpose of our study was to add to the above research and test whether exposure to serious parental illness is associated with health beliefs, and the development of health anxiety in patients' children – key aspects of the CB model that are not yet empirically tested. Showing such a link would help in early identification of and intervention with at-risk groups. We focused on 18–25-year-olds as emerging adulthood is specified as the typical age of onset for clinical levels of health anxiety (i.e. levels meeting diagnostic criteria for illness anxiety disorder).

We hypothesized individuals with a seriously ill parent would have higher levels of health anxiety and higher levels of maladaptive health beliefs versus individuals with healthy parents. We also predicted the relationship between parental illness and health anxiety would be fully mediated by health beliefs. To illustrate via a clinical example, consider two young men who have both observed their mother battle cancer. Based on this experience, one son may come to believe that medical illnesses are awful. The other son may believe that, although unpleasant and difficult, one can cope with illnesses when they occur. The young man with more negative beliefs about illness may experience heightened anxiety about his health upon noticing a strange bump on his hand, whereas the young man with less negative beliefs about illness may experience minimal anxiety in response to this same experience.

## **Method**

### *Participants*

Participants were recruited through the University's psychology participant pool, local newspapers, online advertising, and posters placed in local medical offices and the University campus. Individuals recruited through the participant pool obtained course credit for participation. In total, 328 individuals with healthy parents (healthy parent group) and 116 individuals with seriously ill parents (ill parent group) participated with mean ages of 20.1 ( $SD = 2.0$ ) and 21.1 ( $SD = 2.4$ ), respectively. On average, both groups had a very large number of female ( $n = 363$ ; 81.7%), and Caucasian ( $n = 393$ ; 88.5%) participants. Most participants reported good health currently ( $n = 378$ ; 85.1%), while 14.9% ( $n = 66$ ) reported one or more physical health problems. Demographics were collapsed into meaningful and analyzable groups (i.e. Caucasian vs. Non-Caucasian, illness present vs. illness not present). Chi-square tests revealed no significant differences between the ill and healthy parent group in terms of percentage female, Caucasian, or currently ill. A *t*-test revealed no difference between the groups with respect to age.

### *Procedure*

Our study was approved by the first two authors' University ethics board. Data were collected using an online survey containing relevant measures. After enrolling in the study via an internet-based software program, participants were directed to a secure website where they provided consent and completed measures. Several studies indicate that the administration

of anxiety-related assessment measures using internet-based and paper-and-pencil formats yield comparable results (Coles, Cook and Blake, 2007). Data screening methods were used to ensure the quality of the data (e.g. we deleted data containing duplicate IP addresses and duplicate data as well as outliers suggesting participants did not attend to survey items). In total, 39 cases containing duplicate data were eliminated.

### Measures

*Demographic and Parental Illness Questionnaire.* A study specific questionnaire assessed demographics and parental illness variables. Participants indicated whether either of their parents had ever been diagnosed (by a physician) with a serious medical illness; examples of serious illnesses (e.g. cancer, multiple sclerosis [MS], inflammatory bowel disease [IBD], cardiovascular disease) were provided. Participants who identified as having a seriously ill parent, currently or in the past, answered a series of questions about their parent's illness (e.g. type of illness, offspring's age at diagnosis). Participants reporting parental illness were included in the ill parent group regardless of the amount of time elapsed since diagnosis. Evidence suggests reports of parental medical history are accurate, particularly for salient medical events or serious illnesses such as cancer (Chang, Smedby, Hjalgrim, Glimelius and Adami, 2006).

*Short Health Anxiety Inventory (SHAI; Salkovskis, Rimes, Warwick and Clark, 2002).* The SHAI is a widely used 14-item measure of health anxiety. For each item, participants select a statement that best describes the way they have been feeling over the past 6 months. Items are scored 0 to 3 with the total score ranging from 0 to 42. Higher scores indicate higher levels of health anxiety. The SHAI has demonstrated good internal consistency and strong construct validity, including convergent and divergent validity (Alberts, Hadjistavropoulos, Jones and Sharpe, 2013; Salkovskis et al., 2002). It has also demonstrated good discriminant validity, with the SHAI total score accurately differentiating hypochondriasis from other anxiety disorders and panic disorder (Abramowitz, Olatunji and Deacon, 2007). In our study, the reliability of the SHAI was good ( $\alpha = .87$ ).

*Health Cognitions Questionnaire (HCQ; Hadjistavropoulos et al., 2012).* The HCQ is a 20-item measure assessing four core beliefs involved in the development of health anxiety: (a) Likelihood of illness, (b) Awfulness of illness, (c) Difficulty coping with illness, and (d) Medical service inadequacy. Participants rate each statement on a scale from 1 (strongly disagree) to 5 (strongly agree). Research has confirmed the 4-factor structure of the HCQ among healthy undergraduates, healthy community adults, and community adults with medical conditions. It has demonstrated good internal consistency and predictive and discriminant validity (Hadjistavropoulos et al., 2012). In our study, the reliability of the HCQ scales was acceptable to good, with alphas ranging from .74 (Awfulness of illness) to .88 (Difficulty coping with illness).

## Results

### Data analytic strategy

To test whether levels of health anxiety differed between those with ill parents and those with healthy parents, independent samples *t*-tests compared each group's mean score on the

**Table 1.** Means and standard deviations for total sample, ill parent group, and healthy parent group

Measure	Total sample ( <i>N</i> = 444)		Ill parent group ( <i>n</i> = 116)		Healthy parent group ( <i>n</i> = 328)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
SHAI	12.19	5.53	13.03*	5.56	11.89*	5.49
HCQ subscale						
Awfulness of illness	14.27	2.68	13.91	2.81	14.40	2.62
Likelihood of illness	11.54	3.27	12.51**	3.40	11.20**	3.16
Difficulty coping with illness	20.06	5.54	19.29	5.08	20.34	5.68
Medical service inadequacy	9.70	3.36	9.66	3.30	9.70	3.40

Notes: SHAI = Short Health Anxiety Inventory; HCQ = Health Cognitions Questionnaire.

\**p* < .01; \*\**p* < .001

SHAI. Similarly, four independent samples *t*-tests tested if those with ill parents, vs. those with healthy parents, reported higher levels of health beliefs on the HCQ subscales. Tests of the four a priori hypotheses were conducted using Bonferroni adjusted alpha levels of .0125 per test. To test whether health beliefs mediate the predicted link between parental illness and health anxiety we conducted a mediation analysis. Traditional procedures described by Baron and Kenny (1986) as well as more current methods involving an SPSS macro (Preacher and Hayes, 2004), designed to directly test the statistical significance of indirect effects using a nonparametric bootstrapping procedure, were utilized. Bootstrapping is a nonparametric approach to effect size estimation and hypothesis testing that makes no assumptions about the shape of the distributions of the variables or the sampling distribution of the statistic (Preacher and Hayes, 2004) and is considered a preferred method for making inferences about indirect effects (Hayes, 2009). Statistically significant results imply the indirect effect is greater than zero, as determined by the absence of zero in the 95% confidence interval. Bootstrap resampling conducted through macros is a commonly used method of conducting mediation analyses given its accuracy (Hayes, 2009).

#### *Preliminary analyses*

Skewness and kurtosis were examined for each measure. Variables with skewed *z*-scores (skew statistic divided by its standard error) > ± 3.29 were square root transformed prior to analysis (Field, 2009). These included the SHAI and the HCQ Difficulty coping with illness and Medical service inadequacy subscales.

#### *Descriptive statistics*

Means and standard deviations of the skewed variables are reported prior to transformation in Table 1. Means on the SHAI fell well below those reported in clinical samples and were similar to means reported in nonclinical samples (Alberts et al., 2013). Participants' means on the HCQ were comparable to those reported among non-clinical samples (Hadjistavropoulos et al., 2012). Correlations among measures (Table 2) showed each of the health beliefs was significantly associated with health anxiety. All beliefs were significantly intercorrelated, with

**Table 2.** Correlations among measures

Measure	1.	2.	3.	4.	5.
1. SHAI		.29**	.28**	.17**	.49**
HCQ subscale					
2. Difficulty coping with illness			.22**	.49**	.20**
3. Medical service inadequacy				.07	.19**
4. Awfulness of illness					.15**
5. Likelihood of illness					

Notes: SHAI = Short Health Anxiety Inventory; HCQ = Health Cognitions Questionnaire.

\* $p < .05$ ; \*\* $p < .01$

the strongest relation between difficulty coping with illness and perceived awfulness of illness and the weakest between medical service inadequacy and perceived awfulness of illness.

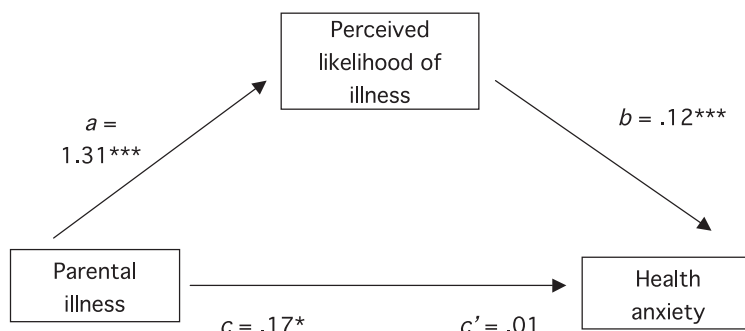
Parental illness variables were examined in the ill parent group. Almost half of participants reported having an ill mother (48.3%). Roughly one-third reported having an ill father (35.3%), and 16.4% reported both parents had a serious medical illness; 45.4% of parents suffered from cancer, 10.3% MS, 6.2% cardiovascular disease, and 8.2% of IBD; 27.8% reported their parent had been diagnosed with a serious illness other than the ones listed (e.g. arthritis, diabetes). A small portion of parents (2.1%) were described as having multiple medical conditions (e.g. cancer and IBD). Regarding age at diagnosis, 10.3% of offspring reported their parent was diagnosed before they were born, 15.4% reported they were between 0 and 5 years when their parent was diagnosed, 20.6% were between 6 and 12 years, 25.7% were between 13 and 17 years, and 27.9% reported they were between 18 and 25 years.

#### *Group comparison of health anxiety*

Hypothesis 1 stated individuals with ill parents would have higher levels of health anxiety than those with healthy parents. To test this hypothesis, an independent samples *t*-test compared group means on transformed SHAI scores. Individuals with ill parents reported greater levels of health anxiety than individuals with healthy parents (Table 1). This difference was small in magnitude but statistically significant,  $t(442) = 1.96$ ,  $p = .05$ ,  $d = .21$ .

#### *Group comparison of health beliefs*

Four independent samples *t*-tests were conducted to test whether, as per hypothesis 2, those with ill parents, vs. those with healthy parents, endorsed stronger health beliefs on the HCQ. Results showed a small, but significant, difference, with those with ill parents reporting higher levels of perceived likelihood of illness than those with healthy parents (Table 1),  $t(442) = 3.77$ ,  $p < .001$ ,  $d = .40$ . However, the groups did not significantly differ in their beliefs pertaining to the awfulness of illness, difficulty coping with illness, and medical service inadequacy.



**Figure 1.** Mediation model for the relationship between parental illness, elevated health anxiety, and perceived likelihood of illness. Coefficients shown are the unstandardized beta weights. \*\*\* $p < .001$ ; \* $p = .05$

### Mediation analysis

An estimate of 5,000 resampling iterations was used to test mediation. The bootstrapped estimate of the indirect effect was estimated to lie between  $-.25$  and  $-.07$  with 95% confidence, and it was concluded the indirect effect was different from zero at  $p < .05$ .

Using Baron and Kenny's (1986) criteria, and with parental illness coded as 1 and no parental illness coded as 0, results indicated the direct effect of parental illness on health anxiety was statistically different from zero ( $p = .05$ ); individuals with ill parents reported higher levels of health anxiety than those with healthy parents (Figure 1). The effect of parental illness on the perceived likelihood of illness (i.e. the mediator) was statistically different from zero ( $p < .001$ ); individuals with ill parents reported higher perceived likelihood of illness than those with healthy parents. The effect of perceived likelihood of illness on health anxiety, when controlling for parental illness, was also statistically significant ( $p < .001$ ); individuals who reported higher levels of perceived likelihood of illness had higher levels of health anxiety, even controlling for whether or not they had ill parents. Finally, the direct effect of parental illness on health anxiety, when controlling for perceived likelihood of illness, was not statistically different from zero ( $p = .86$ ). As Figure 1 shows, there was no relationship between parental illness and health anxiety after controlling for perceived likelihood of illness, indicating Baron and Kenny's (1986) criteria for mediation were satisfied. These results, and the results of the bootstrapping analysis, suggest perceived likelihood of illness mediated the effect of parental illness on health anxiety.

### Discussion

Our study fills a key gap in knowledge by testing links among exposure to serious parental illness, health beliefs, and health anxiety in a large sample of emerging adults with ill or healthy parents. Examination of these variables provided a novel test of a central tenet of the CB model of health anxiety; that is, past experiences with illness, such as illness in a parent, leads to the formation of negative beliefs about health, and subsequent health anxiety (Salkovskis and Warwick, 2001; Warwick and Salkovskis, 1990). To our knowledge, only

one study has tested the link between illness in a parent and increased health anxiety in the offspring (Noyes et al., 2002). Results of this study indicated the experience of having a parent who was seriously ill was not more common among individuals whose symptoms met diagnostic criteria for hypochondriasis. In contrast, results of our study demonstrated higher levels of health anxiety among offspring with seriously ill parents in comparison to offspring with healthy parents. Our study improves on past research by measuring health anxiety as a continuous rather than categorical variable and by using a substantially larger sample (thereby generating more trustworthy statistical estimates). To our knowledge, no studies have tested the role health beliefs play in mediating the connection between parental illness and health anxiety. Clarification of such mediating factors is important, as they highlight targets for assessment and treatment by identifying mechanisms responsible for the relation between exposure to serious parental illness and subsequent health anxiety. Thus, our results incrementally advance understanding of the CB model of health anxiety.

#### *Comparison of health anxiety and health beliefs*

Consistent with past research and the CB model (Salkovskis and Warwick, 2001), individuals who had a parent with a serious illness vs. those who did not reported higher levels of health anxiety. This effect was small in magnitude, yet statistically significant. In regards to beliefs, results revealed those with ill parents reported higher levels of perceived likelihood of illness than those with healthy parents. This was a small but significant effect. Of note, those with ill parents did not report higher levels of other health beliefs such as perceived awfulness of illness, difficulty coping with illness, or medical service inadequacy. Having an ill parent may be *specifically* related to the belief one has an increased risk of illness rather than to other negative beliefs about health. It is unclear why other differences between groups were not observed. It is possible these beliefs are present to at least some extent among all individuals based on observations of illness in others or themselves. For example, most people would presumably perceive receiving a diagnosis of cancer as potentially awful and would perceive coping with this diagnosis and the subsequent treatment as a difficult task. Similarly, it is likely most hold at least some doubt towards the medical system given that medical errors are not uncommon and are often given attention in the media (Li, Morway, Velasquez, Weingart and Stuver, 2013).

#### *Mediation and health beliefs*

Further support for the CB model was provided through the mediation analysis. Results indicated the relationship between parental illness and health anxiety in offspring was fully mediated by perceived likelihood of illness. These results bring greater specificity to the CB model, as other key beliefs (i.e. perceptions of the awfulness of illness, difficulty coping with illness, medical service inadequacy) did not act as mediators. These results are also clinically relevant, as they suggest beliefs about the likelihood of illness should be intervention targets for health anxious individuals with a history of serious parental illness.

Although all individuals have some level of risk for contracting a serious disease, those who have had a parent diagnosed are often at higher risk, given the heritable component of many illnesses (Hindorff, Gillanders and Manolio, 2011). Based on these results, it could be argued that perceiving oneself as more likely to develop a serious illness based on a parent's illness



is not a dysfunctional perception but is instead realistic. Moreover, this type of perception may motivate some individuals to engage in health-promoting behaviours. This is consistent with adolescents' reports of attitudinal and behavioural changes following the diagnosis of cancer in their parent (e.g. commitment to a healthier life to reduce cancer risk or obtaining information about cancer; Kissil, Niño, Jacobs, Davey and Tubbs, 2010). It is also possible parental illness could lead to more adaptive cognitive processing in offspring. This experience may increase the offspring's resilience to the real threat of illness, create realistic illness-related imagery, or potentially alert individuals to realistic and helpful treatment information about an illness they may be at risk of developing.

These findings raise the important but frequently overlooked issue of determining when health anxiety moves from being adaptive to maladaptive. Regardless of experiences with parental illness, some level of health anxiety may be adaptive as it motivates individuals to engage in appropriate actions (e.g. take prescribed medications) or seek needed medical attention (Abramowitz and Braddock, 2008). Although perceiving oneself as being at increased risk for a particular illness based on family history of that illness is associated with elevated health anxiety, this belief may be adaptive as it could motivate individuals to engage in behaviours aimed at reducing their risk of illness (e.g. following nutrition guidelines). To directly address the adaptive vs. maladaptive issue, research should explore whether elevated health anxiety among individuals with an ill parent is associated with increased health-promoting and preventative behaviours, or whether it is associated with negative outcomes that are often observed with more severe levels of health anxiety such as increased reassurance seeking and reduced quality of life. Given our findings, individuals exposed to parental illness may be an ideal group in which to examine these adaptive and maladaptive behaviours.

### *Limitations and conclusions*

There was wide variability among the parental illnesses reported. Our findings may have differed if the study had been limited to a specific parental illness. The study also focused on the offspring's perception of their parent having experienced a serious illness as compared to an objective measure of illness severity. We assumed it was the perception of severity that was most important, but study of offspring who experience a parent with an objectively serious illness deserves examination. Similarly, it may be interesting to compare health anxiety among individuals whose parents differed in the degree of heritability of the illness. Another variable that could also be examined is whether offspring who have known medical risks that are the subject of comment at annual physical evaluations experience elevated health anxiety. It is possible both of these variables may influence health anxiety among those with a medically ill parent. There was a large range in the participants' age at the time of parental diagnosis, extending from before birth to young adulthood. This factor may have reduced the reliability of some retrospective reports, given the amount of time elapsed since the childhood experience. Our study also lacked other measures of distress (e.g. depression and generalized anxiety). The absence of such measures makes it more difficult to ascertain the specificity to health anxiety of the observed differences. However, this issue was considered to be less of a concern given research supporting the discriminant validity of the SHAI (Abramowitz et al., 2007).

The cross-sectional design used precludes causal inferences regarding the relationship between parental illness, health beliefs, and health anxiety. While past experiences with

parental illness may precede beliefs about the likelihood of illness, another factor might both strengthen these beliefs and trigger health anxiety. For example, parental illness may lead to somatic hypervigilance and/or reassurance-seeking, which could lead to dysfunctional health beliefs and health anxiety. Longitudinal research is needed in order to examine the development of health anxiety over time and to establish the temporal unfolding of these factors. Although research has indicated findings generated from internet-based surveys generalize across presentation formats and are consistent with findings from traditional methods, it is also recognized that data could be compromised by the anonymity of participants (Gosling, Vazire, Srivastava and John, 2004). Steps were taken to minimize this limitation by eliminating repeat responses from the same IP address. Finally, our study did not examine behavioural or perceptual components of health anxiety (e.g. reassurance-seeking and somatic hypervigilance). Research is needed to explore the influence parental illness may have on behavioural and somatic expressions of health anxiety and how such findings could be incorporated into the CB model.

We also note that, in addition to parental illness, there are other potential pathways to the development of health beliefs and health anxiety that deserve research attention (e.g. hearing about the prevalence of illnesses, medical errors, or misdiagnoses via the media as well as friends and family). Experiencing these situations directly or observing them with a loved one may lead to the development of beliefs and health anxiety (Rachman, 2012).

In summary, our findings support the CB model of health anxiety in that the relationship between parental illness and health anxiety was mediated by beliefs about the likelihood of illness. These findings highlight the importance of a specific health belief as a contributor to health anxiety among individuals who have experienced serious illness in a parent, thereby adding specificity to the CB model.

## References

- Abramowitz, J. S. and Braddock, A. E.** (2008). *Psychological Treatment of Health Anxiety and Hypochondriasis: a biopsychosocial approach*. Cambridge, MA: Hogrefe and Huber.
- Abramowitz, J. S., Olatunji, B. O. and Deacon, B. J.** (2007). Health anxiety, hypochondriasis, and the anxiety disorders. *Behavior Therapy*, 38, 86–94. doi: [16/j.beth.2006.05.001](https://doi.org/10.1016/j.beth.2006.05.001)
- Alberts, N. M., Hadjistavropoulos, H. D., Jones, S. L. and Sharpe, D.** (2013). The Short Health Anxiety Inventory: a systematic review and meta-analysis. *Journal of Anxiety Disorders*, 27, 68–78. doi: [10.1016/j.janxdis.2012.10.009](https://doi.org/10.1016/j.janxdis.2012.10.009)
- American Psychiatric Association** (2013). *Diagnostic and Statistical Manual of Mental Disorders (5th ed.)*. Arlington, VA: American Psychiatric Publishing.
- Asmundson, G. J. G., Taylor, S., Carleton, N. R., Weeks, J. W. and Hadjistavropoulos, H. D.** (2012). Should health anxiety be carved at the joint? A look at the health anxiety construct using factor mixture modeling in a non-clinical sample. *Journal of Anxiety Disorders*, 26, 246–251. doi: [10.1016/j.janxdis.2011.11.009](https://doi.org/10.1016/j.janxdis.2011.11.009)
- Baron, R. M. and Kenny, D. A.** (1986). The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173–1182. doi: [10.1037/0022-3514.51.6.1173](https://doi.org/10.1037/0022-3514.51.6.1173)
- Barsky, A. J., Ettner, S. L., Horsky, J. and Bates, D. W.** (2001). Resource utilization of patients with hypochondriacal health anxiety and somatization. *Medical Care*, 39, 705–715.

- Chang, E. T., Smedby, K. E., Hjalgrim, H., Glimelius, B. and Adami, H.-O. (2006). Reliability of self-reported family history of cancer in a large case-control study of lymphoma. *Journal of the National Cancer Institute*, 98, 61–68. doi: [10.1093/jnci/djj005](https://doi.org/10.1093/jnci/djj005)
- Coles, M. E., Cook, L. M. and Blake, T. R. (2007). Assessing obsessive compulsive symptoms and cognitions on the internet: evidence for the comparability of paper and internet administration. *Behaviour Research and Therapy*, 45, 2232–2240. doi: [10.1016/j.brat.2006.12.009](https://doi.org/10.1016/j.brat.2006.12.009)
- Compas, B. E., Worsham, N. L., Epping-Jordan, J. E., Grant, K. E., Mireault, G., Howell, D. C., et al. (1994). When mom or dad has cancer: markers of psychological distress in cancer patients, spouses, and children. *Health Psychology*, 13, 507–515.
- Field, A. P. (2009). *Discovering Statistics Using SPSS (3rd ed.)*. London: Sage.
- Gosling, S. D., Vazire, S., Srivastava, S. and John, O. P. (2004). Should we trust web-based studies? A comparative analysis of six preconceptions about internet questionnaires. *The American Psychologist*, 59, 93–104. doi: [10.1037/0003-066X.59.2.93](https://doi.org/10.1037/0003-066X.59.2.93)
- Hadjistavropoulos, H., Janzen, J., Kehler, M., Leclerc, J., Sharpe, D. and Bourgault-Fagnou, M. (2012). Core cognitions related to health anxiety in self-reported medical and non-medical samples. *Journal of Behavioral Medicine*, 35, 167–178. doi: [10.1007/s10865-011-9339-3](https://doi.org/10.1007/s10865-011-9339-3)
- Hayes, A. F. (2009). Beyond Baron and Kenny: statistical mediation analysis in the new millennium. *Communication Monographs*, 76, 408–420. doi: [10.1080/03637750903310360](https://doi.org/10.1080/03637750903310360)
- Hindorff, L. A., Gillanders, E. M. and Manolio, T. A. (2011). Genetic architecture of cancer and other complex diseases: lessons learned and future directions. *Carcinogenesis*, 32, 945–954. doi: [10.1093/carcin/bgr056](https://doi.org/10.1093/carcin/bgr056)
- Kissil, K., Niño, A., Jacobs, S., Davey, M. and Tubbs, C. Y. (2010). “It has been a good growing experience for me”: growth experiences among African American youth coping with parental cancer. *Families, Systems, and Health*, 28, 274–289. doi: [10.1037/a0020001](https://doi.org/10.1037/a0020001)
- Li, J. W., Morway, L., Velasquez, A., Weingart, S. N. and Stuver, S. O. (2013). Perceptions of medical errors in cancer care: an analysis of how the news media describe sentinel events. *Journal of Patient Safety*. doi: [10.1097/PTS.0000000000000039](https://doi.org/10.1097/PTS.0000000000000039)
- Longley, S. L., Broman-Fulks, J. J., Calamari, J. E., Noyes, R., Wade, M. and Orlando, C. M. (2010). A taxometric study of hypochondriasis symptoms. *Behavior Therapy*, 41, 505–514. doi: [10.1037/a0020001](https://doi.org/10.1037/a0020001)
- Marcus, D. K., Gurley, J. R., Marchi, M. M. and Bauer, C. (2007). Cognitive and perceptual variables in hypochondriasis and health anxiety: a systematic review. *Clinical Psychology Review*, 27, 127–139. doi: [10.1016/j.cpr.2006.09.003](https://doi.org/10.1016/j.cpr.2006.09.003)
- Niemelä, M., Paananen, R., Hakko, H., Merikukka, M., Gissler, M. and Räsänen, S. (2012). The prevalence of children affected by parental cancer and their use of specialized psychiatric services: the 1987 Finnish Birth Cohort study. *International Journal of Cancer*, 131, 2117–2125. doi: [10.1002/ijc.27466](https://doi.org/10.1002/ijc.27466)
- Noyes, R., Jr., Carney, C. P., Hillis, S. L., Jones, L. E. and Langbehn, D. R. (2005). Prevalence and correlates of illness worry in the general population. *Psychosomatics*, 46, 529–539. doi: [10.1176/appi.psy.46.6.529](https://doi.org/10.1176/appi.psy.46.6.529)
- Noyes, R., Jr., Stuart, S., Langbehn, D. R., Happel, R. L., Longley, S. L. and Yagla, S. J. (2002). Childhood antecedents of hypochondriasis. *Psychosomatics*, 43, 282–289. doi: [10.1176/appi.psy.43.4.282](https://doi.org/10.1176/appi.psy.43.4.282)
- Preacher, K. J. and Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, and Computers*, 36, 717–731. doi: [10.3758/BF03206553](https://doi.org/10.3758/BF03206553)
- Rachman, S. (2012). Health anxiety disorders: a cognitive construal. *Behaviour Research and Therapy*, 50, 502–512. doi: [10.1016/j.brat.2012.05.001](https://doi.org/10.1016/j.brat.2012.05.001)

- Romer, G., Barkmann, C., Schulte-Markwort, M., Thomalla, G. and Riedesser, P.** (2002). Children of somatically ill parents: a methodological review. *Clinical Child Psychology and Psychiatry*, 7, 17–38. doi: [10.1177/1359104502007001003](https://doi.org/10.1177/1359104502007001003)
- Salkovskis, P. M., Rimes, K. A., Warwick, H. M. C. and Clark, D. M.** (2002). The Health Anxiety Inventory: development and validation of scales for the measurement of health anxiety and hypochondriasis. *Psychological Medicine*, 32, 843–853. doi: [10.1017/S0033291702005822](https://doi.org/10.1017/S0033291702005822)
- Salkovskis, P. M. and Warwick, H. M. C.** (2001). Making sense of hypochondriasis: a cognitive model of health anxiety. In G. J. G. Asmundson, S. Taylor and B. Cox (Eds.), *Health Anxiety: clinical and research perspectives on hypochondriasis and related conditions* (pp. 46–64). Toronto: John Wiley and Sons.
- Schönbrodt, F. D. and Perugini, M.** (2013). At what sample size do correlations stabilize? *Journal of Research in Personality*, 47, 609–612. doi: [10.1016/j.jrp.2013.05.009](https://doi.org/10.1016/j.jrp.2013.05.009)
- Warwick, H. M. C. and Salkovskis, P. M.** (1990). Hypochondriasis. *Behaviour Research and Therapy*, 28, 105–117. doi: [10.1016/0005-7967\(90\)90023-C](https://doi.org/10.1016/0005-7967(90)90023-C)