Psychological Mechanisms of Health Anxiety: Evidence for the Metacognitive Model

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An honours thesis submitted to the Department of Psychology

in partial fulfillment of the requirements for the degree of

Bachelor of Arts (Honours Psychology)

Department of Psychology

MacEwan University

Edmonton, Alberta

April 9, 2021

Abstract

Individuals with severe health anxiety (HA) disproportionately believe that they have, or may acquire, a serious illness. Additionally, individuals with severe HA often engage in somatization, which is the tendency to report physical symptoms that do not have a detectable cause. Past research has established that anxiety sensitivity, somatosensory amplification, and catastrophic beliefs contribute to HA. Other variables, such as intolerance of uncertainty (IU) and metacognitive beliefs about health, have been recently associated with HA. However, these factors have not been assessed together in a single study. Through self-report questionnaires, the present study examined whether IU, metacognitions, and cognitive avoidance are associated with HA in a university sample (N = 564). Cognitive avoidance was included as an exploratory variable. Using a hierarchical regression analysis, metacognitions about illness beliefs, and metacognitions about the uncontrollability of thoughts, uniquely predicted HA when controlling for both anxiety sensitivity and somatosensory amplification. An additional hierarchical regression analysis determined that metacognitions about illness, metacognitions about the uncontrollability of thoughts, and metacognitions about biased beliefs uniquely predicted somatization when controlling for anxiety sensitivity and somatosensory amplification. IU, catastrophic beliefs, and cognitive avoidance did not emerge as unique predictors for either HA or somatization. These results indicate that both researchers and clinicians may wish to further explore the role of metacognitive beliefs about health in the development and maintenance of HA.

Acknowledgements

I would like to thank my honours supervisor, Dr. Alexander Penney. I always tell my peers I lucked out with having the supervisor that I did. Dr. Penney has spent countless hours refining my writing and research skills. Working with him and in his lab has enriched my undergraduate experience, and I am grateful for the professional and academic skills that he helped me develop. I am confident that his mentorship has prepared me for future graduate studies. Thank you to Dr. Kathleen Corrigall for agreeing to be my second reader for my thesis. I had the opportunity to briefly participate in Dr. Corrigall's lab as a research assistant for her student's thesis project, as well as being a student in her class. Dr. Corrigall changed my view on education, which has encouraged me to approach my thesis as an opportunity to challenge myself and collaborate with others.

I would also like to thank members of the WAHA lab and my honours cohort. There have been many times that I have asked for advice or bounced ideas off my fellow peers, and I am always thankful for their genuine responses and how they took time out of their busy schedules to help me improve. It has been a pleasure to go through the honours program with these individuals and having fellow peers that understand this unique experience. I wish each one the best in their future careers and studies.

Lastly, I would like to thank my fiancé Steven Carmichael, who has been my moral support and continually cheered me on. He has always sacrificed his time so that I could focus on my thesis and schoolwork. He is the epitome of serving others well so that they may pursue their dreams, and I aspire to be at least half the person he is.

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List of Abbreviations

ASI-3	Anxiety Sensitivity Index-3
ASI-C	Anxiety Sensitivity Index-3 – Cognitive Concerns
ASI-S	Anxiety Sensitivity Index-3 – Social Concerns
ASI-P	Anxiety Sensitivity Index-3 – Physical Concerns
CAQ	Cognitive Avoidance Questionnaire
CAQ-AVD	Cognitive Avoidance Questionnaire – Avoidance
CAQ-DIS	Cognitive Avoidance Questionnaire – Distraction
CAQ-SUB	Cognitive Avoidance Questionnaire – Substitution
CAQ-SUP	Cognitive Avoidance Questionnaire – Suppression
CAQ-TRAN	Cognitive Avoidance Questionnaire – Transformation of Thoughts into Images
HA	Health anxiety
IU	Intolerance of uncertainty
IUS	Intolerance of Uncertainty Scale
IUS-18	Intolerance of Uncertainty Scale-18 Item Version
IUS-INH	Intolerance of Uncertainty Scale – Inhibitory
IUS-PRO	Intolerance of Uncertainty Scale – Prospective
MCQHA	Metacognition Questionnaire-Health Anxiety
MCQ-B	Metacognition Questionnaire-Health Anxiety – Biased Beliefs
MCQ-I	Metacognition Questionnaire-Health Anxiety – Illness Beliefs
MCQ-U	Metacognition Questionnaire-Health Anxiety – Uncontrollable Beliefs
PHQ-15	Patient Health Questionnaire-15
SHAI	Short Health Anxiety Inventory

SOS	Symptoms and Outcomes Scale
SOS-CAT	Symptoms and Outcomes Scale – Catastrophic Interpretations
SOS-MIN	Symptoms and Outcomes Scale – Minor Interpretations
SSAS	Somatosensory Amplification Scale

Psychological Mechanisms of Health Anxiety: Evidence for the Metacognitive Model

To some extent, everyone worries about their health from one time to another. Worrying about health is known as health anxiety (HA). HA exists on a spectrum, ranging from low to high levels of worry (Salkovskis et al., 2002). People with severe HA worry excessively about their health, and disproportionately fear that they have, or may acquire, a dangerous illness (Warwick & Salkovskis, 1990). Furthermore, individuals with severe HA misinterpret normal somatic sensations as threatening (Warwick & Salkovskis, 1990). There is also a tendency for individuals with severe HA to engage in somatization, which is the process of reporting symptoms and physical ailments that appear to not have a detectable cause (Barsky et al., 2001). Individuals with severe HA often frequent their primary care facilities unnecessarily and create a significant burden on health services (Tyrer et al., 2011). Additionally, severe HA is associated with poor recovery from medically verifiable physical ailments (Tyrer et al., 2011).

Traditionally, individuals with severe HA likely met the criteria for hypochondriasis (American Psychological Association [APA], 2000). Recently, illness anxiety disorder and somatosensory disorder replaced hypochondriasis in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (APA, 2013). Individuals with these disorders are highly anxious about their health and unreasonably preoccupied with illness-related concerns. However, an individual with illness anxiety disorder does not need to exhibit somatic symptoms, while an individual with somatosensory disorder does (APA, 2013). Illness anxiety disorder and somatosensory disorder show considerable overlap in the criteria needed for diagnosis, with the definitive feature being HA (Newby et al., 2017). Since HA is essential in diagnosing these disorders, the present study will focus on the underlying construct of HA.

HA is not only related to illness anxiety disorder and somatosensory disorder but is also closely related to anxiety disorders, as many anxiety disorders involve health concerns. For example, an individual with generalized anxiety disorder may have a specific worry regarding their health. Additionally, individuals with obsessive-compulsive disorder may fear germs and illness-contamination. Abramowitz et al. (2007) found similarities between the psychological mechanisms underlying hypochondriasis and panic disorder, phobias, and obsessive-compulsive disorder. Hypochondriasis and the latter anxiety disorders all exhibit similarities in excessive body vigilance, reassurance-seeking, misinterpreting somatic sensations as dangerous, and heightened anxiety sensitivity (Olatunji et al., 2009a). Research has also found that many thinking styles related to anxiety disorders, such as maladaptive metacognitive beliefs and intolerance of uncertainty (IU), also correlate with HA (Bailey & Wells, 2014; Deacon & Abramowitz, 2008).

Furthermore, research conducted by Scarella et al. (2016) examined whether hypochondriasis should be categorized as a somatoform, depressive, or anxiety disorder. Scarella et al. (2016) found that comorbid anxiety disorders were more prevalent among hypochondriacal patients than comorbid depression. Moreover, the researchers concluded that when controlling for somatization symptoms, worries about health were related to anxiety disorders instead of mood. Furthermore, health worry correlated more with anxiety than with somatization. The Scarella et al. (2016) study demonstrates that the underlying construct of HA is more similar to anxiety disorders compared to mood or somatoform disorders.

The conventional and most widely used approach toward HA is Warwick and Salkovskis' (1990) cognitive-behavioural model, which theorizes that dysfunctional illness-related beliefs contribute to the misinterpretation of bodily sensations and catastrophic thinking. In turn,

catastrophic thinking leads to high levels of anxiety and causes an attentional bias, which worsens illness conviction and physical, cognitive, behavioural, and affective symptoms. The perceptual model of HA is another approach that has received recognition and posits that individuals with hypochondriasis perceive and amplify physical sensations as harmful (Barsky et al., 1990). A review by Marcus et al. (2007) examined the empirical support for the cognitive-behavioural and perceptual models of hypochondriasis and HA. In particular, Marcus et al. (2007) reviewed studies that targeted dysfunctional illness-related assumptions and cognitive processes, HA triggers, and somatic perception and amplification. Marcus et al. (2007) concluded that empirical research demonstrates that HA is related to dysfunctional beliefs and generally supports the central facets of the cognitive-behavioural model. The support for the perceptual model of HA was less substantial. Further, Marcus et al. (2007) proposed that the cognitive-behavioural model could be further developed by focusing on identifying the underlying cognitive processes of HA and whether particular cognitive processes are specific to HA. Moreover, understanding HA more fully would advance the treatment of HA. Therefore, the present study aims to examine cognitive functions that likely influence HA that have not been previously investigated together. In particular, how IU, metacognitive beliefs, and cognitive avoidance contribute to HA.

IU is considered a transdiagnostic factor across anxiety and mood disorders (Carleton, 2016). Carleton (2012) conceptualizes IU as a dispositional characteristic where an individual is unable to withstand negative events, either internal or external, that elicit uncertainty. Individuals with high levels of IU hold maladaptive beliefs toward uncertainty, fear the unknown, and react poorly when faced with ambiguous situations (Carleton, 2016). Primarily, research has found a strong correlation between IU and worry (Birrell et al., 2011; Buhr & Dugas, 2006; Dugas et al.,

2001; Einstein, 2014). However, research has also found that IU positively correlates with severe HA and acts as a maintaining factor (Deacon & Abramowitz, 2008). IU holds important implications regarding HA, as individuals with severe HA may find it difficult to tolerate any health-related uncertainty (Deacon & Abramowitz, 2008). Furthermore, individuals with high levels of IU may engage in reassurance and checking behaviour, which is characteristic of individuals with severe HA (Norris & Marcus, 2014).

Currently, research has established that there is a significant association between IU and HA, and that IU incrementally contributes to levels of HA (Boelen & Carleton, 2012; Deacon & Abramowitz, 2008; Fergus & Bardeen, 2013; Kaur et al., 2011; Kraemer et al., 2016; Wright et al., 2016). Additionally, IU is associated with the cognitive domain of HA, such as worry about illness and catastrophic health appraisals (Gerolimatos & Edelstein, 2012; Fergus & Valentiner, 2011). Moreover, IU has is associated with HA related behaviours. For example, Fergus (2013) found that IU moderated the effect on the relationship between HA and searching for medical information on the Internet. Horenstein et al. (2019) found that high levels of IU and anxiety sensitivity were significantly associated with increased medical care utilization. However, research has also found that the IU does not act independently from anxiety sensitivity, as anxiety sensitivity mediates the relationship between IU and HA (O'Bryan & McLeish, 2017; Fetzner et al., 2014). The present study aims to examine IU with another promising mechanism that researchers have found to influence HA, which is metacognitive beliefs (Bailey & Wells, 2015a).

Metacognitive beliefs are the beliefs that an individual has toward his or her thought processes (Bailey & Wells, 2015a). These beliefs are focused on controlling, modifying, and interpreting thoughts, and can be positive or negative (Bailey & Wells, 2015a; Wells &

Cartwright-Hatton, 2004). For example, an individual can view their worrying as conducive and beneficial or as harmful and distressing. Commonly researched metacognitive beliefs are positive beliefs about worry, negative beliefs about the uncontrollability and danger of thoughts, and the maladaptive belief that one needs to control their thoughts (Wells & Cartwright-Hatton, 2004). Metacognitive beliefs are argued to contribute to the development and maintenance of anxiety and mood disorders (Wells, 2009). For example, individuals with generalized anxiety disorder, depression, and panic disorder exhibit negative metacognitive beliefs (Wells & Carter, 2001). To examine the relationship between HA and metacognitive beliefs, Bailey and Wells (2015c) developed a measure that specifically measures metacognitive beliefs about health. Bailey and Wells (2016) found that metacognitive beliefs about health strongly predict HA symptoms. In particular, believing that thinking about illness is uncontrollable or that worrying about illness is useful, appear to strongly relate to HA (Bailey & Wells, 2016; Melli et al., 2018). The metacognitive model provides an alternative view that HA is more related to beliefs about thinking, rather than dysfunctional beliefs toward illness (Bailey & Wells, 2015b).

Currently, empirical research suggests that there is a significant relationship between metacognitive beliefs and HA (Bailey & Wells, 2015a; Melli et al., 2016; Fergus & Spada, 2018; Solem et al., 2015). Bailey and Wells (2015a) found positive associations between metacognitive beliefs about health, catastrophic misinterpretation, and HA. Additionally, metacognitive beliefs about health are found to be stronger predictors of HA than catastrophic misinterpretation, dysfunctional illness-related beliefs, neuroticism, and somatosensory amplification (Bailey & Wells, 2015a, 2015b, 2016). Likewise, Melli et al. (2016) found that metacognitive beliefs about health were the strongest predictor of HA, after controlling for anxiety, depression, anxiety sensitivity, and illness-related dysfunctional beliefs.

Additionally, treatment-outcome research demonstrates that changes in metacognitive beliefs resulted in a clinically meaningful improvement in HA symptoms (Bailey & Wells, 2014; Solem et al., 2015). Furthermore, Melli et al. (2017) examined metacognitive beliefs about health amongst participants with a diagnosis of severe HA and found that the metacognitive beliefs about health predicted HA symptoms above depression, anxiety, anxiety sensitivity, and health-related dysfunctional beliefs. While research indicates that both IU and metacognitive beliefs are significantly associated with HA, they have not been examined together in previous HA research.

In addition to IU and metacognitive beliefs about health, a third mechanism of interest, cognitive avoidance, will be examined. Cognitive avoidance describes the use of strategies to avoid thoughts about distressing situations or problems (Borkovec et al., 1998). These strategies may consist of suppressing thoughts, worrying, or distracting oneself (Wells & Davies, 1994). Paradoxically, suppressing thoughts may cause an increase in the frequency of the thought being suppressed (Sexton & Dugas, 2008a). Concerning HA, individuals who suppress health concerns may experience increased frequency of health worries. Researchers propose that cognitive avoidance maintains anxiety disorders and inhibits emotional processing (Langlois & Ladouceur, 2004; Sexton & Dugas, 2008a). Researchers have primarily examined the relationship between cognitive avoidance and generalized anxiety disorder (Sexton & Dugas, 2008a; Sexton & Dugas, 2009; Stapinski et al., 2010). Regarding its contribution to HA, there is limited, but promising research. In particular, one study showed that adapting a treatment designed to treat mechanisms of generalized anxiety disorder, which includes targeting cognitive avoidance and worry, decreased participants' levels of HA (Langlois & Ladouceur, 2004). Additionally, previous research demonstrates that metacognitive beliefs, such as negative beliefs about worry, predicts

cognitive avoidance (Sexton & Dugas, 2008b). The present study will examine the potential relationship between cognitive avoidance and HA, as there is no current research that has specifically examined this relationship.

Present Study

In sum, psychological mechanisms such as IU, metacognitive beliefs about health, and cognitive avoidance may be central in understanding HA. However, research on the relationship between HA and IU, metacognitive beliefs about health, and cognitive avoidance, and their specific, unique contributions is scarce, and to the author's knowledge have not been investigated before in the same study. The present study aims to examine the relationship between HA and somatization and the proposed mechanisms of IU, metacognitive beliefs about health, and cognitive avoidance. Somatization was included in the present study to examine which factors were related to the physical sensations that often accompany health anxiety, in addition to the beliefs that are associated with health anxiety.

Additionally, the author controlled for constructs that have an established relationship with HA, such as anxiety sensitivity, somatosensory amplification, and catastrophic illness-related beliefs. Anxiety sensitivity describes the fear of anxiety-related arousal and is instrumental in conceptualizing anxiety disorders (Taylor et al., 2007). Anxiety sensitivity is strongly correlated with hypochondriacal concerns and is predictive of some components of HA, such as body checking (Bravo & Silverman, 2001; Norton & Sears Edwards, 2017; Olatunji et al., 2009b). Likewise, somatosensory amplification is the tendency to perceive physical sensations as noxious and is highly elevated in individuals with severe HA (Barsky et al., 1990; Freyler et al., 2013; Köteles & Doering, 2016). Finally, catastrophic illness-related beliefs encompass the tendency to overestimate the probability of having or acquiring an illness and are

considered a core feature of HA (Marcus, 1999; Marcus et al., 2007; Warwick & Salkovskis, 1990).

Hypotheses

As previous research has not examined metacognitive beliefs, IU, and cognitive avoidance with HA and somatization in the same study before, this study is largely exploratory. Although exploratory, I made the following predictions:

Hypothesis 1: Measures of IU, metacognitive beliefs about health, and cognitive avoidance will significantly correlate with measures of HA and somatization.

Hypothesis 2: IU will account for more variance in HA and somatization than cognitive avoidance beliefs and metacognitions about health.

Hypothesis 3: IU will be the dominant predictor, compared to metacognitive beliefs about health and cognitive avoidance, and will predict HA and somatization beyond the established predictors of anxiety sensitivity, somatosensory amplification, and catastrophic beliefs.

Method

Participants

The sample for the present study consisted of 600 undergraduate psychology students at MacEwan University. Participants were recruited via MacEwan University's online research site. Of the 600 participants, 36 were removed from data analyses because of missing data, resulting in 564 participants in the final sample. Students could voluntarily sign up for the study and were eligible to receive two percent course credit for a psychology course for participating in the study. The majority of students were Caucasian and female, with a mean age of 21.83 years old (see Table 1).

Table 1.
Participant demographic characteristics (N = 564)

Characteristics	Mean	*SD*	Frequency	Percentage
Age	21.83	5.042		
Sex				
Female			408	72.3%
Male			151	26.8%
Other			5	1.0%
Gender				
Female			405	71.8%
Male			148	26.2%
Non-Binary			4	0.7%
Trans Man			1	0.2%
Two-Spirit			1	0.2%
Other/Not Specified			5	0.9%
Ethnicity				
Caucasian/White			307	54.4%
Southeast Asian			52	9.2%
Middle Eastern			32	5.7%
Mixed Race			26	4.6%
African Canadian/Black			26	4.6%
African			22	3.9%
Eastern European			15	2.7%
East Asian			14	2.5%
Hispanic/Latino			11	2.0%
Indigenous/Aboriginal			8	1.4%
Other			51	8.6%
Marital Status				
Single			316	56.0%
Dating			184	32.6%
Married/common law			53	9.4%
Divorced/separated			9	1.6%
Current Employment				
Full-time			54	9.6%
Part-time			300	53.2%
Not employed			208	36.9%

Note. Percentages do not always add to 100% due to missing data.

Measures

Demographics Measure

Demographic questionnaire. This questionnaire consists of 9-items assessing demographic factors. Specifically, participants were asked questions regarding sex, gender, age, ethnicity, relationship status, education, employment, and if they have any medical or mental conditions.

Health Anxiety Measures

Short Health Anxiety Inventory (SHAI; Salkovskis et al., 2002). The SHAI is an 18-item questionnaire that measures HA. Each item consists of four statements, and the participant chooses the statement that is most applicable. Item scores range from 0 to 3, and total scores range from 0 to 54. Higher scores represent greater levels of HA. The SHAI is a good predictor of HA (Salkovskis et al., 2002). Moreover, the SHAI demonstrates excellent internal consistency (α = .95) and acceptable test-retest reliability (r = 0.76; Salkovskis et al., 2002). In addition, a meta-analysis of the SHAI concluded that the SHAI has acceptable Cronbach's alpha scores, strong construct validity, and is a psychometrically sound tool for assessing HA (Alberts et al., 2013).

Patient Health Questionnaire-15 (PHQ-15; Kroenke et al., 2002). The PHQ-15 comprises 15-items that assess self-reported somatic symptom severity. Additionally, the PHQ-15 correlates with HA and health-related quality of life (Gierk et al., 2015). Participants rate items on a 3-point Likert-type scale (0 = *not at all* to 2 = *bothered a lot*) with scores ranging from 0 to 30. Higher scores demonstrate a greater frequency and severity of somatic symptoms. The PHQ-15 shows good internal reliability (α = 0.80; Gierk et al., 2015; Kroenke et al., 2002).

Moreover, the PHQ-15 indicates good convergent validity because PHQ-15 scores strongly associate with sick days used and patients' overall level of functioning (Kroenke et al., 2002).

Mechanisms of Interest

Intolerance of Uncertainty Scale (IUS; Buhr & Dugas, 2002). The IUS is a 27-item self-report questionnaire that assesses how an individual reacts to uncertainty and ambiguous events. Participants rate items on a 5-point Likert scale (1 = *not at all characteristic of me* to 5 = *entirely characteristic of me*) with higher scores indicating greater levels of IU. The IUS shows excellent internal consistency and test-retest reliability (Buhr & Dugas, 2002; Khawaja & Yu, 2010). While the IUS demonstrates strong psychometric properties, some researchers debate whether the IUS factors are valid, as analyses consistently find a range of possible factors (Hong & Lee, 2015). As such, Carleton et al. (2007) developed a short version of the IUS that reliably demonstrated a two-factor structure and consisted of 12 items, which is more commonly used in current research. However, the 12-item short-form version of the IUS has also been criticized for compromising content and construct validity (Sexton & Dugas, 2009). A recent study by Hong and Lee (2015) administered the IUS, conducted exploratory and confirmatory factor analyses, and concluded that an 18-item version had better psychometric properties and greater validity than the 12-item IUS. As such, while participants completed the entire 27-item IUS, the present study will only utilize the items associated with the 18-item version of the IUS (IUS-18). Total scores of the IUS-18 range from 18 to 90. The IUS-18 also includes two subscales: the IUS-18 PRO and IUS-18 INH. The IUS-18 PRO subscale measures prospective IU, which represents actively seeking out strategies to decrease uncertainty and increase certainty (Hong & Lee, 2015). In comparison, the IUS-18 INH subscale measures inhibitory IU, which describes the phenomenon of becoming paralyzed when faced with uncertainty and the subsequent impaired

functioning (Hong & Lee, 2015). Total scores of the IUS-18 subscales range from 9 to 45, with higher scores representing greater IU.

Metacognition Questionnaire-Health Anxiety (MCQHA; Bailey & Wells, 2015c). The MCQHA consists of 14-items that measure an individual's metacognitive beliefs toward thinking about health (Bailey & Wells, 2015c). Participants rate items on a 4-point Likert-type scale (1 = *do not agree* to 4 = *agree very much*) with higher scores representing greater metacognitive beliefs regarding HA. The MCQHA has three distinct subscales. These subscales are beliefs about biased thinking (MCQ-B), beliefs that thoughts can cause illness (MCQ-I), and beliefs that thoughts about illness are uncontrollable (MCQ-U). The MCQ-B describes the perception that thinking in particular ways can preclude or cause illness (Bailey & Wells, 2015c). The total scores for MCQ-I and MCQ-B range from 0 to 20. The MCQ-U subscale has one less item resulting in total scores ranging from 0 to 16. The MCQHA demonstrates good internal consistency (α = .90; Bailey & Wells, 2015c). In addition, the MCQHA has shown acceptable Cronbach's alpha in Italian samples ($\alpha \geq .77$; Melli et al., 2017). Moreover, the MCQHA shows good convergent reliability when related to measures of health anxiety (Bailey & Wells, 2015c).

Cognitive Avoidance Questionnaire (CAQ; Sexton & Dugas, 2008a). The CAQ is a 25-item questionnaire that assesses the tendency for individuals to use cognitive avoidance strategies when facing negative thoughts and images (Sexton & Dugas, 2008a). Items are rated on a 5-point Likert-type scale (1 = *not at all typical* to 5 = *completely typical*). Total scores can range from 25 to 125. Higher scores indicate more cognitive avoidance. Items are categorized into five subscales of different types of cognitive avoidance, such as thought suppression (CAQ-SUP), thought substitution (CAQ-SUB), distraction (CAQ-DIS), avoidance of threatening stimuli (CAQ-AVD), and the transforming images into thoughts (CAQ-TRN). The CAQ

subscales demonstrate good to excellent internal consistency (Gosselin et al., 2007; Sexton & Dugas, 2008a). Total scores on the subscales range from 5 to 25. Additionally, the CAQ shows high test-retest reliability (r = .85; Sexton & Dugas, 2008a). Furthermore, when compared to measures of worry, the CAQ exhibits moderate convergent validity (Sexton & Dugas, 2008a). In addition, the original French version (Gosselin et al., 2002; as cited in Sexton & Dugas, 2008a) also has high internal consistency, test-retest reliabilities, convergent validity, and discriminant validity.

Controlled Variables

Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007). The ASI-3 assesses anxiety sensitivity. The questionnaire consists of 18-items that load on three subscales: physical (ASI-P), social (ASI-S), and cognitive concerns (ASI-C). The ASI-P measures the belief that physical symptoms of anxiety will cause severe health consequences. The ASI-C measures the belief that cognitions related to anxiety (e.g.., concentration difficulties) will cause poor mental health. The ASI-S measures the belief that anxiety reactions that are observable to others will cause social rejection. Items are rated on a five-point Likert-type scale (0 = *very little* to 4 = *very much*). The ASI-3 total score ranges from 0 to 72. The three subscale scores range from 0 to 24. Higher scores indicate greater anxiety sensitivity. The ASI-3 demonstrates robust psychometric properties (Taylor et al., 2007; Olthius et al., 2014; Wheaton et al., 2012).

Somatosensory Amplification Scale (SSAS; Barsky et al., 1990). The SSAS is a 10-item questionnaire that measures how disturbing individuals' find physical sensations. Participants rate how characteristic each statement is of them on a five-point Likert-type scale (1= *not at all true* to 5 = *extremely true*). Total scores range from 10 to 50. Higher scores demonstrate a greater degree of somatosensory amplification. The SSAS demonstrates

acceptable test-rest reliability and internal consistency (Axelsson et al., 2020; Barsky et al., 1990; Köteles & Doering, 2016).

Symptoms and Outcomes Scale (SOS; Marcus, 1999). The SOS measures dysfunctional beliefs toward illness and physical symptoms. In particular, whether individuals overestimate the likelihood of lethal diseases. Each SOS item consists of two sentences describing an individual with an ambiguous symptom. Symptoms are paired with two potential diagnoses, either a catastrophic or mild illness. Participants rate items by selecting a probability on a five-point scale (*a. 0-20%* to e. *81-100%*). The scale consists of 20-items divided into two subscales: catastrophic (SOS-CAT) and minor (SOS-MIN) interpretations. SOS-CAT measures the tendency to see ambiguous symptoms as indicators of potentially catastrophic illness, such as a brain tumour. In comparison, SOS-MIN measures the tendency to see ambiguous symptoms as indicators of a benign illness, such as a cold. For both subscales, scores range from 10 to 50. Higher scores on the SOS-CAT demonstrate greater dysfunctional beliefs. The SOS-CAT shows acceptable internal consistency (Marcus et al., 1999; Marcus et al., 2008; Marcus & Church, 2003). Additionally, higher scores on the SOS-MIN demonstrate fewer dysfunctional beliefs. Typically, the SOS-MIN coefficient α ranges from .57 to .68 (Marcus, 1999; Marcus & Church, 2003).

Procedure

Participants completed the study between March 2020 and September 2020. Participants were recruited via MacEwan University's SONA system, where they logged onto their personal SONA account (https://grantmacewan.sona-systems.com/). Students were presented with numerous study options, and voluntarily selected the present study. SONA is a research site that the Psychology Department at MacEwan University uses to post study availability, pre-screen

participants, award course credit for research participation, and integrate Qualtrics. Qualtrics is an online survey website that the MacEwan University Psychology Department uses to conduct online research.

After signing up for this study via SONA, participants were directed to Qualtrics, where they were presented with an online consent form (see Appendix A). Consenting participants were first asked to complete the demographic characteristics questionnaire, and then the previously mentioned measures (see Appendix B) were introduced in randomized order, along with several additional questionnaires that were not examined for the present study. After completing the questionnaires, participants were provided with an online debriefing form (see Appendix C) that provided additional details of the study, general contact information for the researchers, and other resources available to them. The study was designed to be completed by participants within approximately 60 minutes.

Statistical Analyses

Prior to data analyses, the raw data was screened for missing data entry values and accuracy. As previously mentioned, a total of 36 participants were removed from data analysis because of substantial missing data. Further data screening was conducted on the final sample of 564 participants. With the remaining participant data, missing individual data points were replaced based on how much data was provided for a specific scale/subscale. Specifically, the decision of whether to replace the missing data was based on the following condition: If a participant missed 20% or less of their data on a specific scale/subscale, then missing data was filled in by calculating the mean score of their remaining responses on that scale/subscale. However, if a participant missed more than 20% for a particular scale/subscale, missing values on that scale/subscale were not entered. Regarding outliers, replacements were made according

to Tabachnick and Fidell's (2007) recommendations. According to Tabachnick and Fidell (2007), values were considered outliers if a value fell above or below a set cut-off score. The cut-off score was established by multiplying the standard deviation by three and adding or subtracting it from the mean (Tabachnick & Fidell, 2007). Outlier values were reduced to one score above or below the last value that was not considered an outlier (Tabachnick & Fidell, 2007). Skewness and kurtosis were also examined for all measures according to Tabachnick and Fidell's guidelines (2007).

After data screening, the subsequent analyses were conducted. Zero-order correlations were calculated to assess the correlations between the scores of the SHAI, PHQ-15, IUS-18, MCQHA subscales, CAQ, ASI, SSAS, SOS-CAT, and SOS-MIN. Following the correlational analyses, multiple regression analyses were conducted with the SHAI and PHQ-15 scores as the dependent variables to assess the unique relationships between these variables and the IUS-18, MCQ-B, MCQ-I, MCQ-U, and CAQ scores. Following the multiple regression analyses, hierarchical regression analyses were conducted with the SHAI and PHQ-15 scores as the dependent variables. With the SHAI scores as the dependent variable, the scores of the ASI-Total and SSAS were entered on the first step, while the IUS-18, MCQ-I, MCQ-U, and CAQ were included on the second step. This analysis was used to examine whether the IUS-18, MCQ-I, MCQ-U, and CAQ uniquely predicted SHAI scores when controlling for the scores of the ASI-Total and SSAS. Similarly, with the PHQ scores as the dependent variable, the scores of the ASI-Total and SSAS were entered on the first step, with the IUS-18, MCQ-B, MCQ-I, MCQ-U, and CAQ included on the second step. This analysis was used to examine whether the IUS-18, MCQ-B, MCQ-I, MCQ-U, and CAQ uniquely predicted PHQ-15 scores when controlling for the scores of the ASI-Total and SSAS. For all analyses, alpha was set to .05.

Results

Data Screening

Several missing values were replaced including: 29 missing values for the SHAI, 57 missing values for the PHQ-15, 43 missing values for the IUS, 20 missing values for the MCQHA subscales, 55 missing values for the CAQ subscales, 17 missing values for the ASI-3 subscales, 23 missing values for the SSAS, and 38 missing values for the SOS subscales. Missing data values were shared across 183 participants, with an average of 1.54 missing values per each of these participants. One participant was responsible for the highest number of missing items, equaling seven data points. A total of 14 participants' raw data contained an outlier which was adjusted accordingly. In examining skewness and kurtosis for all measures, the scores for the MCQ-I, ASI-P, and ASI-C subscales were not within acceptable limits and required transformations (Tabachnick & Fidell, 2007). A log transformation was computed for the MCQ-I, ASI-P, and ASI-C subscales. Subsequent analyses were conducted with both the transformed and non-transformed MCQ-I, ASI-P, and ASI-C subscales and it was found that the results did not change. Therefore, the non-transformed subscale scores were used for all following analyses.

Descriptive statistics were conducted to examine Cronbach's alpha coefficients, means, range, and standard deviations for all scales (see Table 2 and Table 6). Most measures exhibited acceptable to excellent Cronbach's alphas, except for the MCQ-U and CAQ-SUB subscales which demonstrated adequate alpha coefficients (see Table 2 and Table 6). In comparison to previous research, the mean score on the SHAI was substantially higher than student samples, and was more similar to anxious samples (Alberts et al., 2013; Salkovskis et al., 2002). For the PHQ-15, the mean score was similar to primary care and obstetrics-gynaecology patients that report medium levels of somatic symptom severity (Kroenke et al., 2002). The mean scores for

the IUS-18 (Hong & Lee, 2015) and MCQHA subscales (Bailey & Wells, 2016) were similar to mean scores of university samples in prior research. The mean score on the CAQ was slightly higher than mean scores that have been previously published using non-clinical data (Sexton & Dugas, 2008a). Similarly, the mean score on the ASI-3 was substantially higher than previous undergraduate student samples and were similar to clinical samples (Taylor et al., 2007; Wheaton et al., 2012). Likewise, the mean score on the SOS-CAT and SOS-MIN were more similar to clinical samples than healthy controls (Weck et al., 2012). In addition, the mean score for the SSAS was substantially higher than student samples and was more similar to clinical samples (Aronson et al., 2001; Barsky et al., 1990).

Main Analyses

Pearson's *r* correlations were computed to test the first hypothesis. As predicted in hypothesis 1, Pearson's *r* correlations revealed that the SHAI scores significantly moderately-strongly correlated with IUS-18, MCQ-B, MCQ-I, MCQ-U, and CAQ scores (see Table 3). Further, as anticipated, PHQ-15, ASI-3, and SSAS scores significantly correlated with SHAI scores (see Table 3). However, SHAI scores had very small correlations with the SOS-CAT and SOS-MIN.

Additionally, as predicted in hypothesis 1, Pearson's *r* correlations revealed that the PHQ-15 significantly strongly correlated with the IUS-18 (see Table 3). The PHQ-15 also had small to moderate correlations with the MCQ-B, MCQ-I, MCQ-U, CAQ, ASI-3, SSAS, and SOS-CAT (see Table 3). The SOS-MIN did not significantly correlate with the PHQ-15 (see Table 3). Since the SOS-CAT and SOS-MIN exhibited very low correlations with both the SHAI and the PHQ-15, these subscales were excluded from all further analyses.

As previously stated, multiple linear regression analyses were conducted to test the second hypothesis. The first multiple linear regression analysis was performed to determine whether the IUS-18, MCQ-B, MCQ-I, MCQ-U, and CAQ were uniquely associated with HA. In this regression, the SHAI was entered as the dependent variable, while the IUS-18, MCQ-B, MCQ-I, MCQ-U, and CAQ were entered as predictor variables. The multiple regression analysis demonstrated that all measures were associated with SHAI scores, except for the MCQ-B (see Table 4). In contrast to the second hypothesis, the MCQ-U was the most substantial contributor to HA instead of the IUS-18 (see Table 4). Furthermore, the MCQ-I predicted SHAI scores almost as well as the IUS-18 (see Table 4). However, as predicted, the IUS-18 was a more substantial contributor to SHAI scores than the CAQ.

The second multiple linear regression analysis was conducted to determine whether the scores from the IUS-18, MCQ-B, MCQ-I, MCQ-U, and CAQ were associated with somatization. In this regression, PHQ-15 scores were entered as the dependent variable, and the IUS-18, MCQ-B, MCQ-I, MCQ-U, and CAQ were entered as predictor variables. All predictor variables were found to contribute to PHQ-15 scores (see Table 4). As hypothesized, the IUS-18 was the strongest contributor to PHQ-15 scores (see Table 4).

Hierarchical regression analyses were performed to test the third hypothesis. The first hierarchical regression analysis was performed to determine whether the IUS-18, MCQ-I, MCQ-U, and CAQ would uniquely contribute to HA independently from anxiety sensitivity and somatosensory amplification. Since the MCQ-B was not significant in the prior multiple regression analyses, the MCQ-B subscale was excluded for this regression. In this regression, SHAI scores were entered as the dependent variable, ASI-3 and SSAS scores were entered on the first step, and IUS-18, MCQ-I, MCQ-U, and CAQ scores were entered as predictor variables on

the second step. The first step accounted for 31% of the variance in SHAI scores, $F(2, 539) = 120.91$, $p < .001$ (see Table 5). As expected, ASI-3 and SSAS scores both contributed a significant amount of variance in SHAI scores. The second step accounted for an additional 10.0% of variance in SHAI scores, $F_{change}(4, 535) = 21.66$, $p < .001$ (see Table 5). The MCQ-I and MCQ-U were found to be unique contributors to SHAI scores (see Table 5). Unexpectedly, the IUS-18 was not a significant contributor to SHAI scores after controlling for ASI-3 and SSAS scores, which was not predicted in the third hypothesis. The CAQ was also found to not be predictive of SHAI scores.

The second hierarchical regression analysis investigated whether the IUS-18, MCQ-B, MCQ-I, MCQ-U, and CAQ could uniquely predict somatization independently from anxiety sensitivity and somatosensory amplification. In this regression, PHQ-15 scores were entered as the dependent variable, ASI-3 and SSAS scores were entered on the first step, and IUS-18, MCQ-B, MCQ-I, MCQ-U, and CAQ scores were entered as predictor variables in the second step. The first step accounted for 26% of the variance in PHQ-15 scores, $F(2, 537) = 93.54$, $p < .001$. The ASI-3 and SSAS scores both contributed a significant amount of variance. The second step accounted for an additional 3.1% of the variance in PHQ-15 scores, $F_{change}(5, 532) = 4.65$, $p < .001$ (see Table 5). The MCQ-B, MCQ-I, and MCQ-U were found to be unique contributors to PHQ-15 scores, while the IUS-18 and CAQ did not emerge as significant predictors (see Table 5). The finding that the IUS-18 was not a significant contributor did not support hypothesis 3. The IUS-18 and ASI-3 strongly correlated with each other (see Table 3), which might explain why the IUS-18 did not predict either SHAI or PHQ-15 scores. Since anxiety sensitivity is more closely related to HA than IU, by including the ASI-3 in step one of the hierarchical regression analyses, the IUS-18 may not have been able to contribute significantly.

Supplemental Analyses

Additional analyses were conducted as there is a possibility that individual subscales are better predictors than their associated total scale scores. Total scale scores consist of multiple subscales that measure different facets of a construct. Particular subscales of a construct may be more pertinent to HA than the corresponding total score of that measure. In other words, a subscale that would predict HA may lose predictive strength when combined with the other subscales to produce a total scale. Therefore, supplementary analyses were computed to investigate which individual subscales of the IUS-18, MCQHA, CAQ, and ASI-3 made the strongest contributions to the SHAI and PHQ-15. A series of partial correlations for the IUS-18 subscales were conducted to control for the IUS-PRO and IUS-INH. The partial correlations demonstrated that when controlling for the IUS-PRO, the IUS-INH significantly correlated with the SHAI, $pr = .22$, $p < .001$. Likewise, when IUS-INH was controlled, the IUS-PRO significantly correlated with the SHAI, $pr = .13$, $p = .002$. Multiple linear regression analyses were conducted for the other scales. The MCQHA subscales that significantly correlated with the SHAI and PHQ in the primary multiple regression analyses were used for these supplemental analyses (see Table 4). The results of the individual scale multiple linear regression analyses demonstrated that SHAI scores were significantly associated with the MCQHA subscales: MCQ-I and MCQ-U; the CAQ subscales: CAQ-SUP and CAQ-TRN; and with all three ASI-3 subscales: ASI-P, ASI-C, and ASI-S (see Table 7).

For the PHQ-15, the partial correlations revealed that when controlling for the IUS-PRO, the IUS-INH significantly correlated with the PHQ-15, $pr = .11$, $p = .008$. Similarly, when the IUS-INH was controlled, the IUS-PRO significantly correlated with the PHQ-15, $pr = .17$, $p < .001$. Furthermore, multiple linear regression analyses showed that the PHQ-15 scores were

significantly associated with the all three MCQHA subscales, as well as the CAQ-SUP, ASI-P, and ASI-C subscales (see Table 7).

Following the individual scale multiple linear regression analyses, combined multiple linear regression analyses were conducted to investigate whether individual subscales that were significantly associated with the SHAI and PHQ-15 would still contribute when other significant total and subscale scores were included. The first combined multiple linear regression analysis was performed to determine whether the IUS-PRO, IUS-INH, MCQ-I, MCQ-U, CAQ-SUP, CAQ-TRN, ASI-P, ASI-C, ASI-S, and SSAS were uniquely associated with HA. The combined multiple regression analysis demonstrated that the MCQ-I, MCQ-U, ASI-P, and SSAS were uniquely associated with SHAI scores (see Table 8). However, the IUS-18 subscales, CAQ subscales, and the social and cognitive dimensions of anxiety sensitivity were no longer predictive (see Table 8).

The subsequent combined multiple linear regression analysis examined whether the IUS-PRO, IUS-INH, MCQ-B, MCQ-I, MCQ-U, CAQ-SUP, ASI-P, ASI-S, and SSAS were associated with somatization. The combined multiple regression analysis demonstrated that the MCQ-B, MCQ-I, MCQ-U, ASI-P, ASI-S, and SSAS were uniquely associated with SHAI scores (see Table 8). However, the IUS-18 subscales and CAQ-SUP were no longer predictive of SHAI scores (see Table 8).

The last hierarchical regression analysis was performed to determine whether the IUS-PRO, IUS-INH, MCQ-I, MCQ-U, CAQ-SUP, CAQ-TRN, ASI-P, ASI-C, ASI-S, and SSAS would uniquely contribute to HA independently from somatization. In this regression, the SHAI was entered as the dependent variable, the PHQ-15 was entered on the first step, and the

Table 2.
Psychometric properties of the measures used in the main analyses

Measure	Mean	*SD*	Observed Range	Cronbach's Alpha
SHAI	18.02	7.80	2-48	.87
PHQ-15	10.30	5.30	0-26	.81
IUS-18	47.58	15.13	18-88	.94
CAQ-Total	69.86	19.92	25-120	.94
MCQ-B	6.98	2.47	5-17	.78
MCQ-I	9.87	3.53	5-20	.82
MCQ-U	7.52	2.41	4-16	.66
ASI-3	23.53	14.64	0-72	.92
SOS-MIN	30.32	6.35	10-50	.74
SOS-CAT	23.12	6.99	10-50	.86
SSAS	28.36	7.23	12-50	.77

Note. SD = Standard Deviation; Observed Range = Range of Participants' Scores; SHAI = Short Health Anxiety Inventory; PHQ-15 = Patient Health Questionnaire-15; IUS-18 = Intolerance of Uncertainty Scale-18; CAQ = Cognitive Avoidance Questionnaire; MCQ-B = Metacognition Questionnaire-Health Anxiety: Biased Beliefs; MCQ-I = Metacognition Questionnaire-Health Anxiety: Illness Beliefs; MCQ-U = Metacognition Questionnaire-Health Anxiety: Uncontrollable Beliefs; ASI-3 = Anxiety Sensitivity Index-3; SOS-MIN = Symptoms and Outcomes Scale-Minor Subscale; SOS-CAT = Symptoms and Outcomes Scale-Catastrophic Subscale; SSAS = Somatosensory Amplification Scale

Table 3.

Bivariate correlations between the measures used in the main analyses

	1	2	3	4	5	6	7	8	9	10
1. SHAI	-									
2. PHQ-15	.52**	-								
3. IUS-18	.45**	.37**	-							
4. MCQ-B	.33**	.13**	.34**	-						
5. MCQ-I	.33**	.22**	.21**	.37**	-					
6. MCQ-U	.51**	.29**	.19**	.37**	.34**	-				
7. CAQ	.37**	.30**	.50**	.27**	.22**	.36**	-			
8. ASI-3	.53**	.47**	.58**	.38**	.29**	.45**	.47**	-		
9. SSAS	.36**	.38**	.40**	.15**	.19**	.28**	.36**	.40**	-	
10. SOS-CAT	.09*	.01	.19**	.18**	.06	.18**	.36**	.15**	.11**	-
11. SOS-MIN	.10*	.08*	.14**	-0.23	.01	.13**	.14**	.06	.34**	.22**

Note. SHAI = Short Health Anxiety Inventory; PHQ-15 = Patient Health Questionnaire-15; IUS-18 = Intolerance of Uncertainty Scale-18; MCQ-B = Metacognition Questionnaire-Health Anxiety: Biased Beliefs; MCQ-I = Metacognition Questionnaire-Health Anxiety: Illness Beliefs; MCQ-U = Metacognition Questionnaire-Health Anxiety: Uncontrollable Beliefs; CAQ = Cognitive Avoidance Questionnaire; ASI-3 = Anxiety Sensitivity Index-3; SSAS = Somatosensory Amplification Scale; SOS-M = Symptoms and Outcomes Scale-Minor Subscale; SOS-C = Symptoms and Outcomes Scale-Catastrophic Subscale

*$p < .05$. **$p < .01$.

Table 4.
Multiple linear regression analyses

Variable	*R*	R^2	*t*	*pr*
DV: SHAI				
	.589	.347**		
IUS-18			5.06**	.21**
MCQ-B			-0.16	-.01
MCQ-I			3.95**	.17**
MCQ-U			7.06**	.29**
CAQ			3.00**	.13**
DV: PHQ-15				
	.439	.192**		
IUS-18			5.33**	.22**
MCQ-B			-3.07**	-.13**
MCQ-I			3.26**	.14**
MCQ-U			3.61**	.15**
CAQ			2.40*	.10*

Note. pr = Partial correlation; SHAI = Short Health Anxiety Inventory; PHQ-15 = Patient Health Questionnaire-15; IUS-18 = Intolerance of Uncertainty Scale-18; MCQ-I = Metacognition Questionnaire-Health Anxiety: Illness Beliefs; MCQ-B = Metacognition Questionnaire-Health Anxiety: Biased Beliefs; MCQ-U = Metacognition Questionnaire-Health Anxiety: Uncontrollable Beliefs; CAQ = Cognitive Avoidance Questionnaire.
*$p < .05$. **$p < .01$.

Table 5.
Hierarchical regression analyses

Variable	*R*	R^2	R^2 *Change*	*t*	*pr*
DV: SHAI					
Step 1	.557	.310	.310**		
ASI-3				11.75**	.53**
SSAS				4.56**	.19**
Step 2	.637	.406	.096**		
ASI-3				5.88**	.25**
SSAS				2.94**	.13**
IUS-18				1.94	.06
MCQ-I				3.17**	.11**
MCQ-U				6.40**	.21**
CAQ				1.35	.06
DV: PHQ-15					
Step 1	.508	.258	.258**		
ASI-3				9.09**	.37**
SSAS				5.75**	.24**
Step 2	.538	.289	.031**		
ASI-3				6.22**	.26**
SSAS				4.54**	.19**
IUS-18				1.73	.08
MCQ-B				-3.53**	-.15**
MCQ-I				2.42**	.10**
MCQ-U				2.58**	.11**
CAQ				0.41	.02

Note. pr = Partial correlation; SHAI = Short Health Anxiety Inventory; PHQ-15 = Patient Health Questionnaire-15; ASI-3 = Anxiety Sensitivity Index-3; SSAS = Somatosensory Amplification Scale; IUS-18 = Intolerance of Uncertainty Scale-18; MCQ-I = Metacognition Questionnaire-Health Anxiety: Illness Beliefs; MCQ-B = Metacognition Questionnaire-Health Anxiety: Biased Beliefs; MCQ-U = Metacognition Questionnaire-Health Anxiety: Uncontrollable Beliefs; CAQ = Cognitive Avoidance Questionnaire.
*$p < .05$. **$p < .01$.

IUS-PRO, IUS-INH, MCQ-I, MCQ-U, CAQ-SUP, CAQ-TRN, ASI-P, ASI-C, ASI-S, and SSAS were entered as predictor variables on the second step. The first step accounted for 21.0% of the variance in SHAI scores, $F(1, 540) = 200.79$, $p < .001$ (see Table 9). The second step accounted for an additional 19.4% of variance in SHAI scores, $F_{change}(10, 530) = 20.51$, $p < .001$ (see Table 9). The MCQ-I, MCQ-U, and ASI-P were found to be unique contributors to SHAI scores (see Table 9). The IUS-PRO, IUS-INH, CAQ-SUP, CAQ-TRN, ASI-C, ASI-S, and SSAS did not emerge as unique predictors of SHAI scores when the PHQ-15 was controlled for (see Table 9). Additionally, the MCQ-U was found to be the strongest predictor of SHAI scores beyond somatization (see Table 9).

Discussion

The present study sought to explore the relationship between HA and somatization with IU, metacognitions about health, and cognitive avoidance. Correlational analysis supported the first hypothesis and indicated that measures of IU, metacognitive beliefs about health, and cognitive avoidance significantly correlated with HA and somatization measures. The second hypothesis predicted that IU would account for more variance in HA and somatization than metacognitions about health and cognitive avoidance beliefs. However, multiple linear regression analyses demonstrated that metacognitions about health accounted for more variance in HA and somatization than IU and cognitive avoidance. Likewise, the third hypothesis was not supported, as metacognitions about health more strongly predicted HA and somatization than IU when controlling for established predictors, such as anxiety sensitivity and somatosensory amplification.

Supplemental analyses confirmed that metacognitive beliefs about health that thoughts can cause illness, metacognitive beliefs about health that thoughts are uncontrollable, anxiety

sensitivity, and somatosensory amplification are the largest contributors to HA. IU and cognitive avoidance were not found to be significant predictors of HA. The supplemental analyses also highlighted that physical concerns specific to anxiety sensitivity uniquely predicted HA, whereas cognitive and social concerns did not. When controlling for somatization, metacognitive beliefs about health that thoughts are uncontrollable became the most significant predictor of HA, followed by physical concerns specific to anxiety sensitivity and metacognitive beliefs about health that thoughts can cause illness.

Regarding somatization, supplemental analyses also confirmed the main findings. Specifically, metacognitive beliefs about health regarding biased health beliefs, metacognitive beliefs about health that thoughts can cause illness, metacognitive beliefs about health that thinking about health is uncontrollable, anxiety sensitivity, and somatosensory amplification are the largest contributors to somatization. However, supplemental analysis emphasized that only physical and social concerns specific to anxiety sensitivity uniquely predict somatization, whereas cognitive concerns were not a significant predictor. Additionally, the results indicated that IU and cognitive avoidance were not significant predictors of somatization.

Overall, the results of the present study indicate that metacognitions about health contribute significantly to HA and somatization. Specifically, metacognitive beliefs about health that thoughts can cause illness and that thoughts about illness are uncontrollable uniquely contribute to HA.

Table 6.
Psychometric properties of additional subscales used in the supplemental analyses

Measure	Mean	*SD*	Range	Cronbach's Alpha
IUS-18 PRO	25.40	7.99	9-45	.89
IUS-18 INH	22.19	8.19	9-45	.91
CAQ-SUP	16.20	4.93	5-25	.87
CAQ-SUB	12.34	4.07	5-24	.55
CAQ-DIS	15.02	5.03	5-25	.88
CAQ-AVD	13.93	5.23	5-25	.89
CAQ-TRN	12.38	4.70	5-25	.84
ASI-P	6.39	5.53	0-24	.89
ASI-C	6.77	5.91	0-24	.84
ASI-S	10.35	5.81	0-24	.82

Note. Range = Range of Participants' Scores; *SD* = Standard Deviation; IUS-18 PRO = Intolerance of Uncertainty Prohibitory Scale; IUS-18 INH = Intolerance of Uncertainty Inhibitory Scale; CAQ-SUP = Cognitive Avoidance Questionnaire-Suppression; CAQ-SUB = Cognitive Avoidance Questionnaire-Substitution; CAQ-DIS = Cognitive Avoidance Questionnaire-Distraction; CAQ-AVD = Cognitive Avoidance Questionnaire-Avoidance; CAQ-TRN = Cognitive Avoidance Questionnaire-Transformation of Thoughts into Images; ASI-P = Anxiety Sensitivity Index-3 Physical Concerns; ASI-C = Anxiety Sensitivity Index-3 Cognitive Concerns; ASI-S = Anxiety Sensitivity Index-3 Social Concerns

Table 7.
Supplemental individual scale multiple linear regression analyses

Variable	*R*	R^2	*t*	*pr*
DV: SHAI				
	.529**	.280**		
MCQ-I			4.27**	.18**
MCQ-U			9.76**	.39**
	.376**	.141**		
CAQ-SUP			2.50*	.11*
CAQ-SUB			1.56	.07
CAQ-DIS			0.32	.01
CAQ-AVD			1.15	.05
CAQ-TRN			0.03*	.09*
	.548**	.301**		
ASI-P			7.88**	.32**
ASI-C			2.00*	.08*
ASI-S			3.51**	.15**
DV: PHQ-15				
	.335**	.112**		
MCQ-B			-2.09*	-.09*
MCQ-I			3.57**	.15**
MCQ-U			6.16**	.26**
	.305**	.093**		
CAQ-SUP			2.09*	.09*
CAQ-SUB			1.29	.06
CAQ-DIS			0.95	.04
CAQ-AVD			1.68	.07
CAQ-TRN			-0.43	-.02
	.483**	.234**		
ASI-P			6.31**	.26**
ASI-C			1.18	.05
ASI-S			3.96**	.17**

Note. pr = Partial correlation; MCQ-B = Metacognition Questionnaire-Health Anxiety: Biased Beliefs; MCQ-I = Metacognition Questionnaire-Health Anxiety: Illness Beliefs; MCQ-U = Metacognition Questionnaire-Health Anxiety: Uncontrollable Beliefs; CAQ-SUP = Cognitive Avoidance Questionnaire-Suppression; CAQ-SUB = Cognitive Avoidance Questionnaire-Substitution; CAQ-DIS = Cognitive Avoidance Questionnaire-Distraction; CAQ-AVD = Cognitive Avoidance Questionnaire-Avoidance; CAQ-TRN = Cognitive Avoidance Questionnaire-Transformation of Thoughts into Images; ASI-P = Anxiety Sensitivity Index-3 Physical Concerns; ASI-C = Anxiety Sensitivity Index-3 Cognitive Concerns; ASI-S = Anxiety Sensitivity Index-3 Social Concerns.
*$p < .05$. **$p < .01$.

Table 8.
Supplemental combined multiple linear regression analyses

Variable	*R*	R^2	*t*	*pr*
DV: SHAI				
	.649	.421**		
IUS-PRO			1.04	.05
IUS-INH			1.31	.06
MCQ-I			2.96**	.13**
MCQ-U			5.83**	.25**
CAQ-SUP			1.76	.08
CAQ-TRN			0.04	.002
ASI-P			5.40**	.23**
ASI-C			-0.11	.000
ASI-S			1.37	.06
SSAS			2.50*	.11*
DV: PHQ-15				
	.550	.302		
IUS-PRO			1.40	.06
IUS-INH			0.68	.03
MCQ-B			-3.59**	-.15**
MCQ-I			2.23*	.10*
MCQ-U			2.17*	.09*
CAQ-SUP			1.11	.05
ASI-P			5.66**	.24**
ASI-S			2.09*	.09*
SSAS			4.15**	.18**

Note. pr = Partial correlation; SHAI = Short Health Anxiety Inventory; PHQ-15 = Patient Health Questionnaire-15; IUS-18 PRO = Intolerance of Uncertainty Prohibitory Scale; IUS-18 INH = Intolerance of Uncertainty Inhibitory Scale; CAQ-SUP = Cognitive Avoidance Questionnaire-Suppression; CAQ-TRN = Cognitive Avoidance Questionnaire-Transformation of Thoughts into Images; ASI-P = Anxiety Sensitivity Index-3 Physical Concerns; ASI-C = Anxiety Sensitivity Index-3 Cognitive Concerns; ASI-S = Anxiety Sensitivity Index-3 Social Concerns; SSAS = Somatosensory Amplification Scale.
*$p < .05$. **$p < .01$.

Table 9.
Supplemental hierarchical regression analyses

Variable	*R*	R^2	R^2 *Change*	*t*	*pr*
DV: SHAI					
Step 1	.521	.271	.271**		
PHQ-15				14.17**	.52**
Step 2	.689	.474	.203**		
PHQ-15				7.29**	.30**
IUS-PRO				0.70	.03
IUS-INH				1.19	.05
MCQ-I				2.61**	.11**
MCQ-U				5.79**	.24**
CAQ-SUP				1.08	.05
CAQ-TRN				0.74	.03
ASI-P				4.12**	.18**
ASI-C				-0.06	-.002
ASI-S				0.75	.03
SSAS				1.16	.05

Note. *pr* = Partial correlation; SHAI = Short Health Anxiety Inventory; PHQ-15 = Patient Health Questionnaire-15; IUS-18 PRO = Intolerance of Uncertainty Prohibitory Scale; IUS-18 INH = Intolerance of Uncertainty Inhibitory Scale; CAQ-SUP = Cognitive Avoidance Questionnaire-Suppression; CAQ-TRN = Cognitive Avoidance Questionnaire-Transformation of Thoughts into Images; ASI-P = Anxiety Sensitivity Index-3 Physical Concerns; ASI-C = Anxiety Sensitivity Index-3 Cognitive Concerns; ASI-S = Anxiety Sensitivity Index-3 Social Concerns; SSAS = Somatosensory Amplification Scale.
**$p < .01$.

Theoretical Implications Requiring Further Exploration

Metacognitive beliefs about health have only been recently investigated with HA (Bailey & Wells, 2015a; Bailey & Wells, 2016). Nevertheless, the findings of the present study align with the limited research that has been conducted. Specifically, the metacognitive belief that thoughts are uncontrollable contributes uniquely to HA beyond other variables, such as anxiety sensitivity and somatosensory amplification (Bailey & Wells, 2016; Melli et al., 2018). This finding also aligns with the theoretical underpinning of the metacognitive model, which proposes that the belief that thoughts are uncontrollable is a leading negative metacognition that contributes to the development and maintenance of various anxiety disorders (Bailey & Wells, 2016). The metacognitive belief that thoughts are uncontrollable may be the strongest predictor for HA because it may act as a dominant metacognition that exacerbates other maladaptive metacognitions. For example, suppose an individual feels as though they cannot control how much they worry about their health. In that case, it is plausible that they feel like they have no control over other thoughts, such as thinking that thoughts about illness could cause adverse health outcomes or that thinking a certain way could cause illness. Additionally, this might elucidate why the metacognitive belief that thoughts can cause illness was a unique predictor of HA, but was not as strong as the metacognitive belief that thoughts are uncontrollable.

While past research has found that metacognitive beliefs about biased thinking also contributes to HA (Bailey & Wells, 2016), this result was not found in the present study's findings. A few explanations for this are proposed. First, these conflicting results might have occurred because previous research sampled nursing student populations (Bailey & Wells, 2015c). The present study sampled a potentially more diverse pool of students taking an introductory psychology course. Therefore, the relationship between metacognitive beliefs about

biased thinking and HA might only exist in select subsamples. A second possible explanation has been proposed by Melli et al. (2017), who had similar inconsistent findings. Melli et al. (2017) propose that beliefs about biased thinking are a positive metacognitive belief. The general population is thought to have positive metacognitive beliefs; therefore, beliefs about biased thinking may be more typical of individuals who are on the milder end of the HA continuum (Melli et al., 2017). This explanation could clarify why the metacognitive belief about biased thinking was not a significant predictor of HA in this study, since the mean scores on the SHAI and PHQ-15 were similar to clinical populations. In concordance, prior research in generalized anxiety disorder has shown that positive metacognitive beliefs are not as predictive of generalized anxiety disorder symptoms as negative metacognitive beliefs (Penney et al., 2013). Given the inconsistent finding about beliefs about biased thinking and HA, researchers may want to further investigate whether beliefs about biased thinking are unique to HA.

However, while the present findings revealed that beliefs about biased thinking were not a predictor of HA, these beliefs were a negative predictor of somatization. If the results are correct, beliefs about biased thinking could act as a protective factor for somatization. However, these results are more likely due to suppression effects. In multiple regression analyses, suppression effects appear as a statistical artefact. Suppression effects can occur when an independent variable is included and suppresses irrelevant variance, therefore enhancing the predictive value of another independent variable with the dependent variable of interest (Thompson & Levine, 1997). In multiple regression analyses, sources of suppression become challenging to identify because of the inclusion of multiple independent variables (Thompson & Levine, 1997). In the present study, numerous independent variables were included. The potential suppression in beliefs about biased thinking with somatization may have been due to a

combination of independent variables (see Table 2), and do not reflect the true relationship between beliefs about biased thinking and somatization.

While metacognitive beliefs about biased thinking were a negative predictor of somatization, both beliefs that thoughts are uncontrollable and thoughts can cause illness were positive predictors of somatization, as would be expected. The metacognitive belief that thoughts are uncontrollable may be connected to somatization because when an individual with high levels of HA feels a physical symptom, they might believe that they cannot stop thinking about that physical symptom, which may exacerbate somatization. Additionally, the metacognitive belief that thoughts can cause illness may contribute to somatization. Individuals with heightened HA think about illness frequently and might coincidentally believe that their thoughts caused somatic symptoms or worsened physical sensations. In general, the present study's results align with the metacognitive model, which proposes that metacognitive beliefs about thinking are causally linked to psychopathology symptoms, such as anxiety disorders and depression (Papageorgiou & Wells, 2003). In this circumstance, metacognitive beliefs about health are linked to both HA and somatization.

Previous research has suggested that IU is associated with HA and incrementally contributes to levels of HA (Boelen & Carleton, 2012; Deacon & Abramowitz, 2008; Fetzner et al., 2014; Wright et al., 2016). The present study's results partially align with the research in the field, as IU significantly correlated with HA in the preliminary correlation analysis and multiple linear regression analysis. However, the present study's findings suggest that IU loses predictive strength when adding the variables of metacognitive beliefs about health and anxiety sensitivity. Past research has been inconsistent regarding the relationship between IU and anxiety sensitivity. Some prior research indicated that anxiety sensitivity influences the development of HA more

than IU (Boelen & Carleton, 2012; Norton et al., 2005). In contrast, other findings suggested that IU is a significant predictor of HA after controlling for anxiety sensitivity (Fergus & Bardeen, 2013; Fetzner et al., 2014). According to the present study's findings, IU was no longer statistically associated with HA when controlling for anxiety sensitivity, along with additional variables. These findings support research that proposes that anxiety sensitivity is a more significant predictor of HA than IU (Norton et al., 2015). However, in the present study, IU and anxiety sensitivity had a moderate to strong correlation. It is possible that IU did not contribute unique variance to HA because of the underlying relationship between IU and anxiety sensitivity. Overall, the findings confirm that anxiety sensitivity is a risk factor for the development of HA (Norton et al., 2005).

As previously mentioned, the supplemental analysis demonstrated that physical concerns specific to anxiety sensitivity uniquely predict HA, whereas cognitive and social concerns specific to anxiety sensitivity did not emerge as significant predictors. This result supports similar findings where only the physical dimension of anxiety sensitivity incrementally contributed to HA (Deacon & Abramowitz, 2009; Fergus & Bardeen, 2013; Fetzner et al., 2014). According to the cognitive-behavioural model of HA, catastrophizing about physical sensations is a key feature of HA (Warwick & Salkovskis, 1990). The physical dimension of anxiety sensitivity measures the belief that physical symptoms of anxiety will cause adverse health outcomes (Taylor et al., 2007). Thus, according to the cognitive-behavioural model of HA, it is logical that physical concerns specific to anxiety sensitivity would contribute to increased HA. Higher levels of anxiety sensitivity may predispose individuals to react negatively when noticing a physical sensation and trigger worry and rumination about health. However, it is worth noting that the metacognitive belief about the uncontrollability of thoughts replaced anxiety sensitivity

as the strongest predictor of HA when controlling for somatization. The results of the present study are consistent with previous findings that examined the relationship between metacognitive beliefs about health, anxiety sensitivity, and HA (Melli et al., 2016; Melli et al., 2017). These findings indicated that metacognitive beliefs about the uncontrollability of thoughts were the largest predictor of HA, while anxiety sensitivity was the second-largest predictor (Melli et al., 2016; Melli et al., 2017).

The inclusion of cognitive avoidance in the present study was largely exploratory. There is limited research suggesting that cognitive avoidance is predictive of HA (Langlois & Ladouceur, 2004). Since cognitive avoidance was not a significant contributor to HA or somatization in either the primary or supplementary analyses, the findings suggest that cognitive avoidance is not a mechanism that underlies HA. Likewise, catastrophic dysfunctional beliefs, as measured by the SOS-CAT, were not predictive of HA in the present study.

Another finding that aligns with previous research is that somatosensory amplification predicted HA (Barsky et al., 1990). However, somatosensory amplification lost predictive strength when controlling for somatization. This outcome may be explained by the similarity of somatosensory amplification and somatization. Somatosensory amplification describes how upsetting individuals find physical sensations (Barsky et al., 1990). In comparison, somatization describes self-reported somatic symptom severity (Kroenke et al., 2002). Somatosensory amplification likely contributes to somatic symptom severity, so it is not surprising that once the severity of somatic symptoms was controlled, the belief that somatic symptoms are upsetting became accounted for. The similarity between the constructs was also demonstrated statistically, as somatosensory amplification and somatization were moderately correlated in the present study.

Research in the field of HA is limited compared to other anxiety-related disorders. As such, this study provides preliminary results that could influence research in the area and fill in gaps in the literature. This study is the first to examine the relationship between HA, and both IU and metacognitions about health, after controlling for known contributing factors. Overall, the results of the present study indicate that metacognitive beliefs about health contribute significantly to HA and somatization. The present study aimed to identify the underlying cognitive processes specific to HA and further develop the cognitive-behavioural model. However, the results of the present study suggest that the metacognitive model of psychological disorders (Nordahl et al., 2019) might offer a better explanation of HA than the traditional cognitive-behavioural model (Warwick & Salkovskis, 1990).

The metacognitive model of psychological disorders proposes that maladaptive metacognitive beliefs result in repetitive negative thinking (Bailey & Wells, 2016; Nordahl et al., 2019). Thus, the metacognitive model posits that HA results from a general repetitive thinking style about illness, whereas the traditional cognitive-behavioural model emphasizes that specific dysfunctional illness beliefs contribute to HA (Marcus et al., 2007; Warwick & Salkovskis, 1990). For example, a metacognitive belief describes an individual's belief toward their thinking processes, such as believing that "I cannot control thinking about being sick." In comparison, a dysfunctional illness belief is directed toward a specific phenomenon, such as "Doctors are incompetent at accurately diagnosing disease."

The metacognitive model might explain why catastrophic illness-related beliefs and IU did not emerge as significant contributors to HA in the present study. Catastrophic illness-related beliefs are specific beliefs and do not exemplify a general thinking style. Regarding IU, IU is considered to a be a dispositional and transdiagnostic factor (Carleton, 2016). However, a recent

model of IU has proposed that IU triggers catastrophic beliefs toward uncertainty (Hebert & Dugas, 2019). Thus, this new model of IU argues that specific beliefs toward uncertainty causes emotional and behavioural problems. Based on the results of the present study, it seems that the traditional cognitive-behavioural model may too greatly emphasize the importance of specific beliefs. In the context of the metacognitive model, an individual's belief about their general thinking processes might explain HA better than specific HA-related beliefs.

However, the metacognitive model does not clearly articulate why anxiety sensitivity is an important contributor to HA. Anxiety sensitivity is regarded as a transdiagnostic factor (Smits et al., 2019). Potentially, anxiety sensitivity may overlap with the metacognitive model. For example, the metacognitive model proposes that there are both type 1 and type 2 worries (Wells, 2005). Type 1 worries are considered to be common in the general population that predispose individuals in developing type 2 worries. Type 2 worries are considered to be the negative metacognitions that contribute to psychopathology (Wells, 2005). Anxiety sensitivity could possibly be a type 1 worry that predisposes individuals in developing negative metacognitive beliefs, such as believing that thoughts are controllable. The metacognitive model also argues for a feedback loop where the type 2 worries trigger the type 1 worries (Wells, 2005). Potentially, negative metacognitive beliefs about health could also enhance anxiety sensitivity. However, research would need to be conducted to demonstrate whether negative metacognitive beliefs mediate the relationship between anxiety sensitivity and HA.

Implications of these findings suggest that it may be worthwhile for researchers to further examine the role of metacognitive beliefs about health with HA. Additionally, researchers may want to investigate the specific relationship between anxiety sensitivity and metacognitive beliefs in relation to HA. It may be worth examining how metacognitive beliefs about health and anxiety

sensitivity influence each other longitudinally and which variable predicts the onset of anxiety sensitivity over time.

Treatment Implications

The finding that metacognitive beliefs about health significantly accounted for HA suggests that clinicians may want to examine the efficacy of targeting metacognitive beliefs about health in treatment. It is generally recommended that individuals with severe HA receive cognitive-behavioural therapy (Axelsson & Hedman-Lagerlöf, 2019). While cognitive-behavioural therapy is an effective treatment for severe HA, the findings of the present study suggest that incorporating aspects of metacognitive treatment could enhance treatment outcomes. The present study's findings support preliminary research that demonstrated that changes in metacognitive beliefs resulted in clinically meaningful improvement in HA symptoms (Bailey & Wells, 2014; Solem et al., 2015).

Strengths of the Study

This study is the first to examine the role of IU, metacognitive beliefs about health, and cognitive avoidance with HA and somatization. The present study also extended the research of metacognitive beliefs in relation to HA by controlling for variables that have an established relationship with HA. Another strength of the present study is that the study recruited a large sample size, with only 36 participants being removed from analyses (N = 564). A large sample size decreases the marginality of error in results and increases the confidence in the validity and generalizability of findings (Price et al., 2015). Further, to reduce order effects, all measures used in this study were presented in a random order to participants. Moreover, the ethnicities of the sample demographic were diverse and multicultural (see Table 1), as well as representative of Edmonton's demographic population (Statistics Canada, 2016).

Limitations

The sample used in the present study was a convenience sample and limited to a non-clinical university population, which might limit the generalizability of findings to both the general and clinical populations. Future researchers should consider including data from clinical and non-clinical community populations to increase the validity of their results. Furthermore, the data collected was disproportionately female (72.3%) and Caucasian (54.4%). Likewise, the present study's average age is not representative of the general population (M = 21.83, SD = 5.04). A community-based sample may increase proportionate representations of gender and age.

Also, participants completed the study between March 2020 and September 2020. This timeframe resulted in the study being conducted during the initial stages of the COVID-19 pandemic in Canada. The pandemic might have influenced the present study, such as producing the higher-than-expected mean scores on the SHAI, PHQ-15, ASI-3, SSAS, SOS-CAT, and SOS-MIN. These measures assess various aspects of illness conviction, augmented physical sensations, somatization, and health worries. During the pandemic, individuals were encouraged to screen daily for physical symptoms, and there was widespread media coverage of illness and illness transmission. Society's greater emphasis on health and physical sensations might have amplified the student samples' scores on these health measures. However, the study results should not be invalidated by this, as higher scores on these measures simply imply that the student sample represented a more clinical population. Therefore, the higher expected mean scores might help further the generalizability of results to clinical samples. Moreover, the impact of media coverage on students' HA levels should have also increased the present study's measures of both the beliefs and levels of HA, thus the results of the present study should still reflect the underlying relationship between HA and the variables explored. Also, it is worth

noting that HA has been steadily rising in student populations over the last three decades (Kosic et al., 2020), which might further explain the high mean scores in the present study.

Conclusion

Individuals with severe HA worry excessively about their health and misinterpret normal body sensations as threatening (Warwick & Salkovskis, 1990). This study extends the current literature by examining specific factors found to contribute to HA but have not been previously investigated together, such as IU, metacognitive beliefs about health, cognitive avoidance, anxiety sensitivity, somatosensory amplification, and catastrophic beliefs (Bailey & Wells, 2016, Barsky et al., 1990; Deacon & Abramowitz, 2008; Langlois & Ladouceur, 2009; Marcus & Church, 2003; O'Bryan & McLeish, 2017). Analyses revealed that metacognitive beliefs about health and anxiety sensitivity accounted for the most variance in HA. Supplemental analyses confirmed that metacognitive beliefs that thoughts can cause illness, metacognitive beliefs that thoughts are uncontrollable, anxiety sensitivity, and somatization are the largest contributors to HA. Additionally, metacognitive beliefs about biased thinking, metacognitive beliefs that thoughts can cause illness, metacognitive beliefs that thoughts are uncontrollable, anxiety sensitivity, and somatosensory amplification are the largest contributors to somatization.

Future research may want to consider the metacognitive model of psychological disorders in explaining HA (Nordahl et al., 2019). Also, researchers may want to investigate how anxiety sensitivity interacts with metacognitive beliefs to produce HA.

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Appendix A

Consent Form

MacEwan UNIVERSITY | PSYCHOLOGY

Participant Consent Form

Project Title: The Role of Metacognitive Beliefs, Intolerance of Uncertainty, and Cognitive Avoidance in Health Anxiety

Researcher(s):

- Alexander Penney, Ph.D., Assistant Professor, Department of Psychology, MacEwan University, Alexander.Penney@macewan.ca
- Tiffany Unrau, BA Psychology (Honours), MacEwan University, unraut2@mymacewan.ca

Purpose of the Research:

- You are invited to participate in a research study in the Department of Psychology at MacEwan University. This study is interested in exploring how intolerance of uncertainty, cognitive avoidance, and metacognitions may contribute to health anxiety.

Procedures:

- In today's study, you will be asked to complete a variety of online questionnaires relevant to health anxiety, metacognitive beliefs, intolerance of uncertainty, cognitive avoidance, negative and positive affect, anxiety sensitivity, somatosensory amplification, catastrophizing thoughts, and other symptoms.
- You may skip any questions that you are uncomfortable with answering and you are free to withdraw from the study any time without penalty.
- At the end of the study, you will be debriefed on the purpose of the study.
- This study will take approximately 45-60 minutes to complete.

Potential Risks:

- The study is minimal risk. That is, involvement in this research will be no riskier than engaging in everyday thoughts or worries towards your health and thinking processes.
- Although unlikely, you may experience discomfort providing answers to certain questions. You may skip any questions you do not wish to answer. If at any point you experience discomfort, you may withdraw from the study.
- You will not be penalized for withdrawing from the study.
- Upon completion of the study, you will receive a debriefing form, which provides an in-depth explanation of the study. The debriefing form will also provide contact information for resources available to you at MacEwan University.

- Counselling services are available at MacEwan Wellness and Psychological Services located in Room 7-103A. You may contact this office via email at WPS@macewan.ca or by phone at 780-497-5063.

Potential Benefits:

- By participating in today's study, you will be contributing to the psychological literature on health anxiety, metacognitions, cognitive avoidance, and intolerance of uncertainty.
- You will gain a better understanding of how research in psychology is conducted.
- You may gain greater self-awareness regarding your thoughts, behaviours, and anxiety you may experience.

Compensation:

- You may eligible to earn up to 2% toward your final grade in your psychology course for taking part in this study. Details about how credit is awarded are described in your course outline provided by your professor, and you may contact the research pool coordinator, Danielle Striemer (striemerd@macewan.ca), if you have additional questions.

Confidentiality/Anonymity:

- The responses you provide in this study are anonymous. There will be no questions that require you to provide identifying information or any information that would reveal your identity. Therefore, upon submitting your data you will not be able to withdraw your responses, as we are unable to match you to your data.
- Data for this survey is collected through Qualtrics which is located in United States of America. As such, the data is subject to American privacy and security laws. This survey or questionnaire does not ask for personal identifiers or any information that may be used to identify you. The company servers may record incoming IP addresses of the computer that you use to access the survey, but the company asserts that no connection is made between your data and your computer's IP address. The privacy and security policy for the on-line survey company can be found at: https://www.qualtrics.com/privacy-statement/ and at: https://www.qualtrics.com/security-statement/

Anticipated use of the data and dissemination of the results:

- The data collected will only be used for research purposes. The anonymous data gathered in this study may be presented of academic conferences or in research publications. The data will be reported in aggregate form, so that it will not be possible to identify individuals. Your confidentiality is assured.

Right to withdraw:

- Your participation is voluntary. You are free to skip any questions that you do not wish to answer.
- You may withdraw from the study for any reason, at any time, without explanation or penalty of any sort. To do so, simply discontinue your completion

of the questionnaires by closing your browser window.
- Whether you choose to participate or not will have no effect on your class standing or how you will be treated.

Follow up and Questions:
- If you have any questions or concerns, please contact the researcher(s) using the information at the top of page.

Questions or Concerns about Ethical Conduct:
- This project has been approved on ethical grounds by the MacEwan University Research Ethics Board. Any questions regarding your rights as a participant may be addressed to the Board at 780-497-4280 or REB@macewan.ca.

Documenting Consent:
- By completing and submitting the questionnaire, your free and informed consent is implied and shows that you understand the above conditions of participation in this study.
- I hereby agree to participate in the above-described research. I understand that consent does not constitute a waiver of legal rights in the event of research-related harm.

Appendix B

Measures Used in the Present Study

Demographics Questionnaire

We would appreciate your responses to the following questions.

1) What sex were you assigned at birth, meaning on your original birth certificate?

___Male
___Female
___Unsure/don't know
___Prefer not to answer
___Other (please specify): _____

2) What is your current gender/gender identity?

___Male
___Female
___Trans Man - Female to Male (FtM)
___Trans Woman - Male to Female (MtF)
___Two-Spirit
___Non-Binary
___Unsure/Don't know
___Prefer not to answer
___Other (please specify): _____

3) Age: _____

4) Which of the following <u>best</u> describes your racial/ethnic identity?

___Caucasian (White)
___Black
___Indigenous/Aboriginal
___Latino/Hispanic/Caribbean
___South American (e.g., Brazilian, Chilean, Peruvian, etc.)
___African
___Scandinavian
___Eastern European (e.g., Russian, Ukrainian, Romanian, etc.)
___Middle Eastern
___Israeli
___East Asian (e.g., Chinese, Japanese, Korean, etc.)
___Southeast Asian (e.g., Malaysian, Filipino, Vietnamese, etc.)

___Mixed race
___Don't know
___Prefer not to answer
___Other (please specify): _____

5) What is your current marital status?
__Single
__Dating
__Married/common law
__Divorced/separated
__Widowed

6) Are you currently employed?
__Full Time
__Part Time
__Retired
__No

7) Are you currently a student?
__Yes – Full Time
__Yes – Part Time
__No

8) What is your highest level of education?
__Completed Master's/Doctoral degree
__Completed an undergraduate degree/college diploma
__Some university/college
__Completed high school diploma
__Some high school

9) Please list any mental health or medical conditions that you have previously been diagnosed with by a medical doctor, counsellor, or other professional: __None
Condition A: _____ Condition D: _____
Condition B: _____ Condition E: _____
Condition C: _____ Condition F: _____

Short Health Anxiety Index (SHAI)

Each question is this section consists of a group of four statements. Please read each group of statements carefully and then select the one which best describes your feelings, **over the past six months**. Identify the statement by circling the letter next to the statement. It may be that more than one statement applies, in which case, please circle any that are applicable.

1. (a) I do not worry about my health.
   (b) I occasionally worry about my health.
   (c) I spend much of my time worrying about my health.
   (d) I spend most of my time worrying about my health.

2. (a) I notice aches/pains less than most other people (of my age).
   (b) I notice aches/pains as much as most other people (of my age).
   (c) I notice aches/pains more than most other people (of my age).
   (d) I am aware of aches/pains in my body all the time.

3. (a) As a rule I am not aware of bodily sensations or changes.
   (b) Sometimes I am aware of bodily sensations or changes.
   (c) I am often aware of bodily sensations or changes.
   (d) I am constantly aware of bodily sensations or changes.

4. (a) Resisting thoughts of illness is never a problem.
   (b) Most of the time I can resist thoughts of illness.
   (c) I try to resist thoughts of illness but am often unable to do so.
   (d) Thoughts of illness are so strong that I no longer even try to resist them.

5. (a) As a rule I am not afraid that I have a serious illness.
   (b) I am sometimes afraid that I have a serious illness.
   (c) I am often afraid that I have a serious illness.
   (d) I am always afraid that I have a serious illness.

6. (a) I do not have images (mental pictures) of myself being ill.
   (b) I occasionally have images of myself being ill.
   (c) I frequently have images of myself being ill.
   (d) I constantly have images of myself being ill.

7. (a) I do not have any difficulty taking my mind off thoughts about my health.
   (b) I sometimes have difficulty taking my mind off thoughts about my health.
   (c) I often have difficulty in taking my mind off thoughts about my health.
   (d) Nothing can take my mind off thoughts about my health.

8. (a) I am lastingly relieved if my doctor tells me there is nothing wrong.
   (b) I am initially relieved but the worries sometimes return later.
   (c) I am initially relieved but the worries always return later.
   (d) I am not relieved if my doctor tells me there is nothing wrong.

9. (a) If I hear about an illness I never think I have it myself.
   (b) If I hear about an illness I sometimes think I have it myself.
   (c) If I hear about an illness I often think I have it myself.
   (d) If I hear about an illness I always think I have it myself.

10. (a) If I have a bodily sensation or change I rarely wonder what it means.
    (b) If I have a bodily sensation or change I often wonder what it means.
    (c) If I have a bodily sensation or change I always wonder what it means.
    (d) If I have a bodily sensation or change I must know what it means.

11. (a) I usually feel at very low risk for developing a serious illness.
    (b) I usually feel at fairly low risk for developing a serious illness.
    (c) I usually feel at moderate risk for developing a serious illness.
    (d) I usually feel at high risk for developing a serious illness.

12. (a) I never think I have a serious illness.
    (b) I sometimes think I have a serious illness.
    (c) I often think I have a serious illness.
    (d) I usually think that I am seriously ill.

13. (a) If I notice an unexplained bodily sensation I don't find it difficult to think about other things.

(b) If I notice an unexplained bodily sensation I sometimes find it difficult to think about other things.

(c) If I notice an unexplained bodily sensation I often find it difficult to think about other things.

(d) If I notice an unexplained bodily sensation I always find it difficult to think about other things.

14. (a) My family/friends would say I do not worry enough about my health.

(b) My family/friends would say I have a normal attitude to my health.

(c) My family/friends would say I worry too much about my health.

(d) My family/friends would say I am a hypochondriac.

For the following questions, please think about what it might be like if you had a serious illness of a type which particularly concerns you (such as heart disease, cancer, multiple sclerosis and so on). Obviously it may not be possible to know for definite what it would be like; please give your best estimate of what you think might happen, basing your estimate on what you know about yourself and serious illness in general.

---

15. (a) If I had a serious illness I would still be able to enjoy things in my life quite a lot.

(b) If I had a serious illness I would still be able to enjoy things in my life a little.

(c) If I had a serious illness I would be almost completely unable to enjoy things in my life.

(d) If I had a serious illness I would be completely unable to enjoy life at all.

16. (a) If I developed a serious illness there is a good chance that modern medicine would be able to cure me.

(b) If I developed a serious illness there is a moderate chance that modern medicine would be able to cure me.

(c) If I developed a serious illness there is a very small chance that modern medicine would be able to cure me.

(d) If I developed a serious illness there is no chance that modern medicine would be able to cure me.

17. (a) A serious illness would ruin some aspects of my life.
    (b) A serious illness would ruin many aspects of my life.
    (c) A serious illness would ruin almost every aspect of my life.
    (d) A serious illness would ruin every aspect of my life.

18. (a) If I had a serious illness I would not feel that I had lost my dignity.
    (b) If I had a serious illness I would feel that I had lost a little of my dignity.
    (c) If I had a serious illness I would feel that I had lost quite a lot of my dignity.
    (d) If I had a serious illness I would feel that I had totally lost my dignity.

Patient and Health Questionnaire-15 (PHQ-15)

Physical Symptoms

During the past 4 weeks, how much have you been bothered by any of the following problems?

	Not at all (0)	Bothered a little (1)	Bothered a lot (2)
a. Stomach pain	(0)	(1)	(2)
b. Back pain	(0)	(1)	(2)
c. Pain in your arms, legs, or joints (knees, hips, etc.)	(0)	(1)	(2)
d. Menstrual cramps or other problems with your periods (WOMEN ONLY)	(0)	(1)	(2)
e. Headaches	(0)	(1)	(2)
f. Chest pain	(0)	(1)	(2)
g. Dizziness	(0)	(1)	(2)
h. Fainting spells	(0)	(1)	(2)
i. Feeling your heart pound or race	(0)	(1)	(2)
j. Shortness of breath	(0)	(1)	(2)
k. Pain or problems during sexual intercourse	(0)	(1)	(2)
l. Constipation, loose bowels, or diarrhea	(0)	(1)	(2)
m. Nausea, gas, or indigestion	(0)	(1)	(2)
n. Feeling tired or having low energy	(0)	(1)	(2)
o. Trouble sleeping	(0)	(1)	(2)

Intolerance of Uncertainty Scale-27 (IUS 27)

You will find below a series of statements which describe how people may react to the uncertainties of life. Please use the scale below to describe what extent each item is characteristic of you. Please enter a number (1 to 5) that describes you best.

1	2	3	4	5
Not at all characteristic of me		**Somewhat characteristic of me**		**Entirely characteristic of me**

1. _____ Uncertainty stops me from having a strong opinion.
2. _____ Being uncertain means that a person is disorganized.
3. _____ Uncertainty makes life intolerable.
4. _____ It's unfair having no guarantees in life.
5. _____ My mind can't be relaxed if I don't know what will happen tomorrow.
6. _____ Uncertainty makes me uneasy, anxious, or stressed.
7. _____ Unforeseen events upset me greatly.
8. _____ It frustrates me not having all the information I need.
9. _____ Uncertainty keeps me from living a full life.
10. _____ One should always look ahead so as to avoid surprises.
11. _____ A small unforeseen event can spoil everything, even with the best planning.
12. _____ When it's time to act, uncertainty paralyses me.
13. _____ Being uncertain means that I am not first rate.
14. _____ When I am uncertain, I can't go forward.
15. _____ When I am uncertain, I can't function very well.
16. _____ Unlike me, others seem to know where they are going with their lives.
17. _____ Uncertainty makes me vulnerable, unhappy, or sad.
18. _____ I always want to know what the future has in store for me.
19. _____ I can't stand being taken by surprise.
20. _____ The smallest doubt can stop me from acting.
21. _____ I should be able to organize everything in advance.
22. _____ Being uncertain means that I lack confidence.
23. _____ I think it's unfair that other people seem to be sure about their future.
24. _____ Uncertainty keeps me from sleeping soundly.
25. _____ I must get away from all uncertain situations.
26. _____ The ambiguities in life stress me.
27. _____ I can't stand being undecided about my future

Metacognitions Questionnaire-Health Anxiety (MCQHA)

This questionnaire is concerned with beliefs people have regarding thinking about their health. Please read each item and then state how much you generally agree with it by circling the appropriate number. Please respond to all the items. There are no right or wrong answers.

Do not Agree 1	Agree Slightly 2	Agree Moderately 3	Agree very much 4

1.	Thinking of illness could change my health.	1	2	3	4
2.	I cannot have peace of mind so long as I have my physical symptoms.	1	2	3	4
3.	I will be punished for thinking I am in good health.	1	2	3	4
4.	Thinking negatively could increase my chances of disease.	1	2	3	4
5.	Worrying about illness is likely to make it happen.	1	2	3	4
6.	Some thoughts have the power to make me ill.	1	2	3	4
7.	Dwelling on thoughts of illness is uncontrollable.	1	2	3	4
8.	Thinking the worse about my symptoms will keep me safe.	1	2	3	4
9.	Worrying about my health will damage my body.	1	2	3	4
10.	If I think positively about physical symptoms, I will be caught off guard.	1	2	3	4
11.	Worrying about my health will help me cope.	1	2	3	4
12.	I have no control over thinking about my health.	1	2	3	4
13.	Only if I have a diagnosis will I be able to stop worrying.	1	2	3	4
14.	Thinking positively about my health will tempt fate and I will become ill.	1	2	3	4

Cognitive Avoidance Questionnaire (CAQ)

People react differently to certain types of thoughts. Using the following scale, please indicate to what extent each of the following statements is typical of the way that you respond to certain thoughts. Please circle the appropriate number (1 to 5).

Not at all typical	A little typical	Somewhat typical	Very typical	Completely typical
1	2	3	4	5

1. There are things that I would rather not think about.

1 2 3 4 5

2. I avoid certain situations that lead me to pay attention to things I don't want to think about.

1 2 3 4 5

3. I replace threatening mental images with things I say to myself in my mind.

1 2 3 4 5

4. I think about things that concern me as if they were occurring to someone else.

1 2 3 4 5

5. I have thoughts that I try to avoid.

1 2 3 4 5

6. I try not to think about the most upsetting aspects of some situations so as not to be too afraid.

1 2 3 4 5

7. I sometimes avoid objects that can trigger upsetting thoughts.

1 2 3 4 5

8. I distract myself to avoid thinking about certain disturbing subjects.

1 2 3 4 5

9. I avoid people who make me think about things that I do not want to think about.

1 2 3 4 5

Not at all typical	A little typical	Somewhat typical	Very typical	Completely typical
1	2	3	4	5

10. I often do things to distract myself from my thoughts.

1 2 3 4 5

11. I think about trivial details so as not to think about important subjects that worry me.

1 2 3 4 5

12. Sometimes I throw myself into an activity so as not to think about certain things.

1 2 3 4 5

13. To avoid thinking about subjects that upset me, I force myself to think about something else.

1 2 3 4 5

14. There are things I try not to think about.

1 2 3 4 5

15. I keep saying things to myself in my head to avoid visualizing scenarios (a series of mental images) that frighten me.

1 2 3 4 5

16. Sometimes I avoid places that make me think about things I would prefer not to think about.

1 2 3 4 5

17. I think about past events so as not to think about future events that make me feel insecure.

1 2 3 4 5

18. I avoid actions that remind me of things I do not want to think about.

1 2 3 4 5

19. When I have mental images that are upsetting, I say things to myself in my head to replace the images.

1 2 3 4 5

Not at all typical	A little typical	Somewhat typical	Very typical	Completely typical
1	2	3	4	5

20. I think about many little things so as not to think about more important matters.

1 2 3 4 5

21. Sometimes I keep myself occupied just to prevent thoughts from popping up in my mind.

1 2 3 4 5

22. I avoid situations that involve people who make me think about unpleasant things.

1 2 3 4 5

23. Rather than having images of upsetting events form in my mind, I try to describe the events using an internal monologue (things that I say to myself in my head).

1 2 3 4 5

24. I push away the mental images related to a threatening situation by trying to describe the situation using an internal monologue.

1 2 3 4 5

25. I think about things that are worrying other people rather than thinking about my own worries.

1 2 3 4 5

Anxiety Sensitivity Index-3 (ASI-3)

Please circle the number that best corresponds to how much you agree with each item. If any items concern something that you have never experienced (e.g., fainting in public) answer on the basis of how you think you might feel *if you had* such an experience. Otherwise, answer all items on the basis of your own experience. Be careful to circle only one number for each item and please answer all items.

	Very Little	**A little**	**Some**	**Much**	**Very much**
1. It is important for me not to appear nervous.	0	1	2	3	4
2. When I cannot keep my mind on a task, I worry that I might be going crazy.	0	1	2	3	4
3. It scares me when my heart beats rapidly.	0	1	2	3	4
4. When my stomach is upset, I worry that I might be seriously ill.	0	1	2	3	4
5. It scares me when I am unable to keep my mind on a task.	0	1	2	3	4
6. When I tremble in the presence of others, I fear what people might think of me.	0	1	2	3	4
7. When my chest feels tight, I get scared that I won't be able to breathe properly.	0	1	2	3	4
8. When I feel pain in my chest, I worry that I am going to have a heart attack.	0	1	2	3	4
9. I worry that other people will notice my anxiety.	0	1	2	3	4
10. When I feel "spacey" or spaced out I worry that I may be mentally ill.	0	1	2	3	4
11. It scares me when I blush in front of people.	0	1	2	3	4
12. When I notice my heart skipping a beat, I worry that there is something seriously wrong with me.	0	1	2	3.	4
13. When I begin to sweat in a social situation, I fear people will think negatively of me.	0	1	2	3	4
14. When my thoughts seem to speed up, I worry that I might be going crazy.	0	1	2	3	4
15. When my throat feels tight, I worry that I could choke to death.	0	1	2	3	4
16. When I have trouble thinking clearly, I worry that there is something wrong with me.	0	1	2	3	4

17. I think it would be horrible for me to faint in public.	0	1	2	3	4
18. When my mind goes blank, I worry there is something terribly wrong with me.	0	1	2	3	4

1) TOTAL = SUM (Q1-Q18)

2) PHYSICAL CONCERNS = SUM (Q3, Q4, Q7, Q8, Q12, Q15)

3) COGNITIVE CONCERNS = SUM (Q2, Q5, Q10, Q14, Q16, Q18)

4) SOCIAL CONCERNS = SUM (Q1, Q6, Q9, Q11, Q13, Q17)

Somatosensory Amplification Scale (SSAS)

Please indicate the degree to which each of the following statements are ***true of you*** in general.

Not at all true	A little bit true	Moderately true	Quite a bit true	Extremely true
1	2	3	4	5

1. I can't stand smoke, smog, or pollutants in the air.

   1 2 3 4 5

2. I am often aware of various things happening within my body.

   1 2 3 4 5

3. When I bruise myself, it stays noticeable for a long time.

   1 2 3 4 5

4. I sometimes can feel the blood flowing in my body.

   1 2 3 4 5

5. Sudden loud noises really bother me.

   1 2 3 4 5

6. I can sometimes hear my pulse or my heartbeat throbbing in my ear.

   1 2 3 4 5

7. I hate to be too hot or too cold.

   1 2 3 4 5

8. I am quick to sense hunger contractions in my stomach.

   1 2 3 4 5

9. Even something minor, like an insect bite or a splinter, really bothers me.

   1 2 3 4 5

10. I can't stand pain.

    1 2 3 4 5

Symptoms and Outcome Scale (SOS)

Below are descriptions of different people who have different medical symptoms and possible diagnoses to go with these symptoms. We would like you to say how likely you think each diagnosis is. There are no right or wrong answers.

1. Tom has been feeling tired lately and has noticed some strange white spots in the back of his mouth. What is the probability that Tom has a strep throat?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

2. Julie has noticed that one of her birthmarks looks like it has changed color. What is the probability that Julie has skin cancer?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

3. Victor started to notice that there is blood in his stool (feces). What is the probability that Victor has hemorrhoids?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

4. Suddenly, Gina got a splitting headache. She also felt dizzy and weak on one side of her body. What is the probability that Gina is having a stroke?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

5. Erica has noticed what seems like a lump in her breast. What is the probability that Erica has breast cancer?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

6. Lisa has noticed a tingling in her fingers that has not gone away for the past two weeks. What is the probability that Lisa pinched a nerve?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

7. For the past three weeks, Rick has had a heavy cough that has not gone away and he has coughed up blood on two occasions. What is the probability that Rick has a bad case of the flu?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

8. Dan has been very thirsty for the past three weeks and he has noticed that he has to urinate frequently. What is the probability that Dan has diabetes?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

9. Al has felt a tightness in his chest for the past two days. Today his chest is beginning to hurt. What is the probability that Al is having a heart attack?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

10. Cheryl has had a painful headache that has not gone away for the past two weeks. What is the probability that Cheryl has a brain tumor?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

11. Wendy has noticed that one of her birthmarks looks like it has changed color. What is the probability that Wendy just irritated her birthmark and it will not cause her any problems?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

12. Betty has noticed a tingling in her fingers that has not gone away for the past two weeks. What is the probability that Betty is developing multiple sclerosis?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

13. Henry has been feeling tired lately and has noticed some strange white spots in the back of his mouth. What is the probability that Henry is infected with HIV?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

14. Polly has noticed what seems like a lump in her breast. What is the probability that the lump is benign (not harmful)?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

15. Suddenly, Susan got a splitting headache. She also felt dizzy and weak on one side of her body. What is the probability that Susan is having a migraine?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

16. Ken has felt a tightness in his chest for the past two days. Today his chest is beginning to hurt. What is the probability that Ken pulled a muscle?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

17. Ira started to notice that there is blood in his stool. What is the probability that Ira has rectal cancer?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

18. Norm has been very thirsty for the past three weeks and he has noticed that he has to urinate frequently. What is the probability that this is just because Norm has been under stress?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

19. Mary has had a painful headache that has not gone away for the past two weeks. What is the probability that Mary had a concussion?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

20. For the past three weeks, Fred has had a heavy cough that has not gone away and he has coughed up blood on two occasions. What is the probability that Fred has lung cancer?

(a) 0-20% (b) 21-40% (c) 41-60% (d) 61-80% (e) 81-100%

Appendix C

Debriefing Form

Thank you for your participation. We would like to tell you more about the study you just participated in. The purpose of our study is to investigate if metacognitions, cognitive avoidance, and intolerance of uncertainty are related to health anxiety (HA). We also wanted to control for various factors that contribute to HA. These factors were somatosensory amplification, anxiety sensitivity, catastrophizing thoughts, and positive and negative affect.

HA is characterized by disproportionate health concerns. Individuals with severe HA worry excessively and become fearful that they have a serious illness despite being healthy and reassured by their doctor. Please know that your participation does not mean you severe HA. The present study does not diagnose you and your participation does not suggest you have above average worry/anxiety. If you have any distress upon completing this study, please see the services listed below.

This study primarily measured three factors: metacognitions, intolerance of uncertainty, and cognitive avoidance. Past research has shown that compared to health controls, those with HA report higher levels of negative metacognitions and intolerance of uncertainty. However, these two factors have not been studied together. Metacognitions refer to people's thoughts about their thoughts. For example, if someone had negative metacognitive beliefs, they may believe that their thoughts are dangerous and uncontrollable. Intolerance of uncertainty is a characteristic that describes an individual's negative beliefs about uncertainty or uncertain situations. Someone who is high in intolerance of uncertainty would find uncertain situations upsetting and stressful. Cognitive avoidance is a thought strategy that people use to avoid events or problems. For example, an individual with high cognitive avoidance may worry excessively or try to suppress certain thoughts. Cognitive avoidance is characteristic of anxiety disorders but has not been studied exclusively with HA.

This study hypothesizes that metacognitions, intolerance of uncertainty, and cognitive avoidance will have a significant relationship with HA. We predict that those high in HA will report high levels of all three factors.

You completed a series of questionnaires pertaining to HA, metacognitions, intolerance of uncertainty, and cognitive avoidance. Measuring these things will allow us to test our hypotheses. To rule out other potential contributing factors, and for exploratory purposes, we also included questionnaires that measured symptoms of other mental disorders such as OCD, depression, and generalized anxiety disorder, as well as measures for anxiety sensitivity, negative and positive affect, catastrophizing thoughts, and somatosensory amplification.

As mentioned previously, the information you have provided today will be kept anonymous. Therefore, we will be unable to link you to any of the responses you have provided.

Should you have any questions regarding the study, you may contact Tiffany Unrau at unraut2@mymacewan.ca or Dr. Alexander Penney at Alexander.Penney@macewan.ca. If

interested, we will be happy to share with you the results of our study after we have obtained and analyzed all of our data.

If you have any questions or concerns regarding the ethics of this study, you may contact the Research Ethics Board at REB@macewan.ca.

Counselling services are available at MacEwan University's Student Life office located in Room 7-103A. You may contact this office via email at WPA@macewan.ca or by phone at 780-497-5063. Additionally, you may wish to speak with your primary care physician if you experience any further emotional distress following this study. Should you experience a personal emergency, local crisis response is available at 780-482-HELP (4357). You can also contact the Alberta Mental Health Helpline at 1-877-303-2642.

Thank you again for your participation, we greatly appreciate it.