What Maintains Generalized Anxiety Disorder? Examining Intolerance of Uncertainty and Negative Beliefs about Worry

Sydney A. Parkinson

Supervisor: Dr. Alexander M. Penney

Second Reader: Dr. Andrew Howell

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

March 29, 2022

Abstract

Individuals with generalized anxiety disorder (GAD) experience excessive and chronic worry over a variety of daily events. If left untreated, GAD tends to be chronic and cause difficulties in daily functioning. Therefore, understanding the factors that cause and maintain GAD is important to allow for the effective treatment of the disorder. The Metacognitive Model, Intolerance of Uncertainty Model, and Emotional Dysregulation Model each implicate specific mechanisms as the casual and maintaining factor in GAD. Existing research has shown negative beliefs about worry (NBW), intolerance of uncertainty (IU), and fear of emotions to be associated with GAD. However, the existing research is primarily cross-sectional, which does not allow researchers to determine whether these beliefs cause and maintain GAD. The present longitudinal study examined whether NBW, IU, fear of emotions, negative problem orientation, and cognitive avoidance predict worry severity and GAD symptoms at follow-up. Undergraduate psychology students, pre-screened for high levels of worry, completed a series of online self-report measures assessing levels of worry, GAD symptoms, NBW, IU fear of emotions, negative problem orientation, and cognitive avoidance. Participants (N = 372) returned 4-months later to complete the same series of questionnaires. Multiple regression analyses revealed that NBW was the only mechanism to consistently emerge as a predictor of pathological worry and GAD symptoms cross-sectionally and longitudinally. Exploratory analyses revealed that changes in NBW and IU were the only mechanisms to predict changes in GAD at follow-up. These findings have implications for the understanding and treatment of GAD.

Acknowledgments

Most importantly, I would like to express my sincerest thanks to Dr. Alex Penney for supervising my honours thesis project. Dr. Penney, I am not sure there are words to adequately describe how grateful I am to have spent the past five years working under your supervision. Thank you for welcoming me into the Worry and Health Anxiety (WAHA) Lab in the first year of my degree. Not only did you supervise my honours thesis, but you provided me so many additional opportunities and experiences. These experiences have helped me develop numerous research skills, such as how to design research studies, apply for funding, write ethics applications, analyze data, and disseminate findings. Dr. Penney, it is your passion for anxiety research, and dedication to making a positive impact for those living with anxiety, that is truly contagious. It is because of your knowledge, guidance, and support that I have achieved my dream of pursing graduate studies in clinical psychology. For this, I will forever be grateful.

I would also like to thank Dr. Andrew Howell for being my second reader. I appreciate your time and effort in reviewing my manuscript, as well as the guidance and support you have provided me throughout the graduate school application process. I am grateful for your mentorship.

I would also like to thank the members of the WAHA Lab and my honours cohort. Specifically, I would like to thank Layton Byam for his friendship and support. Layton has always been just a phone call away to help me bounce ideas around, trouble shoot problems, or simply to lend a listening ear. Above all else, I am thankful for the friendship we share.

Lastly, I would like to thank my parents for their unwavering love and support. Thank you for always encouraging me to pursue my dreams. I would not be where I am today without you.

Table of Contents

List of Tables

List of Abbreviations

ASC	Affective Control Scale
CAQ	Cognitive Avoidance Questionnaire
EDM	Emotional Dysregulation Model
GAD	Generalized anxiety disorder
GAD-7	Generalized Anxiety Disorder–7 Item Scale
GADQ-IV	Generalized Anxiety Disorder Questionnaire-IV
IUM	Intolerance of Uncertainty Model
IUS-18	Intolerance of Uncertainty Scale
IUT	Intolerance of Uncertainty Therapy
MCM	Metacognitive Model
MCQ-30	Metacognitions Questionnaire-30
MCQ-NBW	MCQ-30 Negative Beliefs about Uncontrollability and Danger of Worry subscale
MCQ-PBW	MCQ-30 Positive Beliefs about Worry subscale
MCT	Metacognitive Therapy
NPOQ	Negative Problem Orientation Questionnaire
PSWQ	Penn State Worry Questionnaire

What Maintains Generalized Anxiety Disorder? Examining Intolerance of Uncertainty and Negative Beliefs about Worry

Worry is common in everyday life. Most people worry about day-to-day life events, but how much people worry varies extensively between individuals. When individuals experience significant levels of worry daily, they may be considered "chronic worriers". Chronic worriers report high trait worry, experience significant concerns over future events, and experience some physical signs of chronic anxiety (e.g., muscle tension, irritability; Ruscio, 2002). For some chronic worriers, their worrying is so frequent and intense that it leads to clinically significant distress and impaired daily functioning, leading to the onset of generalized anxiety disorder. Generalized anxiety disorder (GAD) is characterized by chronic and excessive worry, lasting at least six months, and is associated with various somatic symptoms, including fatigue, muscle tension, and sleep disturbances (American Psychiatric Association, 2013). Individuals with GAD worry intensely about potential future negative events across a variety of domains, such as work, health, school, or family. At any given time, it is estimated that approximately 2-3% of the population will meet diagnostic criteria for GAD (Barlow et al., 2018; Grant et al., 2005). If left untreated, GAD tends to be chronic, and individuals experience persistent difficulties in ongoing daily functioning (Kessler & Wittchen, 2002).

Given the chronic and impairing nature of GAD, it is imperative that the etiology of GAD be well understood in order to allow for the effective treatment of the disorder. Various theoretical models have been developed to explain what factors cause the development and maintenance of GAD, as well as how best to treat it (Behar et al., 2009; McCabe-Bennett et al., 2018). Currently, there are five major cognitive-behavioural models of GAD, but the two models that have received the greatest empirical support include the Intolerance of Uncertainty Model

(Dugas & Koerner, 2005) and the Metacognitive Model (Wells, 1995). In addition, the Emotional Dysregulation Model has also gained preliminary empirical support in the literature (Mennin et al., 2002).

The Intolerance of Uncertainty Model

According to the Intolerance of Uncertainty Model (IUM), intolerance of uncertainty causes the development and maintenance of GAD (Dugas & Koerner, 2005). Intolerance of uncertainty refers to the anxiety and distress individuals experience when dealing with uncertain situations. In response to such situations, individuals with GAD will engage in worry to better cope with uncertainty. The IUM also suggests that individuals with GAD hold positive dysfunctional beliefs about their worry. Specifically, individuals with GAD believe that worry will allow them to better cope with feared outcomes or will prevent feared events from happening at all. The IUM also argues that two additional mechanisms, negative problem orientation and cognitive avoidance, play a role in GAD by exacerbating and maintaining high levels of worry and anxiety. Individuals who experience negative problem orientation lack confidence in their ability to solve problems, perceive problems as threatening, and become easily frustrated when trying to problem solve (Koerner & Dugas, 2006). Within the IUM, cognitive avoidance refers to the use of various cognitive strategies to avoid or suppress threatening mental images, such as turning mental images into verbal-linguistic thoughts to reduce arousal (Dugas & Koerner, 2005). While the IUM contains these four distinct problematic mechanisms, it is proposed that intolerance of uncertainty is the core driving factor for GAD and serves as the catalyst for the worrying process, causing high levels of anxiety, negative problem orientation, and cognitive avoidance. According to the IUM, not only is intolerance of

uncertainty responsible for causing GAD, but developing a tolerance for and acceptance of uncertainty is central to the treatment of GAD (Robichaud & Dugas, 2006).

Extensive cross-sectional research has established empirical support for the IUM. Researchers have consistently shown, when controlling for other factors commonly associated with worry, that intolerance of uncertainty is strongly associated with pathological worry (Buhr & Dugas, 2006; Dugas et al., 2001; Sexton et al., 2003). Further, researchers have evaluated whether the IUM differentiates between individuals with GAD and various other anxiety disorders. Ladoucer et al. (1999) found that intolerance of uncertainty and negative problem orientation differentiated those with GAD from those with other anxiety disorders (i.e., obsessive-compulsive disorder, social phobia, panic disorder, specific phobia, and posttraumatic stress disorder). Similarly, Dugas et al. (2005) found that that individuals with GAD reported higher levels of intolerance of uncertainty compared to individuals with panic disorder. It was also found that intolerance of uncertainty, positive beliefs about worry, negative problem orientation, and cognitive avoidance all correlated with worry severity, but none of these four model components correlated with the main features of panic disorder (e.g., bodily sensations, agoraphobic cognitions). Further findings suggest that negative problem orientation, intolerance of uncertainty, and beliefs about worry are significantly higher in individuals with GAD compared to moderate worriers (Ladoucer et al., 1998). In addition, experimental research has shown that when participants are placed in situations provoking high levels of uncertainty, trait intolerance of uncertainty predicts participant's state worry (de Bruin et al., 2006; Ladoucer et al., 2000).

Various treatment-outcome studies have also established further empirical support for the IUM. Dugas and Ladoucer (2000) conducted the first treatment-outcome study to examine the

efficacy of Intolerance of Uncertainty Therapy (IUT). Although relying on a small sample, researchers found that most clients no longer met diagnostic criteria for GAD post-treatment. Further, most clients displayed significant improvements in worry severity and GAD symptoms at six- and twelve-month follow-ups. Further research has supported these findings. Dugas et al. (2003) found that GAD clients ($N = 52$) who received IUT reported decreased intolerance of uncertainty and worry severity following treatment, and that these gains were maintained at six-, twelve-, and twenty-four-month follow-ups. Further, Dugas et al. (2010) found that clients with GAD who received IUT experienced greater symptom remission compared to clients who were treated with applied relaxation. Further, while the aforementioned studies targeted all aspects of the IUM, Hebert and Dugas (2019) found that when clients with GAD receive treatment targeting only intolerance of uncertainty, they still experience significant reductions in GAD symptoms and intolerance of uncertainty. Taken together, these findings suggest that IUT results in significant improvements in worry severity and GAD symptoms due to a decrease in intolerance of uncertainty, and that clients continue to make gains once treatment ends.

While various cross-sectional and treatment-outcome studies support the IUM, there is emerging research suggesting that intolerance of uncertainty is a transdiagnostic construct explaining variance across anxiety disorders. Researchers have found evidence that, in addition to being strongly associated with GAD, intolerance of uncertainty is related to panic disorder with or without agoraphobia, obsessive compulsive disorder, social anxiety disorder, and depression (Boelen & Reijntjes, 2009; Mahoney & McEvoy, 2012; Norton & Mehta, 2007, Wright et al., 2016). Therefore, it is possible the association between GAD and intolerance of uncertainty is due to the role of intolerance of uncertainty among anxiety disorders broadly, rather than being specific to GAD.

The Metacognitive Model

The Metacognitive Model (MCM) emphasizes the importance of metacognitions and posits those individuals with GAD hold both positive and negative beliefs about their worry (Wells, 1995). Within the MCM, there are two types of worry: *Type–I worry* and *Type–II worry.* When an individual is initially faced with an anxiety provoking situation, their positive beliefs about worry are activated. When one holds positive beliefs about their worry, they believe that worry is useful and will help them cope with the anxiety inducing situation. These positive beliefs about worry activate the process of *Type–I worry,* which refers to worrying about external situations (e.g., family, friends, work) or physical symptoms of anxiety. Positive beliefs about worry encourage individuals to use worry as a means to cope with anxiety provoking situations. Positive beliefs about worry are also a component of the IUM, with both the IUM and MCM largely agreeing that positive beliefs about worry play a minor, but noteworthy, role in the development of GAD.

However, according to the MCM, negative beliefs about worry and the subsequent *Type–II worry* is main the driving factor behind GAD (Wells, 2005). The MCM posits that during *Type–I worry* individuals with GAD will experience an activation of negative beliefs about worry. Subsequently, individuals with GAD begin to fear their worry is dangerous and uncontrollable. Individuals who believe their worry is dangerous endorse ideas such as, “my worrying thoughts persist no matter how I try to stop them” and “I cannot ignore my worrying thoughts” (Wells & Cartwright-Hatton, 2004). Individuals believing their worry is dangerous endorse ideas such as, “my worrying could make me go mad” and “I could make myself sick with worrying”. The beliefs that one’s worry is uncontrollable and dangerous leads to *Type–II worry,* also known as meta-worry, wherein individuals with GAD begin to experience excessive

worry about their worry. According to the MCM, negative beliefs about worry and the associated meta-worry is what distinguishes chronic worriers from those with GAD (Wells, 2002). Individuals with GAD will then engage in various ineffective coping strategies focused on controlling emotions, behaviours, and thoughts, in an attempt to avoid worrying.

There is significant research support for the MCM. Researchers have consistently shown that negative beliefs about worry are associated with worry, the central feature of GAD (Cartwright-Hatton & Wells, 1997; Wells & Carter, 1999; Wells & Cartwright-Hatton, 2004). However, further research has shown that people with GAD hold stronger negative beliefs about their worry compared to chronic worriers (Penney et al., 2013; Ruscio, 2002). Penney et al. (2013) also found that negative beliefs about worry mediates the relationship between worry severity and GAD symptoms. Further, Koerner et al. (2015) found that negative beliefs about worry predicts dimensional GAD symptom severity scores, as well as whether someone meets criteria for a GAD diagnosis. Researchers have also found evidence suggesting that negative beliefs about worry is specific to GAD, rather than a transdiagnostic construct present across anxiety disorders. Hirsch et al. (2013) suggest that those with GAD endorse the belief that their worry is uncontrollable and dangerous significantly more than those with panic disorder and chronic worriers without GAD. Wells and Carter (2001) also found that negative beliefs about worry, specifically uncontrollability and dangerousness, and *Type–II worry* were more prevalent in those with GAD compared to those with other emotional disorders (i.e., social phobia, panic disorder, and depression). In addition, experimental research has shown that participants with GAD report less control over their thoughts and greater negative beliefs about worry following a five-minute period of intense worrying, compared to chronic worriers without GAD (Ruscio & Borkovec, 2004).

Various treatment-outcome studies have also established further empirical support for the MCM. Wells and King (2006) conducted the first treatment-outcome study to examine the efficacy of metacognitive therapy (MCT), a treatment program for GAD targeting metacognitive beliefs, specifically negative beliefs about worry. The researchers found that post-treatment, clients ($N = 10$) demonstrated significant improvements in somatic anxiety, trait anxiety, and meta-worry. Further, most clients maintained their significant improvements in trait anxiety at both six- and twelve-month follow-ups. More recent research has found further evidence supporting MCT, and therefore, the MCM as well. Haseth et al. (2019) and van der Heiden et al. (2013) found that between 55%–78% of clients with GAD experienced recovery post-treatment on worry severity and GAD symptoms following MCT. Further, Wells et al. (2010) found that compared to applied relaxation, MCT led to better improvements on trait anxiety, worry severity, positive beliefs about worry, and negative beliefs about worry for clients with GAD. When compared to standard cognitive-behaviour therapy, MCT was also found to lead to superior improvements in worry severity post-treatment and at two-year follow-up for clients with GAD (Nordahl et al., 2018).

The Emotional Dysregulation Model

While the IUM and the MCM have received the most empirical support, the newer Emotional Dysregulation Model (EDM) proposes an alternative explanation for GAD. The EDM suggests that individuals with GAD experience emotions with greater intensity, have difficulty regulating their emotions, fear their emotions, and fail at suppressing their emotions (Mennin et al., 2002). Despite the EDM being a less explored conceptualization of GAD, the literature does provide preliminary support for this model. In particular, it has been found that when compared to healthy controls, individuals with GAD experience a greater fear of emotions (Buhr & Dugas,

2012; Mennin et al., 2005). Further, Salters-Pedneault (2006) found that fear of emotions was associated with worry in a sample of individuals with probable GAD. Additionally, researchers have specifically found that fear of depression and fear of anxiety are associated with worry and GAD symptoms (Buhr & Dugas, 2012; Mennin et al., 2005).

Studies Examining the IUM, MCM, and EDM

Historically, researchers have tended to examine intolerance of uncertainty, negative beliefs about worry, and fear of emotions separately. Therefore, this makes it challenging to determine which of these factors is more associated with GAD and worry severity. However, recent research has begun to test the IUM and MCM against one another to help determine which model has more utility in explaining GAD. To date, the results have been equivocal, with some studies finding intolerance of uncertainty to be more strongly associated with worry severity (Khawaja & Chapman, 2011; McEvoy & Mahoney, 2013) and other research finding negative beliefs about worry to be more strongly associated with worry severity (Thielsch et al., 2015; Voon & Phillips, 2015). When comparing the association between meta-worry and intolerance of uncertainty with GAD symptoms in a sample of men at-risk for GAD, meta-worry was found to have the stronger association (Ren et al., 2020). Limited treatment-outcome research has compared GAD treatment programs targeting intolerance of uncertainty to MCT. However, preliminary findings suggest that MCT leads to superior outcomes for clients with GAD, compared to IUT (van der Heiden et al., 2012; van der Heiden & Melchior, 2014). Further, limited research has compared the EDM with either the MCM or IUM to examine which model better explains GAD. The literature that does exist has tended to compare the EDM with the MCM. For example, Stapinski et al. (2010) found that fear of emotions was positively associated with GAD symptoms, even when controlling for metacognitions. Sugiura (2017) also found that

fear of emotions was associated with worry and GAD symptoms. However, negative beliefs about worry had a stronger association with worry and GAD symptoms than fear of emotions. Further, Deleurme et al. (under review) examined whether the EDM helps explain GAD above and beyond the MCM. The researchers found that fear of experiencing anxiety and fear of experiencing depression did uniquely contribute to GAD, but negative beliefs about worry was still the strongest predictor of worry severity and GAD symptoms.

Unfortunately, almost all the existing research comes from either cross-sectional or treatment-outcome data. With cross-sectional data, we are unable to determine the temporal relationship between the proposed mechanisms and worry severity/GAD symptoms. Specifically, we cannot conclude whether intolerance of uncertainty, negative beliefs about worry, or fear of emotions cause increased worry severity and GAD symptoms, or whether worry severity and GAD symptoms cause people to hold these beliefs. Treatment-outcome data partially addresses this limitation because it allows researchers to determine whether changes in beliefs precede changes in symptoms. However, it is possible the factors leading to reduced GAD symptoms and worry severity during treatment may differ from the factors associated with the development/maintenance of GAD. Further, it is possible that factors influencing GAD and worry severity may differ systematically between individuals seeking treatment for GAD and those in the general community.

Longitudinal research

The limitations of both cross-sectional and treatment-outcome data discussed above can be mitigated by conducting longitudinal research in a non-treatment seeking sample. Unfortunately, such research in the current literature is very limited. Nassif (1999) conducted a longitudinal study involving 104 undergraduate students. Participants completed measures of

worry, GAD symptoms, and metacognitive beliefs at baseline and three-month follow-up. Nassif (1999) found that negative beliefs about worry at baseline predicted worry severity and whether or not the participant met the Diagnostic Statistical Manual of Mental Disorders (American Psychiatric Association, 1994) criteria for GAD at follow-up. Further, it was found that negative beliefs about worry at baseline predicted the development of pathological worry, but the reciprocal relationship was not found. While this study provides preliminary evidence for the causal relationship between negative beliefs about worry and GAD symptoms, the generalizability of these findings are limited by the fact that only 19 participants met criteria for GAD at baseline. In addition, from baseline to follow-up only seven participants moved from not meeting criteria for GAD to meeting criteria for GAD. Further, the study did not measure intolerance of uncertainty or fear of emotions, which represents an additional limitation.

Dugas et al. (2012) conducted a longitudinal study to examine changes in intolerance of uncertainty, fear of anxiety, and worry in an adolescent sample ($N = 338$) over a five-year period. The researchers found that change in intolerance of uncertainty predicted change in worry. Fear of anxiety was found to contribute to changes in worry, but to a lesser degree. This study has similar limitations to that of Nassif (1999) due to the limited variables examined. Further, the study only examined changes in worry and did not measure GAD symptoms, which represents a limitation because worry and GAD symptoms are closely related but distinct factors.

A recent longitudinal study conducted by Ryum et al. (2017) examined whether worry, metacognitive beliefs, or the interaction between worry and metacognitive beliefs predicted anxiety over time in a sample 170 undergraduate students. It was found that both worry, and metacognitive beliefs predicted the development of anxiety. However, negative beliefs about worry were found to be particularly important in predicting the development of anxiety.

Unfortunately, the conclusions that can be drawn from this study are restricted by the same limitations of Dugas et al. (2012).

Similarly, Sun et al. (2019) conducted a longitudinal study to examine the importance of worry and metacognitions in the development of GAD symptoms. The researchers found that negative beliefs about worry at baseline predicted GAD symptoms, but not worry, at one-year follow-up. Further, negative beliefs about worry and GAD symptoms at baseline predicted negative beliefs about worry at follow-up. It was also found that there was a reciprocal relationship between negative beliefs about worry and GAD symptoms over time. This suggests that negative beliefs about worry and GAD symptoms may have bidirectional influences on each other.

The current longitudinal research provides preliminary evidence for the role of negative beliefs about worry, intolerance of uncertainty, and fear of anxiety in the development of worry, GAD symptoms, and general anxiety. However, further longitudinal research is warranted to comprehensively compare components of the IUM, MCM, and EDM in predicting the development of worry and GAD symptoms over time.

Present Study

The primary focus of this study was to longitudinally examine the role of proposed mechanisms from the IUM, MCM, and EDM in predicting the maintenance of GAD. Specifically, this study examined the following mechanisms: intolerance of uncertainty, negative beliefs about worry, positive beliefs about worry, fear of experiencing anxiety, fear of experiencing depression, negative problem orientation, and cognitive avoidance. The study also sought to examine which factor was the strongest predictor of worry severity and GAD symptoms both cross-sectionally and longitudinally in an at-risk undergraduate student sample. It

was hypothesized that negative beliefs about worry would be the strongest predictor of worry severity and GAD symptoms based on previous research suggesting it is more strongly associated with GAD compared to intolerance of uncertainty (Ren et al., 2020; van der Heiden et al., 2012; van der Heiden & Melchior, 2014) and fear of emotions (Deleurme et al., under review; Sugiura, 2017).

Hypotheses

1. Negative beliefs about worry will be the strongest predictor of worry severity and GAD symptoms cross-sectionally.
2. Negative beliefs about worry at baseline will be the strongest predictor pathological worry and GAD symptoms at follow-up.

Method

Participants

A non-clinical sample of undergraduate psychology students at MacEwan University participated in this study. High worriers, defined as students who scored above 45 on the Penn State Worry Questionnaire (Meyer et al., 1990), were invited to participate in the study. Participants who completed the baseline survey, and indicated that they would like to participate in the follow-up survey, were invited via email to participate in the 4-month follow-up assessment. A total of 593 participants completed the baseline assessment and 410 participants returned to complete the follow-up for a 69.14% retention rate. Of the 410 returning participants, 38 participants were removed, either due to significant missing data or due to high scores on the Infrequency Scale (Morey, 1991), which suggests random responding. Therefore, the final sample includes 372 participants. The sample is primarily female, and had a mean age of 20.87 years (see Table 1 for full details regarding the sample's demographic characteristics).

Table 1.

Participant demographic characteristics at baseline assessment for the final sample (N = 372)

Characteristics	Mean	*SD*	Frequency	Percentage
Age	20.87	4.80		
Sex				
Female			328	88.2%
Male			42	11.3%
Other			1	0.3%
Gender				
Female			313	84.1%
Male			42	11.3%
Non-Binary			9	2.4%
Trans Man			2	0.5%
Two-Spirit			1	0.3%
Other/Not Specified			4	1.1%
Ethnicity				
Caucasian/White			221	59.4%
Southeast Asian			42	11.3%
Middle Eastern			10	2.7%
Mixed Race			20	5.4%
African Canadian/Black			8	2.2%
African			3	0.8%
Eastern European			6	1.6%
East Asian			10	2.7%
Hispanic/Latino			8	2.2%
Indigenous/Aboriginal			10	2.7%
Other			25	6.7%
Marital Status				
Single			211	56.7%
Dating			133	35.8%
Married/common law			20	5.4%
Divorced/separated			8	2.2%
Current Employment				
Full-time			32	8.6%
Part-time			176	47.3%
Not employed			163	43.8%

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

Measures

Demographic Measure.

Demographic questionnaire. This questionnaire is a 9-item self-report questionnaire used to assess various participant demographic factors. Participants are specifically asked questions related to sex, gender, age, ethnicity, marital status, employment status, education status, and diagnosed medical and mental health conditions.

Generalized Anxiety Disorder-Related Measures.

Generalized Anxiety Disorder Questionnaire-IV (GADQ-IV; Newman et al., 2002).

The GADQ-IV is a self-report diagnostic measure of GAD. It is based on the criteria for GAD contained in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1994). The GADQ-IV contains five yes/no questions regarding worry, a question that requires participants to list up to six current worry topics, one checklist for six physical symptoms, and two questions with eight-point Likert-type scales (0 = *none* to 8 = *very severely*) regarding distress or impairment caused by worry and physical symptoms. The GADQ-IV can be scored with or without a skip out rule. The skip-out rule stops participants from completing the checklist and Likert-type scale questions if they did not experience excessive and uncontrollable worries more days than not in the past 6 months. The GADQ-IV has good test-retest reliability, convergent and divergent validity, and demonstrates a strong one factor structure when scored with or without the skip out rule (Newman et al., 2002; Rodebaugh et al., 2008). In the current study, scores were calculated without the skip out rule. Total scores range from 0 to 13, with higher scores indicating more GAD symptoms and greater impairments. Additionally, when the skip out rule is removed, an

established cut off score of 5.7 on the GADQ-IV has been reported to indicate the presence of GAD (Newman et al., 2002).

Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990). The PSWQ is a 16-item self-report questionnaire designed to measure chronic pathological worry (Meyer et al., 1990). Items are rated on a 5-point Likert-type scale (1 = *not at all typical of me* to 5 = *very typical of me*). Each item assesses the participant's experiences with worry, such as frequency of worry, intensity of worry, and how easily worry is triggered. Total scores range from 16 to 80, with higher scores reflecting higher levels of chronic worry. The PSWQ demonstrates strong internal consistency and good criterion validity, making it a valid measure of trait worry (Brown et al., 1992; Meyer et al., 1990). Use of the PSWQ is further supported by its high convergent, discriminant, and construct validity (Brown et al., 1992). Further, researchers have found that the PSWQ can differentiate between individuals with GAD and individuals with high levels of pathological worry (Behar et al., 2003). Research has shown that a cut off score of 45 on the PSWQ identifies individuals at risk for the development of GAD in a non-clinical sample (Behar et al., 2003; Fresco et al., 2002).

Generalized Anxiety Disorder 7-Item Scale (GAD-7; Spitzer et al., 2006). The GAD-7 is a 7-item self-report questionnaire used to assess the presence of GAD symptoms consistent with the Diagnostic Statistical Manual of Mental Disorders-5 criteria (American Psychiatric Association, 2013; Spitzer et al., 2006). Participants are asked to rate themselves using a 4-point Likert-type scale (0 = *not at all* to 3 = *nearly every day*) regarding the presence and severity of GAD symptoms over the last two weeks. Total scores range from 0 to 21, with higher scores indicating greater GAD symptoms. The GAD-7 displays excellent internal consistency (Johnson

et al. 2019; Spitzer et al., 2006). The GAD-7 also displays strong convergent, factorial, and construct validity (Spitzer et al., 2006).

Mechanisms of Interest.

Intolerance of Uncertainty Scale-18 (IUS-18; Hong & Lee, 2015). The IUS-18 is an 18-item self-report measure assessing an individual's tendency to react negatively to uncertain situations (Hong & Lee, 2015). Participants are asked to rate items using a 5-point Likert-type scale (1 = *not at all characteristic of me* to 5 = *entirely characteristic of me*). Total scores of the IUS-18 range from 18 to 90, with higher scores indicating greater intolerance of uncertain and ambiguous situations. The IUS-18 has been shown to have strong construct validity, as well as convergent and discriminant validity (Hong & Lee, 2015).

Metacognitions Questionnaire-30 (MCQ-30; Wells & Cartwright-Hatton, 2004). The MCQ-30 is a 30-item self-report questionnaire measuring various metacognitive beliefs (Wells & Cartwright-Hatton, 2004). There are five subscales within the MCQ-30, including lack of cognitive confidence ("My memory can mislead me at times"), cognitive self-consciousness ("I think a lot about my thoughts"), need to control thoughts ("I should have control of my thoughts all of the time"), positive beliefs about worry (MCQ-PBW; "I need to worry in order to remain organized"), and negative beliefs about worry (MCQ-NBW; "Worrying is dangerous to me"). Individuals are asked to rate themselves using a 4-point Likert-type scale (1 = *do not agree* to 4 = *agree very much*) and total scores on each of the five subscales range from 6-24. Higher scores indicate increased levels of dysfunctional metacognitions. Only the MCQ-NBW and MCQ-PBW were examined in the present study. The MCQ-30 demonstrates strong internal consistency and good convergent validity (Typaldou et al., 2010; Wells & Cartwright-Hatton, 2004).

Cognitive Avoidance Questionnaire (CAQ; Sexton & Dugas, 2008a). The CAQ is a 25-item questionnaire assessing the tendency for individuals to use cognitive avoidance strategies when faced with intrusive thoughts (Sexton & Dugas, 2008a). Items are rated on a 5-point Likert-type scale (1 = *not at all typical* to 5 = *completely typical*). Total scores for the CAQ range from 25 to 125. Higher scores indicate the use of greater cognitive avoidance. The CAQ total scale demonstrates good internal consistency and both convergent and divergent validity (Gosselin et al., 2007; Sexton & Dugas, 2008a).

Affective Control Scale (ACS; Williams et al., 1997). The ACS is a 42-item self-report questionnaire measuring one's fear of emotion (Williams et al., 1997). The ACS includes four subscales. The present study focused on the following two subscales: fear of depression and fear of anxiety. The fear of depression subscale includes 8-items and subscale scores range from 8 to 56. The fear of anxiety subscale includes 13-items and subscale scores range from 13 to 91. Higher scores indicate one's increased fear of experiencing fear of depression and anxiety, respectively. Participants rate the extent to which they agree with each item using a 7-point Likert scale (1 = *very strongly disagree* to *7 = very strongly agree*). The ACS demonstrates good internal validity, as well as convergent and discriminant validity (Berg et al., 1998; Williams et al., 1997).

Negative Problem Orientation Questionnaire (NPOQ; Robichaud & Dugas, 2005). The NPOQ is a 12-item self-report questionnaire measuring maladaptive attitudes towards social problem-solving (Robichaud & Dugas, 2005). Using a 5-point Likert-type scale (1 = *not at all true of me* to 5 = *extremely true of me*), participants rate the extent to which each of the items corresponds to the way they react or think when faced with a problem. Total scores range from 12 to 60. Higher scores indicate a lack confidence in one's ability to solve problems, greater

tendency to see problems as threatening, and greater frustration when trying to problem solve. The NPOQ demonstrates both convergent and divergent validity, as well as strong internal consistency (Robichaud & Dugas, 2005). The measure was originally developed in French, and the English translation has also demonstrated sound psychometric properties (Gosselin et al., 2001).

Infrequency Scale (INF; Morey, 1991). The INF is used to assess random responding. The INF is an 8-item self-report measure, with individuals rating each item on a 4-point Likert type scale (1 = *false* to 4 = *very true*). Scores range from 0 to 24, with higher scores indicating greater random responding. Although, the INF has low internal consistency, which is to be expected given the nature of the items, it has good construct validity and an established cut off score of 9 or above (Morey, 1991).

Procedure

The MacEwan University Research Ethics Board approved this study and participants completed the study between September 2020 and October 2021. Potential participants completed the PSWQ as part of the MacEwan Psychology Department Pre-screen Survey on SONA. Across the Fall 2020, Winter 2021, and Spring 2021 semesters, a total of 1580 students in the Psychology Research Pool scored above the established cut off score of 45 on the PSWQ and were subsequently contacted via email regarding the possibility of participating in the study. When contacted by email, participants received a password allowing them to access the study via SONA. Participants then logged into their personal SONA account (https://grantmacewan.sona-systems.com/) and voluntarily signed up to participate in this study. The MacEwan University Psychology Department uses the SONA research website to post study availability, pre-screen participants, and award research participation course credit. Participants choosing to participate

in the baseline assessment received 2% credit toward a psychology course allowing research participation. Additionally, participants completing the baseline assessment were assigned a SONA survey ID code (e.g., 45236) allowing researchers to anonymously match participant's baseline and follow-up data. All measures were completed via Qualtrics (https://www.qualtrics.com), the online survey platform MacEwan University utilizes to conduct online research.

After signing up for the study's baseline assessment, potential participants were directed to Qualtrics, where they were presented with a consent form (See Appendix A). The consent form outlined the nature of the study, stated that participation was voluntary, explained that they could withdraw at any time, and informed potential participants of the study's 4-month follow-up assessment. Consenting participants were asked to complete the demographics questionnaire. Participants then completed a series of questionnaires in the following order: GAD-7, IUS-18, GADQ-IV, MCQ-30, CAQ, ACS, NPOQ, and PSWQ (see Measures; Appendix B). Items from the INF were grouped by twos and appended to the ends of the other questionnaires throughout the survey. Upon completing the questionnaires, the participants were asked whether they would like to be contacted in 4-months to participate in the study's follow-up assessment. The percentage of participants responding 'yes' was 92%. Participants were then presented with a debriefing form (see Appendix C) providing further details about the study, contact information for the researchers, and information about other available resources. The study's baseline assessment took approximately 1-hour to complete.

After 4-months, participants who had previously indicated that they would like to participate in the follow-up assessment were again contacted via email, and provided with a Qualtrics link in order to complete the follow-up. The email also informed participants that the

follow-up survey would be identical to the initial survey, except participants would receive a $15.00 e-gift card as compensation for their participation in the follow-up. Additionally, participants were provided the follow-up survey link and their unique 5-digit SONA survey ID number. If participants had not completed the follow-up survey one week after the follow-up invitation, a reminder email was sent.

Upon clicking on the study's follow-up survey link, participants were directed to Qualtrics where they were presented a consent form and asked to provide their SONA survey ID number. Then, participants completed a series of questionnaires and debriefing form that were identical to the baseline assessment. Participants were then asked to enter their email address in order to receive an email from Tango Card to claim their $15.00 e-gift card. Tango Card is a rewards program (https://www.tangocard.com/) that can be integrated into Qualtrics to provide research participants with compensation for their participation. Participants were able to choose from a variety of e-gift options including Amazon, Starbucks, Uber, and more.

Statistical Analyses

Prior to analyzing the data, both the raw baseline and follow-up data was screened for missing data values and random responding. As previously stated, a total of 593 participants completed the baseline assessment and 410 participants returned to complete the follow-up. Of the 410 returning participants, 38 participants were removed, either due to significant missing data or high scores on the INF. Missing individual data points were calculated based on how much data was provided for a specific scale/subscale. The decision of whether to replace the missing data was based on the following criteria. If a participant was missing 20% or less of their data on a specific scale/subscale, then missing data was calculated by averaging their remaining responses for that scale/subscale. If a participant was missing more than 20% of their data on a

particular scale/subscale, then missing values were not calculated. Outliers were handled according to Tabachnick and Fidell's (2007) recommendations. Values were considered to be outliers if they fell above or below a set cut off score. The cut off score was determined by multiplying the standard deviation by three and then adding and subtracting it from the mean (Tabachnick & Fidell, 2007). Outlier values were then replaced with a value either one score above or below the last value not considered an outlier (Tabachnick & Fidell, 2007).

After data screening, the following analyses were conducted. First, descriptive statistics were obtained to examine the mean, standard deviation, range, and Cronbach's alpha coefficient of all measures at baseline and follow-up. Then, bivariate correlations were calculated to assess the correlations between the PSWQ, GAD-7, MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ (see Table 4). A paired sample t-test was then conducted to examine potential differences between participants' baseline and follow-up scores on the PSWQ, GAD-7, MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ.

Next, multiple regression analyses were conducted to examine cross-sectional predictors of worry and GAD symptoms at baseline and follow-up. First, baseline PSWQ scores were entered as the dependent variable and predictor variables included baseline scores on the following measures: MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ. A second regression analysis was conducted with follow-up PSWQ scores entered as the dependent variable and follow-up scores on the MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ entered as predictor variables. Cross-sectional predictors of GAD symptoms at baseline and follow-up were examined using the same two regression analyses as discussed above, excepts baseline and follow-up scores on the GAD-7 were entered as the dependent variables.

In order to assess which mechanisms at baseline were the strongest unique predictors of worry severity and GAD symptoms at follow-up, two regression analyses were conducted. For the first regression analysis, follow-up scores on the PSWQ were entered as the dependent variable. Baseline scores on the MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ were then entered as predictor variables. An identical regression analysis was conducted to assess which mechanism would be the strongest predictor of GAD symptoms at follow-up, except follow-up scores on the GAD-7 were entered as the dependent variable. For all analyses, alpha was set to .05.

Results

Data Screening

Several missing values were replaced in the baseline data including: 6 missing values for the GAD-7, 14 missing values for the PSWQ, 41 missing values for the IUS-18, 5 missing values for the MCQ-NBW, 7 missing values for the MCQ-PBW, 7 missing values for the ACS-DEP, 17 missing values for the ACS-ANX, 15 missing values for the NPOQ, and 42 missing values for the CAQ. No participant's raw data contained outliers.

Several missing values were also replaced in the follow-up data including: 3 missing values for the GAD-7, 10 missing values for the PSWQ, 21 missing values for the IUS-18, 5 missing values for the MCQ-NBW, 4 missing values for the MCQ-PBW, 11 missing values for the ACS-DEP, 13 missing values for the ACS-ANX, 15 missing values for the NPOQ, and 15 missing values for the CAQ. Only 1 participant's raw data contained an outlier, which was adjusted accordingly.

Descriptive statistics were conducted to examine Cronbach's alpha coefficients, means, and standard deviations for all scales at both baseline and follow-up (see Table 2 and Table 3).

All measures demonstrated excellent internal consistency at both assessment points. Scores on the GADQ-IV at both baseline and follow-up were examined to determine the percentage of participants that would likely meet diagnostic criteria for a GAD diagnosis based on the established GADQ-IV cut-off score of 5.7. At baseline, 90.6% of participants scored above the cut-off, with 87.6% of participants scoring above the cut-off at the 4-month follow-up.

Given that the present study pre-screened participants for a high degree of worry, and a substantial percentage of participants met GAD criteria based on the GADQ-IV cut-off score, mean scores on all measures were more similar to means reported in clinical than non-clinical samples. For the PSWQ, the mean score at baseline and follow-up was only slightly lower than typical scores of individuals diagnosed with GAD (Turk et al., 2001). Similarly, mean scores for the GAD-7 at both baseline and follow-up were only slightly lower than typical mean GAD-7 scores for individuals with GAD (Kroenke et al., 2007). Further, according to recommendations by Spitzer et al. (2006), mean scores ranging from 10-14 on the GAD-7 indicate moderate symptom severity. Both baseline and follow-up GAD-7 mean scores fall within this range (see Table 2 and Table 3). As expected, both baseline and follow-up mean scores for the MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ were also higher than scores typically observed in non-clinical undergraduate student samples (Bottesi et al., 2016; Hong & Lee, 2015; Wells & Cartwright-Hatton, 2004; Williams et al., 1997; Sexton & Dugas, 2008).

Bivariate correlations were calculated to assess the correlations between the measures at both baseline and follow-up (see Table 4). Small correlations were observed between ACS-ANX/ACS-DEP and MCQ-PBW. However, all other measures were found to have moderate to strong correlations with each other at both baseline and follow-up (see Table 4). A paired sample t-test was conducted to examine the differences between all measures at baseline and follow-up.

Table 2.

Psychometric properties of the baseline measures used in the main analyses.

Measures	Mean	*SD*	Observed Range	Cronbach's Alpha
PSWQ	63.48	10.78	30-80	.89
GAD-7	11.72	4.53	0-21	.82
IUS-18	55.27	12.76	20-87	.90
MCQ-NBW	16.26	4.51	6-24	.85
MCQ-PBW	12.51	4.37	6-24	.87
ACS-ANX	58.50	12.90	19-88	.88
ACS-DEP	34.92	10.56	8-56	.89
NPOQ	35.67	11.22	13-60	.93
CAQ	76.88	19.44	30-124	.93

Note. Observed Range = Range of Participants' Scores; PSWQ = Penn State Worry Questionnaire; GAD-7 = Generalized Anxiety Disorder 7-Item Scale; IUS-18 = Intolerance of Uncertainty Scale-18; MCQ-NBW = Negative Beliefs About Worry; MCQ-PBW = Positive Beliefs About Worry; ACS-ANX = Fear of Experiencing Anxiety; ACS-DEP = Fear of Experiencing Depression; NPOQ = Negative Problem Orientation Questionnaire; CAQ = Cognitive Avoidance Questionnaire.

Table 3.

Psychometric properties of the follow-up measures used in the main analyses.

Measure	Mean	*SD*	Observed Range	Cronbach's Alpha
PSWQ	63.02	11.24	29-80	.91
GAD-7	10.45	4.72	0-21	.85
IUS-18	54.68	12.82	18-86	.90
MCQ-NBW	15.97	4.68	6-24	.87
MCQ-PBW	13.07	4.86	6-24	.92
ACS-ANX	58.42	12.98	20-88	.89
ACS-DEP	34.50	10.94	8-56	.91
NPOQ	34.92	12.35	12-60	.95
CAQ	75.85	20.54	27-123	.94

Note. Observed Range = Range of Participants' Scores; PSWQ = Penn State Worry Questionnaire; GAD-7 = Generalized Anxiety Disorder 7-Item Scale; IUS-18 = Intolerance of Uncertainty Scale-18; MCQ-NBW = Negative Beliefs About Worry; MCQ-PBW = Positive Beliefs About Worry; ACS-ANX = Fear of Experiencing Anxiety; ACS-DEP = Fear of Experiencing Depression; NPOQ = Negative Problem Orientation Questionnaire; CAQ = Cognitive Avoidance Questionnaire.

Table 4.

Bivariate correlations for all measures at baseline and follow-up.

	1	2	3	4	5	6	7	8
1. PSWQ	-							
2. GAD-7	.59** (.59**)	-						
3. IUS-18	.61** (.63**)	.57** (.49**)	-					
4. MCQ-NBW	.65** (.75**)	.61** (.56**)	.61** (.61**)	-				
5. MCQ-PBW	.25** (.29**)	.21** (.20**)	.28** (.28**)	.16** (.17**)	-			
6. ACS-ANX	.62** (.65**)	.52** (.52**)	.61** (.60**)	.62** (.69**)	.08 (.12*)	-		
7. ACS-DEP	.38** (.43**)	.42** (.38**)	.43** (.43**)	.41** (.48**)	.04 (.07)	.52** (.61**)	-	
8. NPOQ	.63** (.61**)	.49** (.46**)	.69** (.70**)	.55** (.61**)	.24** (.26**)	.66** (.66**)	.47** (.49**)	-
9. CAQ	.41** (.44**)	.45** (.38**)	.48** (.49**)	44** (.50**)	.15** (.29**)	.52** (.52**)	.38** (.36**)	.44** (.51**)

Note. Correlations inside parentheses indicate the correlation between measures at follow-up; PSWQ = Penn State Worry Questionnaire; GAD-7 = Generalized Anxiety Disorder 7-Item Scale; IUS-18 = Intolerance of Uncertainty Scale-18; MCQ-NBW = Negative Beliefs About Worry; MCQ-PBW = Positive Beliefs About Worry; ACS-ANX = Fear of Experiencing Anxiety; ACS-DEP = Fear of Experiencing Depression; NPOQ = Negative Problem Orientation Questionnaire; CAQ = Cognitive Avoidance Questionnaire.

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

A significant difference was observed between baseline and follow-up scores on the GAD-7 and MCQ-PBW. Participants' scores for both the GAD-7 and MCQ-PBW declined slightly from baseline to follow-up (see Table 5). No other measures demonstrated significant differences between baseline and follow-up.

Main Analyses

As previously stated, multiple regression analyses were conducted to examine the first hypothesis. Two separate regression analyses were performed to determine the cross-sectional predictors of worry severity at baseline and follow-up. In the first regression, baseline PSWQ scores were entered as the dependent variable and baseline scores for the MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ were entered as predictor variables. The model accounted for 57.5% of variance in PSWQ scores, F (7, 294) = 56.91, $p < .001$ (see Table 6, Panel A). The MCQ-NBW, MCQ-PBQ, ACS-ANX, and NPOQ were all unique predictors of PSWQ scores. As expected, MCQ-NBW scores predicted the most amount of unique variance in PSWQ scores.

In the second regression analysis, follow-up scores on the PSWQ were entered as the dependent variables and follow-up scores for the MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ were entered as predictor variables. The model accounted for 64.5% of variance in PSWQ scores, F (7, 357) = 92.63, $p < .001$ (see Table 6, Panel B). The MCQ-NBW, MCQ-PBW, ACS-ANX, and IUS-18 were all unique predictors of PSWQ scores at follow-up. Consistent with results from the first regression, and as hypothesized, MCQ-NBW scores predicted the most amount of unique variance in PSWQ scores at follow-up.

Two regression analyses were also conducted to examine cross-sectional predictors of GAD symptoms at baseline and follow-up. In the first regression, baseline GAD-7 scores were

Table 5.

Paired sample t-test for difference between measures at baseline and follow-up.

Variable	M1	M2	M2 - M1	*t*	*p*
PSWQ	63.46	62.97	-0.49	-1.22	.224
GAD-7	11.72	10.46	-1.26	-5.43	<.001
MCQ-NBW	16.26	15.96	-0.29	-1.66	.097
MCQ-PBW	12.51	13.03	0.52	2.47	.014
IUS-18	55.27	54.51	-0.77	-1.61	.108
ACS-ANX	58.53	58.40	-0.13	-0.28	.778
ACS-DEP	34.94	34.57	-0.37	-0.99	.323
NPOQ	35.60	34.92	-0.68	-1.46	.145
CAQ	76.82	76.00	-0.82	-0.95	.341

Note. M1 = Mean scores at baseline; M2 = Mean scores at follow-up; PSWQ = Penn State Worry Questionnaire; GAD-7 = Generalized Anxiety Disorder 7-Item Scale; MCQ-PB = Positive Beliefs about Worry; MCQ-NB = Negative Beliefs about Worry; IUS-18 = Intolerance of Uncertainty Scale-18; ACS-ANX = Fear of Experiencing Anxiety; ACS-DEP = Fear of Experiencing Depression; NPOQ = Negative Problem Orientation; CAQ = Cognitive Avoidance Questionnaire.

Table 6.

Regression analyses for cross-sectional predictors of worry at baseline (Panel A) and follow-up (Panel B).

Variable	*R*	R^2 Change	*β*	*t*	*pr*
Panel A					
DV: PSWQ					
Step 1	.759	.575**			
MCQ-NBW			.310	5.88**	.33
MCQ-PBW			.088	2.20*	.13
IUS-18			.095	1.61	.09
ACS-ANX			.177	2.95**	.17
ACS-DEP			.001	0.02	.01
NPOQ			.278	4.60**	.26
CAQ			.001	0.03	.01
Panel B					
DV: PSWQ					
Step 1	.803	.645**			
MCQ-NBW			.484	10.21**	.48
MCQ-PBW			.146	4.29**	.22
IUS-18			.152	3.17**	.17
ACS-ANX			.186	3.54**	.18
ACS-DEP			-.012	-0.29	-.02
NPOQ			.079	1.57	.08
CAQ			-.049	-1.24	-.07

Note. *β* = Standardized regression coefficient; *pr* = Partial correlation; PSWQ = Penn State Worry Questionnaire; GAD-7 = Generalized Anxiety Disorder 7-Item Scale; MCQ-PB = Positive Beliefs about Worry; MCQ-NB = Negative Beliefs about Worry; IUS-18 = Intolerance of Uncertainty Scale-18; ACS-ANX = Fear of Experiencing Anxiety; ACS-DEP = Fear of Experiencing Depression; NPOQ = Negative Problem Orientation; CAQ = Cognitive Avoidance Questionnaire.

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

entered as the dependent variable and predictor variables included baseline scores on the following measures MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ. The model accounted for 48.0% of variance in GAD-7 scores, F (7, 296) = 39.07, $p < .001$ (see Table 7, Panel A). The MCQ-NBW, MCQ-PBW, IUS-18, and ACS-DEP were all found to contribute unique variance to GAD-7 scores at baseline, but MCQ-NBW scores were found to be the strongest predictor. An identical regression analysis was conducted using follow-up scores on the GAD-7 and follow-up scores for the same predictor variables listed above. The model accounted for 37.7% of variance in GAD-7 scores, F (7, 358) = 30.93, $p < .001$ (see Table 7, Panel B). The following measures were found to contribute unique variance to GAD-7 scores at follow-up: MCQ-NBW, MCQ-PBW, ACS-ANX, and IUS-18. As expected, MCQ-NBW was the strongest predictor of GAD-7 scores at follow-up.

As previously stated, regression analyses were then conducted to examine the second hypothesis. In the first regression analysis, scores the PSWQ at follow-up were entered as the dependent variable and baseline scores for the MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ were entered as predictor variables. The model accounted for 42.8% of variance in PSWQ scores, F (7, 297) = 31.75, $p < .001$ (see Table 8). Scores on the MCQ-NBW, MCQ-PBW, ACS-ANX, and NPOQ at baseline were found to predict PSWQ scores at follow-up. Further, MCQ-NBW scores was found to contribute the most variance to PSWQ scores at follow-up.

A second regression analysis was conducted with scores on the GAD-7 at follow-up entered as the dependent variable and baseline scores for the MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ entered as predictor variables. The model accounted for 25.2% of variance in GAD-7 scores, F (7, 299) = 14.38, $p < .001$ (see Table 9). While the

Table 7.

Regression analyses for cross-sectional predictors of GAD at baseline (Panel A) and follow-up (Panel B).

Variable	*R*	R^2 Change	*β*	*t*	*pr*
DV: GAD-7					
Step 1	.693	.480**			
MCQ-NBW			.318	5.48**	.30
MCQ-PBW			.090	2.05*	.12
IUS-18			.199	3.06**	.18
ACS-ANX			.052	0.78	.05
ACS-DEP			.158	3.09**	.18
NPOQ			.035	0.52	.03
CAQ			.080	1.55	.09
DV: GAD-7					
Step 1	.614	.377**			
MCQ-NBW			.308	4.92**	.25
MCQ-PBW			.089	1.97*	.10
IUS-18			.146	2.30*	.12
ACS-ANX			.140	2.01*	.11
ACS-DEP			.069	1.29	.07
NPOQ			.004	0.07	.01
CAQ			.032	0.61	.03

Note. *β* = Standardized regression coefficient; *pr* = Partial correlation; PSWQ = Penn State Worry Questionnaire; GAD-7 = Generalized Anxiety Disorder 7-Item Scale; MCQ-PB = Positive Beliefs about Worry; MCQ-NB = Negative Beliefs about Worry; IUS-18 = Intolerance of Uncertainty Scale-18; ACS-ANX = Fear of Experiencing Anxiety; ACS-DEP = Fear of Experiencing Depression; NPOQ = Negative Problem Orientation; CAQ = Cognitive Avoidance Questionnaire.

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

Table 8.

Regression analysis for baseline mechanisms predicting worry at follow-up.

Variable	*R*	R^2 Change	*β*	*t*	*pr*
DV: PSWQ					
Step 1	.654	.428**			
MCQ-NBW			.254	4.18**	.24
MCQ-PBW			.125	2.72**	.16
IUS-18			.087	1.27	.07
ACS-ANX			.214	3.08**	.18
ACS-DEP			-.042	-0.78	-.05
NPOQ			.189	2.72**	.16
CAQ			.009	0.16	.01

Note. *β* = Standardized regression coefficient; *pr* = Partial correlation; PSWQ = Penn State Worry Questionnaire; GAD-7 = Generalized Anxiety Disorder 7-Item Scale; MCQ-PB = Positive Beliefs about Worry; MCQ-NB = Negative Beliefs about Worry; IUS-18 = Intolerance of Uncertainty Scale-18; ACS-ANX = Fear of Experiencing Anxiety; ACS-DEP = Fear of Experiencing Depression; NPOQ = Negative Problem Orientation; CAQ = Cognitive Avoidance Questionnaire.

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

Table 9.

Regression analysis for baseline mechanisms predicting GAD at follow-up.

Variable	*R*	R^2 Change	*β*	*t*	*pr*
DV: GAD-7					
Step 1	.502	.252**			
MCQ-NBW			.129	1.87	.11
MCQ-PBW			.082	1.56	.09
IUS-18			.050	0.64	.04
ACS-ANX			.135	1.70	.10
ACS-DEP			.058	0.95	.06
NPOQ			.137	1.72	.10
CAQ			.096	1.58	.09

Note. *β* = Standardized regression coefficient; *pr* = Partial correlation; PSWQ = Penn State Worry Questionnaire; GAD-7 = Generalized Anxiety Disorder 7-Item Scale; MCQ-PB = Positive Beliefs about Worry; MCQ-NB = Negative Beliefs about Worry; IUS-18 = Intolerance of Uncertainty Scale-18; ACS-ANX = Fear of Experiencing Anxiety; ACS-DEP = Fear of Experiencing Depression; NPOQ = Negative Problem Orientation; CAQ = Cognitive Avoidance Questionnaire.

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

overall model revealed that all of the mechanisms together contribute unique variance to GAD-7 scores at follow-up, none of these mechanisms alone were significant predictors of GAD-7 scores.

Supplemental Analyses

Additional exploratory analyses were conducted to examine whether changes in the mechanisms between baseline and follow-up predict changes in worry severity and GAD symptoms over time. First, change scores were calculated for the following variables: PSWQ, GAD-7, MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ. Change scores were calculated by subtracting participants' follow-up scores from baseline scores on all measures. Two regression analyses were then conducted. One regression analysis was conducted with change scores for the PSWQ as the dependent variable and another regression analysis was conducted with change scores for the GAD-7 as the dependent variable. For both regressions, change scores for the MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ were entered as the predictor variables.

As previously stated, the first regression analysis included changes scores on the PSWQ as the dependent variable and the predictor variables included change scores for the following measures: MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP, NPOQ, and CAQ. The regression model accounted for 30.6% of the variance in PSWQ change scores, F (7, 288) = 18.14, $p < .001$ (see Table 10). Changes on the MCQ-NBW, ACS-ANX, ACS-DEP, and NPOQ were found to contribute unique variance to changes in PSWQ scores. Further, change in MCQ-NBW scores was found to be the strongest predictor of change in PSWQ scores.

The last regression analysis included change scores on the GAD-7 as the dependent variable and change scores for the MCQ-NBW, MCQ-PBW, IUS-18, ACS-ANX, ACS-DEP,

Table 10.

Regression analysis for changes in mechanisms predicting changes in worry.

Variable	*R*	R^2 Change	*β*	*t*	*pr*
DV: PSWQchange					
Step 1	.553	.306**			
MCQ-NBWchange			.235	4.13**	.24
MCQ-PBWchange			.049	0.96	.06
IUS-18change			.050	0.89	.05
ACS-ANXchange			.168	2.79**	.16
ACS-DEPchange			.140	2.44*	.14
NPOQchange			.179	3.20**	.19
CAQchange			.016	0.30	.02

Note. *β* = Standardized regression coefficient; *pr* = Partial correlation; PSWQ = Penn State Worry Questionnaire; GAD-7 = Generalized Anxiety Disorder 7-Item Scale; MCQ-PB = Positive Beliefs about Worry; MCQ-NB = Negative Beliefs about Worry; IUS-18 = Intolerance of Uncertainty Scale-18; ACS-ANX = Fear of Experiencing Anxiety; ACS-DEP = Fear of Experiencing Depression; NPOQ = Negative Problem Orientation; CAQ = Cognitive Avoidance Questionnaire.

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

NPOQ, and CAQ as predictor variables. The model accounted for 16.7% of the variance in GAD-7 change scores, F (7, 292) = 8.34, $p < .001$ (see Table 11). Both changes scores for the MCQ-NBW and the IUS-18 emerged as significant predictors of changes in GAD-7 scores. Further, both the MCQ-NBW and the IUS-18 contributed equal unique variance to GAD-7 change scores.

Discussion

The present study primarily sought to longitudinally examine the role of proposed mechanisms from the IUM, MCM, and EDM in predicting the maintenance of pathological worry and GAD symptoms. Beliefs associated with worry severity and GAD symptoms cross-sectionally were also explored. The first hypothesis stated that negative beliefs about worry would be the strongest predictor of worry severity and GAD symptoms at both baseline and follow-up. The results of multiple regression analyses supported this hypothesis: participants with greater negative beliefs about their worry were more likely to experience increased worry severity and GAD symptoms at both assessment points. The second hypothesis stated that negative beliefs about worry at baseline would be the strongest predictor of pathological worry and GAD symptoms at follow-up. This hypothesis was partially supported. Negative beliefs about worry at baseline were found to be the strongest predictor of the degree of pathological worry at follow-up. In other words, participants experiencing elevated negative beliefs about their worry at time one were more likely to report increased levels of pathological worry at time two. However, negative beliefs about worry at baseline were not found to predict the degree of GAD symptoms at follow-up. In fact, none of the mechanisms examined at baseline were found to predict GAD symptoms at follow-up.

Table 11.

Regression analysis for changes in mechanisms predicting changes in GAD.

Variable	*R*	R^2 Change	*β*	*t*	*pr*
DV: GAD-7change					
Step 1	.408	.167**			
MCQ-NBWchange			.225	3.61**	.21
MCQ-PBWchange			-.014	-0.25	-.02
IUS-18change			.217	3.56**	.20
ACS-ANXchange			.041	0.63	.04
ACS-DEPchange			.081	1.28	.08
NPOQchange			.020	0.32	.02
CAQchange			-.096	-1.65	-.10

Note. *β* = Standardized regression coefficient; *pr* = Partial correlation; PSWQ = Penn State Worry Questionnaire; GAD-7 = Generalized Anxiety Disorder 7-Item Scale; MCQ-PB = Positive Beliefs about Worry; MCQ-NB = Negative Beliefs about Worry; IUS-18 = Intolerance of Uncertainty Scale-18; ACS-ANX = Fear of Experiencing Anxiety; ACS-DEP = Fear of Experiencing Depression; NPOQ = Negative Problem Orientation; CAQ = Cognitive Avoidance Questionnaire.

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

Supplemental analyses were then conducted to explore whether changes in negative beliefs about worry, positive beliefs about worry, intolerance of uncertainty, fear of anxiety, fear of depression, negative problem orientation, and cognitive avoidance predicted changes in pathological worry and GAD symptoms over time. The supplemental analyses revealed that changes in negative beliefs about worry predicted changes in both pathological worry and GAD symptoms over time. Further, as anticipated, changes in negative beliefs about worry was the strongest predictor of changes in pathological worry. In other words, participants who experienced an increase (or decrease) in their negative beliefs about worry also experienced an increase (or decrease) in their worry severity. However, along with negative beliefs about worry, changes in intolerance of uncertainty was also found to predict changes in GAD symptoms over time. Additionally, changes in both beliefs were found to equally contribute to changes in GAD. This suggests that the increase (or decrease) of participant's negative beliefs about worry and intolerance of uncertainty both equally influenced the increase (or decrease) of their GAD symptoms over time.

Overall, the results of the present study support the MCM's conceptualization of GAD and align with current evidence suggesting that negative beliefs about worry are central to pathological worry and GAD (Cartwright-Hatton & Wells, 1997; Hirsch et al., 2013; Wells & Carter, 1999, 2001; Wells & Cartwright-Hatton, 2004). Negative beliefs about worry were the only beliefs to consistently emerge as a significant predictor of worry severity and GAD cross-sectionally and longitudinally. Further, negative beliefs about worry repeatedly emerged as the strongest predictor of worry severity and GAD symptoms. This aligns with previous cross-sectional research suggesting that negative beliefs about are more strongly associated with worry and GAD symptoms compared to other beliefs (Ren et al., 2020; Sugiura, 2017). The present

study also replicated findings from Nassif (1999) suggesting that negative beliefs about worry at baseline predict pathological worry at follow-up. Additionally, the findings align with Ryum et al. (2017) suggesting that negative beliefs about worry play an important role in predicting changes in anxiety over time. The findings from the present study suggest that negative beliefs about worry may be the dominant mechanism leading to the development and maintenance of GAD. This aligns with the theoretical underpinning of the MCM, which proposes that negative beliefs about worry are the driving force behind GAD. Accordingly, this suggests that while other mechanisms can contribute to GAD, the root cause of the disorder's development and maintenance is negative beliefs about worry.

Cross-sectionally, intolerance of uncertainty was found to consistently predict GAD symptoms, but it only predicted worry severity cross-sectionally at follow-up. However, negative beliefs about worry still emerged as the stronger predictor, which further supports negative beliefs about worry as the driving mechanism behind GAD. The present study did not find baseline intolerance of uncertainty to predict follow-up worry severity nor GAD symptoms. Additionally, changes in intolerance of uncertainty did not predict changes in worry severity, which does not align with previous findings from Dugas et al. (2012). Dugas et al. (2012) found that changes in intolerance of uncertainty did predict changes in worry severity amongst adolescents. However, negative beliefs about worry were not included in that study. Therefore, it is possible that when changes in negative beliefs about worry are accounted for, changes in intolerance of uncertainty no longer make a significant contribution to changes in worry severity. The present study did, however, find that changes in intolerance of uncertainty predict changes in GAD symptoms. This reaffirms the central argument of the IUM that individuals with GAD do experience anxiety and distress when dealing with uncertain situations. It also offers further

support that intolerance of uncertainty plays a role in the maintenance of GAD symptoms, which aligns with the IUM (Dugas & Koerner, 2005). The present study found that changes in intolerance of uncertainty and negative beliefs about worry were the only beliefs to predict changes in GAD symptoms. This supports both the IUM's and MCM's argument that other maladaptive beliefs and mechanisms, such as positive beliefs about worry, negative problem orientation, and cognitive avoidance, are secondary to the core factors of intolerance of uncertainty and negative beliefs about worry (Dugas & Koerner, 2005; Wells, 2005).

Overall, positive beliefs about worry were found to predict both worry severity and GAD symptoms cross-sectionally. Positive beliefs about worry at baseline were also found to predict worry severity at follow-up. However, positive beliefs about worry did not contribute to GAD symptoms at follow-up. Additionally, changes in positive beliefs about worry did not predict changes in pathological worry or GAD. Taken together, these findings further support both the MCM and the IUM, which argue that while positive beliefs about worry play a role in worry and GAD, they are not the key driver of GAD symptoms. Additionally, negative problem orientation occasionally emerged as a predictor of worry severity, but findings were not consistent. Changes in negative problem orientation were found to predict changes in pathological worry, but did not predict changes in GAD. Further, cognitive avoidance never emerged as a significant predictor of worry or GAD symptoms.

Interestingly, the present study did observe that a fear of experiencing emotions, primarily a fear of experiencing anxiety, consistently demonstrates an association with worry severity and GAD symptoms cross-sectionally. Further, a fear of experiencing anxiety at baseline was found to significantly contribute to worry severity at follow-up, and changes in fear of anxiety and fear of depression were found to predict changes in pathological worry overtime.

This supports the EDM's alternative explanation for GAD, suggesting that individuals with who chronically worry fear their emotional experiences (Mennin et al., 2002). Findings from the present study align with previous research suggesting that a fear of experiencing anxiety and depression is associated with worry and GAD symptoms (Buhr & Dugas, 2012; Mennin et al., 2005). The study also closely aligns with findings from Sugiura (2017) and Deleurme et al. (under review) suggesting that while a fear of experiencing emotions is associated with pathological worry, negative beliefs about worry still has the strongest association.

Overall, the findings suggest that negative beliefs about worry play a central role in pathological worry and GAD and are key in maintaining GAD. Further, intolerance of uncertainty also seems to contribute to the maintenance of GAD over time. Researchers may wish to further investigate how negative beliefs about worry and intolerance of uncertainty influence each other over time. Additionally, researchers may want to investigate the relationship between fear of emotions, specifically fear of anxiety and fear of depression, and negative beliefs about worry and intolerance of uncertainty to better understand how fearing one's emotions relates to pathological worry and GAD. A comprehensive model of GAD founded on the MCM that incorporates aspects of the IUM (i.e., intolerance of uncertainty) and the EDM (i.e., fear of emotions) may be a direction future researchers wish to explore.

Treatment Implications

The finding that negative beliefs about worry significantly contribute to GAD suggests that negative beliefs about worry should be a primary focus of GAD treatment. This aligns with the current literature suggesting that MCT is an effective treatment for GAD and leads to significant improvements in worry severity and GAD symptoms (Haseth et al., 2019; Nordahl et al., 2018; Wells & King, 2006; Wells et al., 2010; van der Heiden et al., 2013). The study also

supports preliminary research demonstrating that MCT leads to superior outcomes for clients with GAD compared to IUT (van der Heiden et al., 2012; van der Heiden & Melchior, 2014). However, given that changes in intolerance of uncertainty were also found to predict changes in GAD symptoms, this suggests that also targeting intolerance of uncertainty in therapy could enhance treatment outcomes. The present study also suggests that incorporating aspects of the EDM, specifically targeting fear of anxiety and fear of depression, may also improve the treatment of GAD.

Strengths

The present study added to the limited available longitudinal research examining factors playing a causal and maintaining role in GAD (Dugas et al., 2012; Nassif, 1999; Ryum et al., 2017; Sun et al., 2019). Further, the study is the first to utilize a longitudinal design to compare the MCM, IUM, and EDM simultaneously. Given that previous research has tended to examine each of these models on their own, the comparative nature of the study represents a significant strength. Further the use of a longitudinal design has implications for helping us better understand the causal and maintaining mechanisms in GAD. Ultimately, this has important implications for how GAD is treated. Further, the study had a large sample size ($N = 372$) and good retention rate. A large sample size decreases the margin of error in results and increases the confidence in the validity and generalizability of the findings (Price et al., 2015). Despite recruiting undergraduate students, the inclusion of individuals high in pathological worry and considered to be at-risk for GAD led to a sample with characteristics more representative of a clinical GAD sample. This increases the generalizability of the findings. The present study is also the first to utilize an at-risk sampling technique to examine changes in worry severity and GAD symptoms.

Limitations

Despite the sample displaying characteristics similar to a clinical GAD sample, participants in the present study did not receive a clinical diagnosis of GAD. Therefore, this limits the generalizability of findings to a clinical population. Future researchers may wish to investigate a sample of individuals with a clinical diagnosis of GAD to increase the validity of the findings.

While the study's longitudinal design is a particular strength, there were only 4 months between when participants completed the baseline and follow-up assessment. As a result, there was limited opportunity for changes in worry severity, GAD symptoms, and mechanisms from baseline to follow-up. Additionally, the present study only included one follow-up assessment. Future research may wish to include multiple follow-ups and a greater length of time between follow-ups to allow for greater change in symptoms and mechanisms. Further, given that participants completed the same series of self-report measures at baseline and follow-up, researchers must also consider the influence of practice effects, which would present a possible source of error.

Finally, the study was conducted between September 2020 and October 2021. Therefore, participants completed the study during the COVID-19 pandemic. It is possible the pandemic may have influenced the present study by producing higher scores on some of the self-report measures. For example, during the pandemic individuals were likely experiencing higher-than-average levels of worry, potentially resulting in increased PSWQ scores. Further, individuals were advised by public health authorities to "worry" about washing their hands frequently, wearing a mask properly, screening for symptoms daily, and much more. Given that many of the public health measures encouraged "worrying" about various daily tasks to avoid contracting

COVID-19, it is possible participants reported inflated positive beliefs about worry. Participants may have more strongly endorsed the beliefs that worrying would help prevent feared events (i.e., COVID-19) from happening.

Conclusion

Individuals with GAD experience chronic and excessive worry over a variety of daily life events (American Psychiatric Association, 2013). This study was the first longitudinal study to compare mechanisms proposed by the MCM, IUM, and EDM. Further, it extends the limited longitudinal research examining mechanisms predicting the development and maintenance of GAD (Dugas et al., 2012; Nassif, 1999; Ryum et al., 2017; Sun et al., 2019). Analyses revealed that negative beliefs about worry consistently predict pathological worry and GAD symptoms. This suggests that negative beliefs about worry play a key role in maintaining pathological worry and GAD symptoms. Supplemental analyses revealed that changes in negative beliefs about worry and intolerance of certainty predict changes in worry and GAD symptoms. Further, experiencing a fear of emotions, specifically anxiety and depression, was found to predict pathological worry. Future research may wish to consider a comprehensive model of GAD founded on the MCM, that incorporates aspects of the IUM (i.e., intolerance of uncertainty) and the EDM (i.e., fear of emotions).

References

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.).

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Barlow, D. H., Durand, V. M., Hofmann, S. G., & Lalumière, M. L. (2018). *Abnormal psychology: An integrative approach* (5th Canadian Edition). Nelson Education.

Berg, C. Z., Shapiro N., Chambless, D. L., & Ahrens, A. H. (1998). Are emotions frightening? II: An analogue study of fear of emotion, interpersonal conflict, and panic onset. *Behaviour Research and Therapy, 36*(1), 3-15. https://doi.org/10.1016/S0005-7967(97)10027-4

Behar, E., Alcaine, O., Zuellig, A. R., & Borkovec, T. D. (2003). Screening for generalized anxiety disorder using the Penn State Worry Questionnaire: a receiver operating characteristic analysis. *Journal of Behavior Therapy and Experimental Psychiatry*, *34*(1), 25–43. https://doi.org/10.1016/s0005-7916(03)00004-1

Behar, E., DiMarco, I. D., Hekler, E. B., Mohlman, J., & Staples, A. M. (2009). Current theoretical models of generalized anxiety disorder (GAD): Conceptual review and treatment implications. *Journal of Anxiety Disorders, 23*(8), 1011-1023. https://doi.org/10.1016/j.janxdis.2009.07.006

Bita, F., & Mohamadi, N. (2017). the psychometric properties of the Generalized Anxiety Disorder Questionnaire-IV. *Psychological Methods and Models*, *8*(29), 87-104.

Brown, T. A., Antony, M. M., & Barlow, D. H. (1992). Psychometric properties of the Penn State Worry Questionnaire in a clinical anxiety disorders sample. *Behaviour Research and Therapy*, *30*(1), 33–37. https://doi.org/10.1016/0005-7967(92)90093-v

Boelen, P. A., & Reijntjes, A. (2009). Intolerance of uncertainty and social anxiety. *Journal of Anxiety Disorders, 23*(1), 130-135. https://doi.org/10.1016/j.janxdis.2008.04.007

Bottesi, G., Ghisi, M., Carraro, E., Barclay, N., Payne, R., & Freeston, M. H. (2016). Revising the intolerance of uncertainty model of generalized anxiety disorder: Evidence from UK and Italian undergraduate samples. *Frontiers in Psychology, 7*, Article 1723. http://doi.org/10.3389/fpsyg.2016.01723

Buhr, K. & Dugas, M. J. (2006). Investigating the construct validity of intolerance of uncertainty and its unique relationship with worry. *Anxiety Disorders, 20*(2), 222-236. https://doi.org/10.1016/j.janxdis.2004.12.004

Cartwright-Hatton, S. & Wells, A. (1997). Beliefs about worry and intrusions: The Meta-Cognitions Questionnaire and its correlates. *Journal of Anxiety Disorders, 11*(3), 279-296. https://doi.org/10.1016/S0887-6185(97)00011-X

de Bruin, G. O., Rassin, E., & Muris, P. (2006). Worrying in the lab: Does intolerance of uncertainty have predictive value? *Behaviour Change, 23*(2), 138-147. http://doi.org.10.1375/bech.23.2.138

Deleurme, K. A., Parkinson, S. A., & Penney, A. M. (under review). Generalized anxiety disorder: Does the emotion dysregulation model predict symptoms beyond the metacognitive model? *Journal of Rational-Emotive & Cognitive-Behavior Therapy.*

Dugas, M. J., Gosselin, P., & Ladouceur, R. (2001). Intolerance of uncertainty and worry: Investigating specificity in a nonclinical sample. *Cognitive Therapy and Research, 25*, 551-558. https://doi.org/10.1023/A:1005553414688

Dugas, M. J., & Koerner, N. (2005). Cognitive-behavioral treatment for generalized anxiety disorder: Current status and future directions. *Journal of Cognitive Psychotherapy, 19*(1), 61-81. http://doi.org/10.1891/jcop.19.1.61.66326

Dugas, M. J., Laugesen, N., & Bukowski, W. M. (2012). Intolerance of uncertainty, fear of anxiety, and adolescent worry. *Journal of Abnormal Child Psychology, 40,* 868-870. http://doi.org/10.1007/s10802-012-9611-1

Dugas, M. J., Marchand, A., & Ladouceur, R. (2005). Further validation of a cognitive-behavioral model of generalized anxiety disorder: Diagnostic and symptom specificity. *Journal of Anxiety Disorders, 19*(3), 329-343. https://doi.org/10.1016/j.janxdis.2004.02.002

Fresco, D. M., Heimberg, R. G., Mennin, D. S., & Turk, C. L. (2002). Confirmatory factor analysis of the Penn State Worry Questionnaire. *Behaviour Research and Therapy, 40*(3), 313-323. http://doi.org/10.1016/s0005-7967(00)00113-3

Grant, B. F., Hasin, D. S., Stinson, F. S., Dawson, D. A., Ruan, W. J, Goldstein, R. B., Smith, S. M., Saha, T. D., & Huang, B. (2005). Prevalence, correlates, co-morbidity, and comparative disability of DSM-IV generalized anxiety disorder in the USA: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Psychological Medicine, 35*(12), 1747-1759. http://doi.org/10.1017/S0033291705006069

Gosselin, P., Langlois, F., Freeston, M. H., Ladouceur, R., Laberge, M., & Lemay, D. (2007). Cognitive variables related to worry among adolescents: Avoidance strategies and faulty beliefs about worry. *Behaviour Research and Therapy, 45*(2), 225-233. https://doi.org/10.1016/j.brat.2006.03.001

Gosselin, P., Pelletier, O., Ladouceur, R. (2001). *The Negative Problem Orientation Questionnaire: Development and preliminary analyses.* [Poster presentation]. Sociéte Québécoise pour la Recherche en Psychologie, Hull, QC, Canada.

Haseth, S., Solem, S., Soro, G. B., Bjornstad, E., Grotte, T. & Fisher, P. (2019). Group metacognitive therapy for generalized anxiety disorder: A pilot feasibility trial. *Frontiers in Psychology, 10*, Article 290. https://doi.org/10.3389/fpsyg.2019.00290

Hirsch, C. R., Matthews, A., Lequertier, B., Perman, G., & Hayes, S. (2013). Characteristics of worry in generalized anxiety disorder. *Journal of Behavior Therapy and Experimental Psychiatry, 44*(4), 388-395. http://doi.org/10.1016/j.jbtep.2013.03.004

Hong, R. Y., & Lee, S. S. M. (2015). Further clarifying the prospective and inhibitory intolerance of uncertainty: Factorial and construct validity of test scores from the Intolerance of Uncertainty Scale. *Psychological Assessment, 27*(2), 605-620. http://doi.org/101037/pas0000074

Johnson, S. U., Ulvenes, P. G., Oktedalen, T., & Hoffart, A. (2019). Psychometric properties of the Generalized Anxiety Disorder 7-Item (GAD-7) Scale in a heterogeneous psychiatric sample. *Frontiers in Psychology, 10,* Article 1713. https://doi.org/10.3389/fpsyg.2019.01713

Kessler, R. C., & Wittchen, H.-U. (2002). Patterns and correlates of generalized anxiety disorder in community samples. *The Journal of Clinical Psychiatry, 63*(Suppl 8), 4-10.

Khawaja, N. G., & Chapman, D. (2007). Cognitive predictors of worry in a non-clinical population. *Clinical Psychologist, 11*(1), 24-32. http://doi.org/10.1080/13284200601151778

Koerner, N., & Dugas, M. J. (2006). A cognitive model of generalized anxiety disorder: The role of intolerance of uncertainty. *Worry and its psychological disorders: Theory, assessment and treatment*, 201-216.

Koerner, N., Tallon, K., & Kusec, A. (2015). Maladaptive core beliefs and their relation to generalized anxiety disorder. *Cognitive Behavior Therapy, 44*(6), 441-455. https://doi.org/10.1080/16506073.2015.1042989

Kroenke, K., Spitzer, R. L., Williams, J. B. W., Monahan, P. O., & Löwe, B. (2007). Anxiety disorders in primary care: Prevalence, impairment, comorbidity, and detection. *Annals of Internal Medicine*, *146*(5), 317–325. https://doi.org/10.7326/0003-4819-146-5-200703060-00004

Ladouceur, R., Blais, F., Freeston, M. H., & Dugas, M. J. (1998). Problem solving and problem orientation in generalized anxiety disorder. *Journal of Anxiety Disorders, 12*(2), 139-152. http://doi.org/10.1016/S0887-6185(98)00002-4

Ladouceur, R., Dugas, M. J., Freeston, M. H., Rhéaume, J., Blais, F., Boisvert, J.-M., Gagnon, F., & Thibodeau, N. (1999). Specificity of generalized anxiety disorder symptoms and processes. *Behavior Therapy, 30*(2), 191-207. https://doi.org/10.1016/S0005-7894(99)80003-3

Ladouceur, R., Gosselin, P., & Dugas, M. J. (2000). Experimental manipulation of intolerance of uncertainty: A study of a theoretical model of worry. *Behaviour Research and Therapy, 38*(9), 933-941. https://doi.org/10.1016/S0005-7967(99)00133-3

Mahoney, A. E., & McEvoy, P. M. (2012). A transdiagnostic examination of intolerance of uncertainty across anxiety and depressive disorders. *Cognitive Behaviour Therapy, 41*(3), 212-222. https://doi.org/10.1080/16506073.2011.622130

Mennin, D. S., Heimberg, R. G., Turk, C. L., & Fresco, D. M. (2002). Applying an emotion regulation framework to integrative approaches to generalized anxiety disorder. *Clinical Psychology: Science and Practice, 9*(1), 85–90. http://doi.org/10.1093/clipsy.9.1.85

Mennin, D. S., Heimberg, R. G., Turk, C. L., & Fresco, D. M. (2005). Preliminary evidence for an emotion dysregulation model of generalized anxiety disorder. *Behaviour Research and Therapy, 43*(10), 1281–1310. http://doi.org/10.1016/j.brat.2004.08.00

Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy, 28*(6), 487–495. http://doi.org /10.1016/0005-7967(90)90135-6

McCabe-Bennett, H., Fracalanza, K., & Antony, M. M. (2018). The psychological treatment of generalized anxiety disorder. In D. David, S. J. Lynn, & G. H. Montgomery (Eds.), *Evidence-based psychotherapy: The state of the science and practice* (1st edition., pp. 95-122). Wiley-Blackwell.

McEvoy, P. M., & Mahoney, A. E. (2013). Intolerance of uncertainty and negative metacognitive beliefs as transdiagnostic mediators of repetitive negative thinking in a clinical sample with anxiety disorders. *Journal of Anxiety Disorders, 27*(2), 216-224. https://doi.org/10.1016/j.janxdis.2013.01.006

Morey, L. C. (1991). *The Personality Assessment Inventory professional manual*. Psychological Assessment Resources.

Newman, M. G., Zuellig, A. R., Kachin, K. E., Constantino, M. J., Przeworski, A., Erickson, T., & Cashman-McGrath, L. (2002). Preliminary reliability and validity of the Generalized Anxiety Disorder Questionnaire-IV: A revised self-report diagnostic measure of generalized anxiety disorder. *Behavior Therapy, 33*(2), 215-233. https://doi.org/10.1016/S0005-7894(02)80026-0

Nordahl, H. M., Borkovec, T. D., Hagen, R., Kennair, L. E. O., Hjemdal, S., Hansen, B., Haseth, S., & Wells, A. (2018). Metacognitive therapy versus cognitive–behavioural therapy in adults with generalised anxiety disorder. *BJPsych Open*, *4*(5), 393-400. http://doi.org/10.1192/bjo.2018.54

Norton, P. J., & Mehta, P. D. (2007). Hierarchical model of vulnerabilities for emotional disorders. *Cognitive Behaviour Therapy, 36*(4), 240-254. https://doi.org/10.1080/16506070701628065

Penney, A. M., Mazmanian, D., & Rudanycz, C. (2013). Comparing positive and negative beliefs about worry in predicting generalized anxiety disorder symptoms. *Canadian Journal of Behavioural Science, 45*(1), 34-41. http://doi.org/10.1037/a0027623

Price, P. C., Jhangiani, R. S., & Chiang, I. A. (2015). Research methods in psychology (2nd Canadian Edition). The Saylor Foundation.

Ren, L., Yang, Z., Wang, Y., Cui, L. B., Jin, Y., Ma, Z., Zhang, Q., Wu, Z., Wang, H-N., & Yang, Q. (2020). The relations among worry, meta-worry, intolerance of uncertainty and attentional bias for threat in men at high risk for generalized anxiety disorder: A network analysis. *BMC Psychiatry*, *20*(1), 1-11. https://doi.org/10.1186/s12888-020-02849-w

Rodebaugh, T. L., Holaway, R. M., & Heimberg, R. G. (2008). The factor structure and dimensional scoring of the Generalized Anxiety Disorder Questionnaire for DSM-IV. *Assessment, 15*, 343-350. http://doi.org/10.1177/1073191107312547

Ruscio, A. M. (2002). Delimiting the boundaries of generalized anxiety disorder: Differentiating high worriers with and without GAD. *Journal of Anxiety Disorders, 16*(4), 377-400. http://doi.org/10.1016/S0887-6185(02)00130-5

Ruscio, A. M., & Borkovec, T. D. (2004). Experience and appraisal of worry among high worriers with and without generalized anxiety disorder. *Behaviour Research and Therapy, 42*(12), 1469-1482. https://doi.org/10.1016/j.brat.2003.10.007

Robichaud, M., & Dugas, M. J. (2005). Negative problem orientation (Part II): Construct validity and specificity to worry. *Behaviour Research and Therapy*, *43*(3), 403-412. http://doi.org/10.1016/j.brat.2004.02.008

Robichaud, M., & Dugas, M. J. (2006). A cognitive-behavioral treatment targeting intolerance of uncertainty. *Worry and its psychological disorders: Theory, assessment and treatment*, 289-304.

Sexton, K. A., & Dugas, M. J. (2008). The Cognitive Avoidance Questionnaire: Validation of the English translation. *Journal of Anxiety Disorders*, *22*(3), 355-370. http://doi.org/10.1016/j.janxdis.2007.04.005

Sexton, K. A., Norton, P. J., Walker, J. R., & Norton, G. R. (2003). Hierarchical model of generalized and specific vulnerabilities in anxiety. *Cognitive Behaviour Therapy, 32*(2), 82-94. https://doi.org/10.1080/16506070302321

Spitzer, R. L., Kroenke, K., Williams, J. B., & Lowe, B. (2006). A brief measure for assessing generalized anxiety disorder. *Archives of Internal Medicine, 166*(10)*,* 1092-1097. http://doi.org/10.1001/archinte.166.10.1092

Stapinski, L. A., Abbott, M. J., & Rapee, R. M. (2010). Fear and perceived uncontrollability of emotion: Evaluating the unique contribution of emotional appraisal variables to prediction of worry and generalised anxiety disorder. *Behaviour Research and Therapy, 48*(11), 1097-1104. http://doi.org/10.1016/j.brat.2010.07.01

Sugiura, Y. (2014). Metacognitive, emotional, and avoidance predictors of generalized anxiety disorder. *Psychology, 8*(4), 636-653. http://doi.org/10.4236/psych.2017.84041

Sun, X., So, S. H., Chan, R. C., Chiu, C.-D., & Leung, P. W. (2019). Worry and metacognitions as predictors of the development of anxiety and paranoia. *Scientific Reports,* 9, 14723. https://doi.org/10.1038/s41598-019-51280-z

Tabachnick, B. G., & Fidell, L. S. (2007). Using multivariate statistics (5th ed.). Allyn and Bacon.

Thielsch, C., Andor, T., & Ehring, T. (2015). Do metacognitions and intolerance of uncertainty predict worry in everyday life? An ecological momentary assessment study. *Behaviour Therapy, 46*(4), 532-543. http://doi.org/10.1016/j.beth.2015.05.001

Turk, C. L., Fresco, D. M., Mennin, D. S., Heimberg, R. G. (2001). *Using the Penn State Worry Questionnaire to distinguish individuals with generalized anxiety disorder from individuals with social anxiety disorder* [Poster presentation]. Annual Meeting of the Association for Advancement of Behavior Therapy, Philadelphia, PA, United States.

Typaldou, M., Nidos, A., Roxanis, I., Dokianaki, F., Vaidakis, N., & Papadimitriou, G. (2010). Psychometric properties of the Metacognitions Questionnaire-30 (MCQ-30) in a Greek sample. *Annals of General Psychiatry, 9*, Article S103. https://doi.org/10.1186/1744-859X-9-S1-S103

Wells, A. (1995). Meta-cognition and worry: A cognitive model of generalized anxiety disorder. *Behavioural and Cognitive Psychotherapy*, *23*(3), 301-320. http://doi.org/10.1017/S1352465800015897

Wells, A. (2002). Worry, metacognition, and GAD: Nature, consequences, and treatment. *Journal of Cognitive Psychotherapy*, *16*(2), 179–192. http://doi.org/10.1891/jcop.16.2.179.63994

Wells, A., & Carter, K. (1999). Preliminary tests of a cognitive model of generalized anxiety disorder. *Behaviour Research and Therapy, 37*(6)*,* 585-594. https://doi.org/10.1016/S0005-7967(98)00156-9

Wells, A., & Carter, K. (2001). Further tests of a cognitive model of generalized anxiety disorder: cognitions and worry in GAD, panic disorder, social phobia, depression, and non-patients. *Behaviour Therapy, 32*(1), 85-102. https://doi.org/10.1016/S0005-7894(01)80045-9

Wells, A., & Cartwright-Hatton, S. (2004). A short form of the metacognitions questionnaire: Properties of the MCQ-30. *Behaviour Research and Therapy, 42*(4), 385-396. http://doi.org./10.1016/S0005-7967(03)00147-5

Wells, A., & King, P. (2006). Metacognitive therapy for generalized anxiety disorder: An open trial. *Journal of Behavior Therapy and Experimental Psychiatry, 37*(3), 206-212. https://doi.org/10.1016/j.jbtep.2005.07.002

Wells, A., Welford, M., King, P., Papageorgiou, C., Wisely, J., & Mendel, E. (2010). A pilot randomized trial of metacognitive therapy vs applied relaxation in the treatment of adults with generalized anxiety disorder. *Behaviour Research and Therapy, 48*(5), 429-434. https://doi.org/10.1016/j.brat.2009.11.013

Williams, K. E., Chambless, D. L., & Ahrens, A. (1997). Are emotions frightening? An extension of the fear of fear construct. *Behaviour Research and Therapy, 35*(3), 239-248. http://doi.org./10.1016/S0005-7967(96)00098-8

Wright, K. D., Lebell, M. A., & Carleton, R. N. (2016). Intolerance of uncertainty, anxiety sensitivity, health anxiety, and anxiety disorder symptoms in youth. *Journal of Anxiety Disorders, 41,* 35-42. https://doi.org/10.1016/j.janxdis.2016.04.011

van der Heiden, C., Melchior, K., & de Stigter, E. (2013). The effectiveness of group metacognitive therapy for generalised anxiety disorder: A pilot study. *Journal of Contemporary Psychotherapy, 43*(3), 151-157. https://doi.org/10.1007/s10879-013-9235-y

van der Heiden, C., & Melchior, K. (2014). A 30-month follow-up of generalized anxiety disorder: Status after metacognitive therapy and intolerance of uncertainty-therapy. *European Journal for Person Centered Healthcare, 2*(4)*,* 434-438.

van der Heiden, C., Muris, P., & van der Molen, H. T. (2012). Randomized controlled trial on the effectiveness of metacognitive therapy and intolerance-of-uncertainty therapy for generalized anxiety disorder. *Behaviour Research and Therapy, 50*(2), 100-109. https://doi.org/10.1016/j.brat.2011.12.005

Voon, D., & Phillips, L. J. (2015). An investigation of relationships between cognitive factors associated with worry. *Journal of Experimental Psychopathology, 6*(4), 330-342. http://doi.org/10.5127/jep.037013

Appendix A

Consent Form

MacEwan UNIVERSITY | PSYCHOLOGY **Consent Form**

Project Title: Longitudinal examination of worry and generalized anxiety disorder symptoms

Researchers:
Sydney Parkinson, B.A. Psychology (Honours)
Student Researcher
parkinsons6@mymacewan.ca

Alexander Penney, Ph.D.
Assistant Professor
alexander.penney@macewan.ca

Purpose of the Research:
The purpose of this research is to investigate what beliefs, specifically metacognitive beliefs and intolerance of uncertainty, contribute to worry and generalized anxiety disorder (GAD) symptoms.

Procedures:
- As a participant, you will be asked to complete a variety of online questionnaires regarding your general anxiety, thoughts about worry, and feelings toward uncertain situations, as well as other related beliefs.
- You may complete the survey anywhere that you feel comfortable and that has a secure internet connection.
- The study will take approximately 45-60 minutes to complete.
- You will be asked whether you would like to be contacted to complete the study's 4-month follow-up. If you select yes, researchers will contact you via your mymacewan.ca email address with the necessary link to complete the follow-up.
- For participating in the study's initial assessment, you may be eligible to receive a 2% bonus course credit.
- The 4-month follow-up will be identical to the current set of questionnaires, however you will be eligible to receive a $15.00 e-gift card at that time. There will be a variety of e-gift cards to choose from.

Potential Risks:
- The study is of minimal risk. There are no known or anticipated risks associated with participating in this research. Though unlikely, you may feel discomfort upon disclosing personal information. Please feel free to skip any questions that you feel uncomfortable answering. You may also withdraw at any time without loss of course credit or compensation.
- Upon completion of the study's initial and follow-up assessment, you will be provided with a debriefing form that will contain contact information for a list of services at your disposal should you experience residual distress.

Potential Benefits:
- For participating in the study's initial assessment, you will be eligible to receive a 2% course credit.
- For participating in the 4-month follow-up, you will receive a $15.00 e-gift card.

- You will gain knowledge about how research in the field of psychology is conducted.
- You will be contributing to the psychological literature on worry, generalized anxiety disorder, metacognitions, and intolerance of uncertainty.
- You will leave with a better understanding of your own thoughts and anxiety.

Compensation:

Initial Assessment

- You may receive up to a 2% course-credit for your participation in the study's initial assessment, as determined by Department of Psychology protocols.

Follow-up Assessment

- For participating in your scheduled 4-month follow-up, you will receive a single $15.00 e-gift card through Reward Genius. You will be able to choose from a variety of gift cards including Amazon, Apple App Store & iTunes, Best Buy, Esso, Starbucks, Uber, Tim Hortons, and more.
- If you decide to end your participation midway through a survey page, simply stop answering questions and click "next". When the next page asks if you wish to continue, click "No". This will redirect you to the debriefing and compensation page.
- Please note that if you simply exit the browser, we will not be able to provide retroactive compensation due to the anonymous nature of the survey.

Confidentiality/Anonymity:

- All responses throughout the study are entirely anonymous.
- Your participation in the study is voluntary. Likewise, you can skip any questions that make you uncomfortable, and you are free to withdraw at any time without penalty.
- **If you choose to participate in 4-month follow-up survey you will be asked to provide the randomly generated identification number that was included in the email you received containing the survey link. The purpose of this identification number is to allow the researchers to match participants' baseline and 4-month follow-up data.**
- Please do not include any personally identifying information on survey materials (i.e., do not include your name).
- Data for the test materials is collected through Qualtrics, located in the United States of America and Ireland. The data is subject to Irish, European Union, and U.S. privacy and security laws. The test materials do not ask for any personal information nor other identifiers. The company servers may record the incoming IP address of the computer that you use to complete the test materials, but the company asserts that no connection is made between your data and your computer's IP address. The security and privacy policy for the online data collection company can be found at:

  http://www.qualtrics.com/security-statement/
  http://www.qualtrics.com/privacy-statement/

Right to Withdraw:

- Your participation in this study is voluntary. You are not obligated to answer questions that you are uncomfortable with.
- You may withdraw from the study at any time for any reason. Reasons for withdrawal do not need to be provided and there will be no penalty.
- Whether you decided to participate or not in the study will have no effect on your treatment or standing within your class.
- You may withdraw from the study at any time. If you wish to withdraw during your initial participation please simply exit your browser. If you wish to withdraw while completing your 4-month follow-up assessment, please press the appropriate button (indicated in the survey instructions) to be redirected to the debriefing form and incentive page. Please note that if you simply exit your browser during the 4-month follow-up, compensation will not be possible due to the anonymous nature of the survey.
- Once you submit your survey, the researchers will be unable to withdraw your data as it contains no identifying information.

This Study is Funded by:

- A 2020 Undergraduate Student Research Initiative (USRI) grant from MacEwan University.
- A 2020 Faculty Project Grant from MacEwan University.

Questions or Concerns:

- If you have questions or concerns regarding this study, please contact Sydney Parkinson (parkinsons6@mymacewan.ca) or Dr. Alexander Penney (alexander.penney@macewan.ca). Contact information for the researchers is also provided at the top of this document.
- You can request a summary of this study once all the data has been collected and analyzed.

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:

- I hereby agree to participate in the study described above. I understand that consent does not constitute a waiver of legal rights in the event of research-related harm.

___ I consent, and wish to participate in the study

___ I do not consent, and do not wish to participate

Appendix B

Measures Used in the Study

Background Information 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 best 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
___Southern Asian (e.g., Indian, Bangladeshi, Pakistani, etc.)
___East Asian (e.g., Chinese, Japanese, Korean, etc.)
___Southeast Asian (e.g., Malaysian, Filipino, Vietnamese, etc.)
___Mixed race
___Unsure/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 MacEwan University student?

__Yes – Full Time
__Yes – Part Time
__No

8) Please list any mental health or medical conditions that you have previously been diagnosed with by a therapist, counsellor, medical doctor, or other professional:

Condition A: _____ Condition D: _____
Condition B: _____ Condition E: _____
Condition C: _____ Condition F: _____

GAD-7

Over the **last 2 weeks,** please indicate how often have you been bothered by the following problems by selecting the appropriate number.

Not at all	Several days	More than half the days	Nearly every day
0	1	2	3

1. Feeling nervous, anxious, or on edge.

   0 1 2 3

2. Not being able to stop or control worrying.

   0 1 2 3

3. Worrying too much about different things.

   0 1 2 3

4. Trouble relaxing.

   0 1 2 3

5. Being so restless that it is hard to sit still.

   0 1 2 3

6. Becoming easily annoyed or irritable

   0 1 2 3

7. Feeling afraid as if something awful might happen.

   0 1 2 3

If you checked off **any** problems, how **difficult** have these problems made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult
☐	☐	☐	☐

IUS-18

You will find below a series of statements which describe how people may react to the uncertainties of life. Please indicate to what extent each item is characteristic of you.

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

1. Uncertainty stops me from having a strong opinion.

   1 2 3 4 5

2. My mind can't be relaxed if I don't know what will happen tomorrow.

   1 2 3 4 5

3. Uncertainty makes me uneasy, anxious, or stressed.

   1 2 3 4 5

4. Unforeseen events upset me greatly.

   1 2 3 4 5

5. It frustrates me not having all the information I need.

   1 2 3 4 5

6. One should always look ahead so as to avoid surprises.

   1 2 3 4 5

7. A small unforeseen event can spoil everything, even with the best planning.

   1 2 3 4 5

8. When it's time to act, uncertainty paralyses me.

   1 2 3 4 5

9. Being uncertain means that I am not first rate.

   1 2 3 4 5

10. When I am uncertain, I can't go forward.

    1 2 3 4 5

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

1. When I am uncertain, I can't function very well.

   1 2 3 4 5

2. Unlike me, others seem to know where they are going with their lives.

   1 2 3 4 5

3. Uncertainty makes me vulnerable, unhappy, or sad.

   1 2 3 4 5

4. I always want to know what the future has in store for me.

   1 2 3 4 5

5. I can't stand being taken by surprise.

   1 2 3 4 5

6. The smallest doubt can stop me from acting.

   1 2 3 4 5

7. I should be able to organize everything in advance.

   1 2 3 4 5

8. Being uncertain means that I lack confidence.

   1 2 3 4 5

GADQ-IV

Please check the appropriate boxes below.

1. Do you experience excessive worry?

Yes ☐ No ☐

2. Is your worry excessive in intensity, frequency, or amount of distress it causes?

Yes ☐ No ☐

3. Do you find it difficult to control your worry (or stop worrying) once it starts?

Yes ☐ No ☐

4. Do you worry excessively and uncontrollably about minor things such as being late for an appointment, minor repairs, homework, etc.?

Yes ☐ No ☐

5. Please list the most frequent topics about which you worry excessively and uncontrollably:

a. _____ d. _____

b. _____ e. _____

c. _____ f. _____

6. During the last six months, have you been bothered by excessive and uncontrollable worries more days than not?

Yes ☐ No ☐

7. During the past six months, have you often been bothered by any of the following symptoms? Place a check next to each symptom that you have had more days than not:

Restlessness or feeling keyed up or on edge ☐

Irritability ☐

Difficulty falling/staying asleep or restless/unsatisfying sleep ☐

Being easily fatigued ☐

Difficulty concentrating or mind going blank ☐

Muscle tension ☐

8. How much do worry and physical symptoms interfere with your life, work, social activities, family, etc.? Circle one number:

None		Mildly		Moderately		Severely		Very Severely
0	1	2	3	4	5	6	7	8

9. How much are you bothered by worry and physical symptoms (how much distress does it cause you)? Circle one number:

None		Mildly		Moderately		Severely		Very Severely
0	1	2	3	4	5	6	7	8

MCQ-30

This questionnaire is concerned with beliefs people have about their thinking. Listed below are a number of beliefs that people have expressed. Please read each item and say how much you *generally* agree with it by selecting the appropriate option. Please respond to all the items, there are no right or wrong answers.

Do Not Agree	Agree Slightly	Agree Moderately	Agree Very Much
1	2	3	4

1. Worrying helps me to avoid problems in the future

1 2 3 4

2. My worrying is dangerous for me

1 2 3 4

3. I think a lot about my thoughts

1 2 3 4

4. I could make myself sick with worrying

1 2 3 4

5. I am aware of the way my mind works when I am thinking through a problem

1 2 3 4

6. If I did not control a worrying thought, and then it happened, it would be my fault

1 2 3 4

7. I need to worry in order to remain organized

1 2 3 4

8. I have little confidence in my memory for words and names

1 2 3 4

9. My worrying thoughts persist, no matter how I try to stop them

1 2 3 4

Do not agree	Agree slightly	Agree moderately	Agree very much
1	2	3	4

10. Worrying helps me to get things sorted out in my mind

1 2 3 4

11. I cannot ignore my worrying thoughts

1 2 3 4

12. I monitor my thoughts

1 2 3 4

13. I should be in control of my thoughts all of the time

1 2 3 4

14. My memory can mislead me at times

1 2 3 4

15. My worrying could make me go mad

1 2 3 4

16. I am constantly aware of my thinking

1 2 3 4

17. I have a poor memory

1 2 3 4

18. I pay close attention to the way my mind works

1 2 3 4

19. Worrying helps me cope

1 2 3 4

Do not agree	Agree slightly	Agree moderately	Agree very much
1	2	3	4

20. Not being able to control my thoughts is a sign of weakness

1 2 3 4

21. When I start worrying, I cannot stop

1 2 3 4

22. I will be punished for not controlling certain thoughts

1 2 3 4

23. Worrying helps me to solve problems

1 2 3 4

24. I have little confidence in my memory for places

1 2 3 4

25. It is bad to think certain thoughts

1 2 3 4

26. I do not trust my memory

1 2 3 4

27. If I could not control my thoughts, I would not be able to function

1 2 3 4

28. I need to worry in order to work well

1 2 3 4

29. I have little confidence in my memory for actions

1 2 3 4

30. I constantly examine my thoughts

1 2 3 4

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 enter the appropriate number (1 to 5).

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

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 situation 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

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

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

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

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

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

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

ACS

Please rate the extent of your agreement with each of the statements below by selecting the appropriate number below each statement.

1	2	3	4	5	6	7
very strongly disagree	strongly disagree	disagree	neutral	agree	strongly agree	very strongly agree

1. I am concerned that I will say things I'll regret when I get angry.

   1 2 3 4 5 6 7

2. I can get too carried away when I am really happy.

   1 2 3 4 5 6 7

3. Depression could really take me over, so it is important to fight off sad feelings.

   1 2 3 4 5 6 7

4. If I get depressed, I am quite sure that I'll bounce right back.

   1 2 3 4 5 6 7

5. I get so rattled when I am nervous that I cannot think clearly.

   1 2 3 4 5 6 7

6. Being filled with joy sounds great, but I am concerned that I could lose control over my actions if I get too excited.

   1 2 3 4 5 6 7

7. It scares me when I feel "shaky" (trembling).

   1 2 3 4 5 6 7

8. I am afraid that I will hurt someone if I get really furious.

   1 2 3 4 5 6 7

1 very strongly disagree	2 strongly disagree	3 disagree	4 neutral	5 agree	6 strongly agree	7 very strongly agree

9. I feel comfortable that I can control my level of anxiety.

1 2 3 4 5 6 7

10. Having an orgasm is scary for me because I am afraid of losing control.

1 2 3 4 5 6 7

11. If people were to find out how angry I sometimes feel, the consequences might be pretty bad.

1 2 3 4 5 6 7

12. When I feel good, I let myself go and enjoy it to the fullest.

1 2 3 4 5 6 7

13. I am afraid that I could go into a depression that would wipe me out.

1 2 3 4 5 6 7

14. When I feel really happy, I go overboard, so I don't like getting overly ecstatic.

1 2 3 4 5 6 7

15. When I get nervous, I think that I am going to go crazy.

1 2 3 4 5 6 7

16. I feel very comfortable in expressing angry feelings.

1 2 3 4 5 6 7

17. I am able to prevent myself from becoming overly anxious.

1 2 3 4 5 6 7

1 very strongly disagree	2 strongly disagree	3 disagree	4 neutral	5 agree	6 strongly agree	7 very strongly agree

18. No matter how happy I become, I keep my feet firmly on the ground.

1 2 3 4 5 6 7

19. I am afraid that I might try to hurt myself if I get too depressed.

1 2 3 4 5 6 7

20. It scares me when I am nervous.

1 2 3 4 5 6 7

21. Being nervous isn't pleasant, but I can handle it.

1 2 3 4 5 6 7

22. I love feeling excited – it is a great feeling.

1 2 3 4 5 6 7

23. I worry about losing self-control when I am on cloud nine.

1 2 3 4 5 6 7

24. There is nothing I can do to stop anxiety once it has started.

1 2 3 4 5 6 7

25. When I start feeling "down", I think I might let the sadness go too far.

1 2 3 4 5 6 7

26. Once I get nervous, I think that my anxiety might get out of hand.

1 2 3 4 5 6 7

1 very strongly disagree	2 strongly disagree	3 disagree	4 neutral	5 agree	6 strongly agree	7 very strongly agree

27. Being depressed is not so bad because I know it will soon pass.

1 2 3 4 5 6 7

28. I would be embarrassed to death if I lost my temper in front of other people.

1 2 3 4 5 6 7

29. When I get “the blues”, I worry that they will pull me down too far.

1 2 3 4 5 6 7

30. When I get angry, I don’t particularly worry about losing my temper.

1 2 3 4 5 6 7

31. Whether I am happy or not, my self-control stays about the same.

1 2 3 4 5 6 7

32. When I get really excited about something, I worry that my enthusiasm will get out of hand.

1 2 3 4 5 6 7

33. When I get nervous, I feel as if I am going to scream.

1 2 3 4 5 6 7

34. I get nervous about being angry because I am afraid I will go too far, and I’ll regret it later.

1 2 3 4 5 6 7

35. I am afraid that I will babble or talk funny when I am nervous.

1 2 3 4 5 6 7

1 very strongly disagree	2 strongly disagree	3 disagree	4 neutral	5 agree	6 strongly agree	7 very strongly agree

36. Getting really ecstatic about something is a problem for me because sometimes being too happy clouds my judgment.

1 2 3 4 5 6 7

37. Depression is scary to me – I am afraid that I could get depressed and never recover.

1 2 3 4 5 6 7

38. I don't really mind feeling nervous; I know it's just a passing thing.

1 2 3 4 5 6 7

39. I am afraid that letting myself feel really angry about something could lead me into an unending rage.

1 2 3 4 5 6 7

40. When I get nervous, I am afraid that I will act foolish.

1 2 3 4 5 6 7

41. I am afraid that I'll do something dumb if I get carried away with happiness.

1 2 3 4 5 6 7

42. I think my judgment suffers when I get really happy.

1 2 3 4 5 6 7

NPOQ

People react in different ways when faced with problems in their daily lives (e.g., health problems, arguments, lack of time, etc.). Please use the scale below to indicate to what extent each of the following items correspond to the way you react or think when confronted with a problem. Please select the number that best corresponds to you for each item.

1	2	3	4	5
Not at all True of me	Slightly true of me	Moderately true of me	Very true of me	Extremely true of me

1. I see problems as a threat to my well-being.
   1 2 3 4 5
2. I often doubt my capacity to solve problems.
   1 2 3 4 5
3. Often before even trying to find a solution, I tell myself that it is difficult to solve problems.
   1 2 3 4 5
4. My problems often seem insurmountable.
   1 2 3 4 5
5. When I attempt to solve a problem, I often question my abilities.
   1 2 3 4 5
6. I often have the impression that my problems cannot be solved.
   1 2 3 4 5
7. Even if I manage to find some solutions to my problems, I doubt that they will be easily resolved.
   1 2 3 4 5
8. I have a tendency to see problems as a danger.
   1 2 3 4 5
9. My first reaction when faced with a problem is to question my abilities.
   1 2 3 4 5
10. I often see my problems as bigger than they really are.
    1 2 3 4 5
11. Even if I have looked at a problem from all possible angles, I still wonder if the solution I decided on will be effective.
    1 2 3 4 5
12. I consider problems to be obstacles that interfere with my functioning.
    1 2 3 4 5

PSWQ

Please circle the number that best describes how typical or characteristic each item is of you, using the following scale:

Not at all Typical		Somewhat Typical		Very Typical
1	2	3	4	5

1.	If I don't have enough time to do everything, I don't worry about it.	1	2	3	4	5
2.	My worries overwhelm me.	1	2	3	4	5
3.	I don't tend to worry about things.	1	2	3	4	5
4.	Many situations make me worry.	1	2	3	4	5
5.	I know I shouldn't worry about things but I just can't help it.	1	2	3	4	5
6.	When I'm under pressure, I worry a lot.	1	2	3	4	5
7.	I am always worrying about something.	1	2	3	4	5
8.	I find it easy to dismiss worrisome thoughts.	1	2	3	4	5
9.	As soon as I finish one task, I start to worry about everything else I have to do.	1	2	3	4	5
10.	I never worry about anything.	1	2	3	4	5
11.	When there is nothing more that I can do about a concern, I don't worry about it anymore.	1	2	3	4	5
12.	I've been a worrier all my life.	1	2	3	4	5
13.	I notice that I have been worrying about things.	1	2	3	4	5
14.	Once I start worrying, I can't stop.	1	2	3	4	5
15.	I worry all the time.	1	2	3	4	5
16.	I worry about projects until they are done.	1	2	3	4	5

INF

Please respond to all the items, there are no right or wrong answers.

False; Not at all True	Slightly True	Mainly True	Very True
0	1	2	3

1. My favourite poet is Raymond Kertezc.

0 1 2 3

2. Sometimes I get ads in the mail that I don't really want.

0 1 2 3

3. My favourite sports event on television is the high jump.

0 1 2 3

4. Most people would rather win than lose.

0 1 2 3

5. My favourite hobbies are archery and stamp-collecting.

0 1 2 3

6. I don't like to have to buy things that are overpriced.

0 1 2 3

7. Most people look forward to a trip to the dentist.

0 1 2 3

8. In my free time I might read, watch TV, or just relax.

0 1 2 3

Appendix C

Debriefing Form

MacEwan UNIVERSITY

Debriefing Form

Thank you for your participation. We would like to tell you more about the study you just participated in. The broad purpose of the study is to investigate what factors may be contributing to the development and maintenance of generalized anxiety disorder (GAD) symptoms. Specifically, the study seeks to examine whether metacognitions or intolerance of uncertainty more strongly predict GAD symptoms.

GAD is characterized by excessive and uncontrollable worrying across a variety of contexts, and is associated with negative metacognitive beliefs and intolerance of uncertainty. Intolerance of uncertainty refers to the degree of anxiety provoked when an individual is in an uncertain situation. Metacognitive beliefs refer to an individual's thoughts about their own thoughts. Negative metacognitive beliefs, such as the belief that worry is uncontrollable and dangerous, have also been found to play an important role in GAD.

While researchers have found that metacognitions and intolerance of uncertainty are important constructs in GAD, most of the current research is correlational. This does not allow researchers to determine whether there is a cause-and-effect relationship between the factors of interest and GAD. Therefore, the present study seeks to understand whether metacognitive beliefs or intolerance of uncertainty more strongly predict GAD symptoms and worry severity.

The present study utilizes a longitudinal design, by having participants complete a baseline and 4-month follow-up assessment. During both assessments, participants complete a series of questionnaires regarding levels of worry, anxiety, and various cognitive beliefs, including metacognitive beliefs and intolerance of uncertainty. This design allows us to examine whether there is a cause-and-effect relationship between the factors of interest and GAD.

Findings may ultimately help us understand the development and maintenance of GAD. Findings will add to the literature on metacognitions and intolerance of uncertainty, and will further our scientific understanding of how these factors are related to GAD. Results may also provide further understanding as to whether it may be useful to treat intolerance of uncertainty and/or negative metacognitions in therapy to help individuals suffering from GAD.

Please Note: Your participation does not mean that you have GAD. The present study does not diagnose you. Your participation does not suggest that you have above average levels of worry/anxiety. If you have any distress upon completing this study, please see the services listed below.

In the event of a personal emergency or if you require immediate medical assistance, please contact **9-1-1** immediately. Additionally, you may wish to speak to your health care professional if you experience any lingering distress following the completion of the study. MacEwan University's Wellness and Psychological services offer free counseling to students online or on campus in room **7-103A**. Wellness and Psychological services can be contacted by

e-mail at **WPS@MacEwan.ca** or by phone at **780-497-5064**. Crisis Response is available at **780-482-HELP (4357)**.

If you have any further questions about the study, you can contact the researchers directly via email (Sydney Parkinson: **ParkinsonS6@MyMacEwan.ca** or Dr. Alexander Penney: **Alexander.Penney@MacEwan.ca**).

We would like to thank you once again for participating in this study.