Do Metacognitions Have a Moderating Role in GAD? An Investigation with Neuroticism, Anxiety Sensitivity, and Intolerance of Uncertainty

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Abstract

There are many cognitive thought patterns and individual factors that are known to underly the persistent and wide spread worrying of individuals with GAD. This includes the personality trait of neuroticism, as well as the maladaptive cognitions of AS, and IU. Metacognitive beliefs about worry, people's beliefs about the impact and controllability of worrying, are also known to be a substantial factor in GAD. Emerging research has suggested that metacognitions may play a role in moderating how strongly other thought patterns predict the symptoms of anxiety. The present studies sought to investigate this possible moderating effect, and evaluate its impact on individuals' worry severity and symptoms of GAD. The first of these studies (N = 573) investigated the moderating effect of metacognitions on the relationships anxiety sensitivity has with worry severity and GAD in an undergraduate sample. The second of these studies (N = 627) expanded upon the first. It investigated the indirect pathways from neuroticism to worry severity and GAD, through anxiety sensitivity and intolerance of uncertainty. Its primary focus was to then investigate if these indirect pathways would be moderated by metacognitive beliefs. Overall, these studies did not conclude that metacognitions play a moderating role in the relationships neuroticism, anxiety sensitivity, and intolerance of uncertainty have with worry severity and GAD. Despite this, it was still found that anxiety sensitivity and intolerance of uncertainty were significant mediators in the indirect pathways that connect neuroticism to worry severity and GAD. This would suggest that future research may wish to further investigate these mediational pathways, and possibly incorporate metacognitions as mediating rather than moderating variables.

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List of Abbreviations

AS	Anxiety sensitivity
ASI-3	Anxiety Sensitivity Index-3
ASI-cognitive	Anxiety Sensitivity Index-3 cognitive subscale
ASI-physical	Anxiety Sensitivity Index-3 physical subscale
ASI-social	Anxiety Sensitivity Index-3 social subscale
BFI-N	Big Five Inventory-2 Negative emotionality subscale
CI	Confidence interval
GAD	Generalized anxiety disorder
GADQ-IV	Generalized Anxiety Disorder Questionnaire-IV
IU	Intolerance of uncertainty
IUS-18	Intolerance of Uncertainty Scale-18
IUS-inhibitory	Intolerance of Uncertainty Scale-18 inhibitory subscale
IUS-prospective	Intolerance of Uncertainty Scale-18 prospective subscale
MCQ-30	Metacognitions Questionnaire-30
MCQ-NBW	MCQ-30 Negative Beliefs about Worry subscale
MCQ-PBW	MCQ-30 Positive Beliefs about Worry subscale
PSWQ	Penn State Worry Questionnaire

Do Metacognitions Have a Moderating Role in GAD? An Investigation of Neuroticism, Anxiety Sensitivity, and Intolerance of Uncertainty

Whether it is about global tragedies or offhand comments, it is difficult to go through life without worrying. While periods of worry may be brief and sporadic, constantly worrying is the way of life for some. When a person's worrying becomes persistent and overwhelming, they may meet criteria for generalized anxiety disorder (GAD). This disorder is characterized by excessive and uncontrollable worry, as well as fatigue, irritability, muscle tension, and difficulties concentrating (American Psychiatric Association, 2022). Unlike social anxiety or a specific phobia, GAD is not focused on a singular topic, and individuals will experience anxiety across multiple domains of life. GAD is also commonly comorbid with other mental disorders, especially major depression (Brown et al., 2001).

GAD is recognized as the most chronic of the anxiety disorders, with generally low rates of remission and a very present risk of relapse if remission does occur (Keller, 2002). Onset before 25 and lack of regular treatment are associated with significantly poorer outcomes (Rubio & López-Ibor, 2007). Due to this, early diagnosis and effective treatment are especially important (Rubio & López-Ibor, 2007). These issues are made worse by the finding that only half of individuals with GAD achieve high end state functioning post treatment (Erickson & Newman, 2005).

The chronic nature of GAD symptoms is slightly tempered by the tendency for symptoms to decrease with age, and many people will no longer meet clinical criteria by age 50 (Rubio & López-Ibor, 2007). However, while many people lose their GAD diagnosis with time, they may still suffer chronic muscle tension and be diagnosed with a somatic disorder. Their anxiety may also simply shift to a more singular domain like health anxiety (Rubio & López-Ibor, 2007).

Given that GAD symptoms are often chronic and difficult to treated, further research into the underlying mechanisms of GAD is needed. These mechanisms include the core personality trait of neuroticism, as well as maladaptive cognitions like anxiety sensitivity, intolerance of uncertainty, and metacognitive beliefs.

The Role of Neuroticism

Neuroticism is the personality trait that describes the tendency to experience negative emotions and it is theorised to underpin a myriad of emotional disorders, including GAD (Norton & Mehta, 2007; Sexton et al., 2003; Watson et al., 2022). Neuroticism is significantly related to both worry and rumination, with the association with worry being especially important as a predictor of GAD (Denovan et al., 2019; Merino et al., 2016). Specifically in relation to GAD symptoms, neuroticism is a strong predictor even when controlling for age, sex, and education (Nordahl et al., 2022).

When investigated in twin studies, neuroticism and GAD appear to partially overlap in genetic risk factors (Mackintosh et al., 2006). However, despite their association with one another, it is important to note that neuroticism and GAD are two distinct constructs (Hale et al., 2010). When individuals' levels of neuroticism and GAD symptoms were repeatedly measured over a five-year longitudinal study, they were consistently observed to be two independent constructs, despite showing a very strong association (Hale et al., 2010). While neuroticism is known to contribute to GAD, a number of mediating variables appear to exist between neuroticism and GAD (Norton & Mehta, 2007; Sexton et al., 2003; Watson et al., 2022). Neuroticism appears to contribute to an array of maladaptive cognitions, such as anxiety sensitivity and intolerance of uncertainty, and these cognitions in turn appear to directly

contribute to GAD symptoms (Norton & Mehta, 2007; Sexton et al., 2003; van der Heiden et al., 2010).

The Role of Anxiety Sensitivity

Anxiety sensitivity (AS) has been described as the fear of anxiety (Reiss et al., 1986), but it is more accurately described as the fear of anxiety and its consequences (Taylor et al., 2007). In contemporary research AS is subdivided into three subcategories of physical, social, and cognitively based concerns (Taylor et al., 2007).

The physical concerns subfactor relates to fears of the physical manifestations of anxiety. For example, a person may fear that their elevated heart rate will cause cardiovascular damage, or that they may become so anxious that they pass out (Taylor et al., 2007). The social concerns subfactor encompasses fears that anxiety will have a negative impact on social situations or relationships. A common example of these would be fears that a person will be too anxious to know what to say, or that they may be ostracised for visibly shaking. The cognitive concerns subfactor consists of fears around the mental consequences of anxiety. One such consequence is the fear of being too anxious to concentrate (Taylor et al., 2007).

AS is not a GAD specific maladaptive cognition, and it is seen as a transdiagnostic factor across anxiety disorders (Olatunji & Wolitzky-Taylor, 2009). Historically it was studied in relation to panic disorder and agoraphobia, and especially the relationship between panic symptoms and the physical concerns subscale (Olatunji & Wolitzky-Taylor, 2009). However, other research has found that AS has an association with GAD that is at least as strong as the association with panic disorder (Naragon-Gainey, 2010). Unlike panic disorder, the relationship between AS and GAD is primarily through the social concerns, and especially cognitive

concerns, subfactors, with the physical concerns subfactor still showing a significant moderate association (Baek et al., 2019; Naragon-Gainey, 2010).

AS has been found to mediate the relationship between neuroticism and symptoms of anxiety (Ho et al., 2011) and worry severity (Sexton et al., 2003). Conversely, other mediation models have not supported AS as mediating the relationship between neuroticism and GAD (Norton et al., 2005; Norton & Mehta, 2007). However, it is important to note that none of these studies utilized a GAD specific measure. They instead relied on measures of overall anxiety (Ho et al., 2011), worry severity (Norton et al., 2005; Sexton et al., 2003), or a combination of GAD and worry severity measures (Norton & Mehta, 2007). More research is needed in this area to help establish the nature of these variables' relationship, and how neuroticism and AS interact in relation specifically to GAD.

The Role of Intolerance of Uncertainty

Intolerance of uncertainty (IU) is another GAD related maladaptive cognition that represents the perceived inability to cope with uncertain future events (Dupuy & Ladouceur, 2008). Like AS, IU has also been found to be transdiagnostic, with meta-analyses finding strong associations between IU and GAD, as well as between IU and major depression and obsessive-compulsive disorder (Gentes & Ruscio, 2011; McEvoy et al., 2019). IU has also been found to have weaker but still significant association with panic disorder/agoraphobia, social anxiety disorder, and eating disorders (McEvoy et al., 2019).

Much like AS, IU is not a unitary factor, with contemporary research suggesting IU is comprised of two distinct subfactors (Hong & Lee, 2015). The first of these factors is labelled prospective IU, and represents aversion towards uncertain future events. A person that is greatly disturbed by the inability to know what will happen in the future would likely score high on

prospective IU. The second subfactor is inhibitory IU, which represents the degree to which a person is paralyzed by uncertain present or future events (Hong & Lee, 2015). A person that rates highly on inhibitory IU would likely exhibit great difficulty in making decisions when faced with uncertain outcomes. When investigated as a single construct, IU has been shown to be predictive of both GAD and worry severity (Koerner et al., 2017). However, when both subfactors of IU are investigated, prospective IU, rather than inhibitory IU, appears to be particularly salient for GAD symptoms (Hong & Lee, 2015; Mahoney & McEvoy, 2012; McEvoy & Mahoney, 2011; Penney et al., 2020).

IU has been proposed to mediate the relationship between neuroticism and GAD (van der Heiden et al., 2010). This idea has been supported by several studies that have found that IU plays a mediating role in the relationship between neuroticism and worry severity (McEvoy & Mahoney, 2013; Norton et al., 2005; Sexton et al., 2003; Yang et al., 2015). However, it is important to note these studies did not include a specific measure of GAD. While valuable, this previous research has also tended to examine IU as a unitary construct, and do so using older IU measures. There exists a current need for research that investigates the separate effects of both prospective IU and inhibitory IU with updated measures, and that looks at how these subfactors of IU may be differentially related to both worry severity and the specific symptoms of GAD.

The Role of Metacognitions

Metacognitions are a broad category that refers to thoughts about one's own thought processes. Two metacognitions that are commonly studied in relation to GAD are negative beliefs about worry, and positive beliefs about worry. Negative beliefs about worry refer to beliefs that worrying is dangerous or uncontrollable (Wells, 2005). This can take the form of a person believing that they will worry themself insane, or that they will simply never stop

worrying. It is theorised that negative beliefs about worry are responsible for maintaining a cycle of worrying as people believe they cannot stop their worry (Wells, 2005). Positive beliefs about worry refer to beliefs that worrying is in someway beneficial (Dugas et al., 2007; Wells, 2005). This often takes the form of believing worrying is a good tool for solving or avoiding problems. Due to these positive beliefs that worry is useful, they are proposed to lead to people initiating worrying (Wells, 2005).

While both negative and positive beliefs about worry are known to be related to GAD, negative beliefs about worry are more strongly associated with GAD symptoms. Negative beliefs about worry appear to be an important factor distinguishing GAD from non-clinical worrying and other disorders (LeBlanc et al., 2021; Penney et al., 2013; Wells & Carter, 2001). While negative beliefs about worry are also somewhat transdiagnostic, showing associations with social anxiety and depression (Penney et al., 2020), they appear less transdiagnostic than IU, with high levels of negative beliefs about worry being a useful indicator to separate GAD from other emotional disorders (Wells & Carter, 2001).

Negative beliefs about worry have been proposed to be a mediating variable between neuroticism and GAD (van der Heiden et al., 2010). This has been supported by findings that negative beliefs about worry mediated the relationship between neuroticism and repetitive negative thinking that is common in GAD (McEvoy & Mahoney, 2013). This finding is especially noteworthy, as it was found in both individuals with and without GAD (McEvoy & Mahoney, 2013).

However, metacognitions have also been preposed to contribute to anxiety independently of neuroticism (Bailey & Wells, 2013; Nordahl et al., 2022). When controlling for neuroticism, positive and negative beliefs about worry have been found to independently predict interpersonal

problems (Nordahl et al., 2021). In comparing a personality model, largely driven by neuroticism, to a metacognitive model for predicting anxiety and depression, it was found that the metacognitive model was the better independent predictor (Nordahl et al., 2022). Similarly, negative beliefs about worry have also been shown to predict health anxiety independently of neuroticism, and it has been shown that metacognitions moderate the relationship between catastrophic misinterpretations and health anxiety (Bailey & Wells, 2013; 2015; 2016).

Research has also recently explored if positive and negative beliefs about worry may moderate the effects of AS on anxiety. Gorday and Bardeen (2022) utilized an adult sample (N = 417) recruited online, and found that positive and negative beliefs about worry moderated the relationship between AS and anxiety symptoms, such that the association between AS and anxiety symptoms became stronger as negative and positive beliefs increased (Gorday & Bardeen, 2022). This study utilized well established measures of AS (Taylor et al., 2007) and metacognitions measures (Wells & Cartwright-Hatton, 2004). However, it is important to note that they did not include a specific measure of GAD, instead using the anxiety subscale of the Depression Anxiety Stress Scales (Lovibond & Lovibond, 1995), a non-disorder specific measure of anxiety. Gorday and Bardeen's (2022) analysis also tested positive and negative beliefs about worry on separate moderation models, rather than testing them as simultaneous moderators. A test of simultaneous moderation should have been conducted, since there could be an interplay between these beliefs. Taking this into account, it is unclear if these results would extend to the symptoms of GAD. Again, more research is needed to establish whether metacognitions play a moderating role within GAD.

Aims of This Research

The present research aimed to investigate the possible moderating roles positive beliefs about worry and negative beliefs about worry have on the relationships AS and IU have with GAD and chronic worry. A secondary goal was to also investigate the mediating roles of AS and IU in the relationship between neuroticism and GAD. This moderated mediation model would help expand the understanding of how neuroticism, AS, and IU contribute to the symptoms of GAD, and better conceptualize how metacognitions may serve to regulate the role of AS and IU in GAD.

Study 1

In the first study, a specific focus was put on the connection between AS and GAD, and how metacognitions may moderate their relationship. This was done to build upon the findings of Gorday and Bardeen (2022) and investigate if the findings would extend to measures of chronic worry and GAD symptoms.

Participants

To determine the minimum necessary sample size, a priori power analyses were conducted using G*Power 3.1.9.7 software (Faul et al., 2009). To provide sufficient statistical power for the moderation analyses, a linear multiple regression: fixed model, R^2 increase test was conducted. This test was conducted with a small effect size of $f^2 = 0.02$, an alpha error probability of 0.05, and a 1-beta error probability of 0.80. This provided a minimum sample size of 485 to attain an actual power of 0.8002080. To account for incomplete data, it was planned to recruit an additional 115 participants, yielding a target of 600 participants.

Participants consisted of undergraduate students from the MacEwan University Department of Psychology's research participation pool. A total of 600 students initially entered the study. After removing substantially incomplete data and participants that failed embedded

attention checks, the final sample was 573. Participants predominantly identified their sex assigned at birth as female (76.8%), with the remainder identifying as male (23.2%). The majority of participants identified as a Woman (72.3%), with Man (22.5%), and Non-Binary (2.6%) being the next largest groups. Ages ranged from 17 to 46, with a mean of 20.84 years. Slightly over half identified as Caucasian/White (55.1%), with Southern Asian (8.6%) and Southeast Asian (8.4%) being the next largest groups. Most participants were currently single (55.1%), spoke English as their first language (82.5%), were employed part-time (57.2%), and were enrolled as fulltime students (94.6%). Slightly over half self-reported being diagnosed with at least one mental health disorder (55.5%).

Measures

Demographic Characteristics Questionnaire

Participants first completed a demographics questionnaire. This consisted of questions on sex, gender, age, ethnicity, marital status, first language, employment status, enrolment status, and mental health diagnoses.

Generalized Anxiety Disorder Questionnaire-IV (GADQ-IV)

Symptoms of GAD were assessed using the GADQ-IV (Newman et al., 2002). The GADQ-IV includes nine items. These consist of five yes or no questions about worry severity, one item for participants to list up to six domains they worry about, another item where participants select which physical GAD symptoms they have experienced, and two Likert-type items regarding distress and impairment (Newman et al., 2002). The scale can be scored using a skip-out rule, where participants do not complete the last three items if they indicate they have not had excessive worry more days than not in the last six months. For the purposes of this study, the skip-out rule was not used, and participants completed the entire scale. Total scores for the

whole scale range from 0 to 13, with higher scores indicating a greater severity of GAD symptoms, and a score of 5.7 or greater being a likely indicator of a clinical GAD diagnosis when the skip-out rule is not utilized (Newman et al., 2002). The scale demonstrates good test-retest reliability, and good convergent and discriminant validity (Newman et al., 2002; Robinson et al., 2010).

Penn State Worry Questionnaire (PSWQ)

The PSWQ assess worry severity (Meyer et al., 1990). The scale consists of 16 worry related statements that participants rate their agreement with on a five-point Likert-type scale ranging from one (not at all typical) to five (very typical). Scores range from 16 to 80, with higher scores indicating greater worry severity (Meyer et al., 1990). When used as a screening tool, a score of 45 has been found to be an effective cut-off for indicating a likely instance of GAD (Behar et al., 2003). The scale has been found to have both good test-retest and internal reliability (Meyer et al., 1990; van Rijsoort et al., 1999), as well as good convergent and discriminant validity (Brown et al., 1992).

Anxiety Sensitivity Index-3 (ASI-3)

Participants' AS was measured using the ASI-3 (Taylor et al., 2007). This scale includes 18 items rated on a five-point Likert-type scale that ranges from zero (very little) to four (very much). Total scale scores range from 0 to 72, with higher scores indicating greater AS. The ASI-3 contains three subscales relating to the physical, social, and cognitive subfactors of AS (Taylor et al., 2007). Each subscale consists of six items, with total scores ranging from 0 to 24. Analysis of subscale and total scores has revealed good internal reliability, as well as good convergent and discriminant validity (Kemper et al., 2012; Taylor et al., 2007).

Metacognitions Questionnaire-30 (MCQ-30)

The MCQ-30 measures participants metacognitive beliefs (Wells & Cartwright-Hatton, 2004). It contains 30 items rated on a four-point Likert scale that ranges from one (do not agree) to four (agree very much). The questionnaire contains five subscales relating to negative beliefs about worry, positive beliefs about worry, cognitive confidence, need to control, or cognitive self-consciousness. Each subscale contains six items, with subscale scores ranging from 6 to 24. The scale has been found to demonstrate good internal and test-retest reliability, as well as good convergent validity (Huntley et al., 2022; Wells & Cartwright-Hatton, 2004). Although all items were administered, only the positive beliefs about worry subscale (MCQ-PBW) and negative beliefs about worry subscale (MCQ-NBW) were included in the analyses.

Procedure

The MacEwan University Research Ethic Board provided ethical approval for this study (File No: 102038). Prior to data collection, study procedures were pre-registered with the Open Science Framework (https://doi.org/10.17605/OSF.IO/J9G8C). Participants were recruited using the MacEwan University Department of Psychology's SONA system (https://macewan.sona-systems.com). The Department of Psychology uses SONA to post available studies, pre-screen participants, and award credit for research participation. Using their individual SONA accounts, prospective participants may search through a list of current studies and voluntarily choose which studies they wish to participate in. Prospective participants wishing to participate would be directed by SONA to the online survey platform Qualtrics. The Department of Psychology uses Qualtrics to host and administer online surveys.

Once directed to Qualtrics, prospective participants would first be presented an informed consent form containing information about the study (see Appendix A). Consenting participants were given a demographics form, followed by all previously mention questionnaires in a

randomized order (see Appendix B). Participants would then be presented a debriefing form further outlining the study and providing additional resources (see Appendix C). The study was designed to take approximately 20 minutes, and all questionnaires were completed online through Qualtrics.

Data Screening & Statistical Analyses

A series of three attention checks were embedded into the questionnaires provided to participants. These consisted of questions where participants were directed to select a specific response, e.g., "To ensure the validity of your responses, please select option 3 (Agree Moderately) for this item." A total of 14 participants failed two or more embedded attention checks, and were removed due to their data being considered unreliable. An additional 13 participants were removed due to substantially incomplete data, leaving a total of 573.

In the event a participant was found to be missing less than 20% of responses to a given scale or subscale, an average of their existing responses would be computed and used to replace the missing data points. Outlier data point corrections were made consistent with Tabachnick and Fidell (2013). In the event any data point exceeded three standard deviations outside the mean for a given scale or subscale, the data point would be considered an outlier and would be changed to be one point above/below the most extreme recorded score in the data set that was not an outlier (Tabachnick & Fidell, 2013). Skewness and kurtosis were also examined for all scales and subscales.

All statistical analyses were conducted using IBM SPSS 28 software. Zero order correlations were computed between all scales and subscales utilized for analysis. Moderation analyses was conducted using Hayes' (2018) PROCESS Model 2, with the seed set to 201407. In the first analysis the X variable (predictor variable) was set to the ASI-3 total score, and the Y

variable (outcome variable) was set to GADQ-IV total score. The W variable (first moderator) was set as MCQ-PBW scores, and the Z variable (second moderator) was set as MCQ-NBW scores (see Fig. 1). This analysis was then re-run three times, with the only modification being the substitution of ASI-3 total scores for each of the three ASI-3 subscales (i.e., ASI-3 physical, ASI-3 social, ASI-3 cognitive) as the X variable. A total of four moderation analyses were therefore run with the GADQ-IV set as the Y variable. This series of four moderation analyses were then re-run, with the only modification being PSWQ total scores being substituted as the Y variable.

Study 1 Results

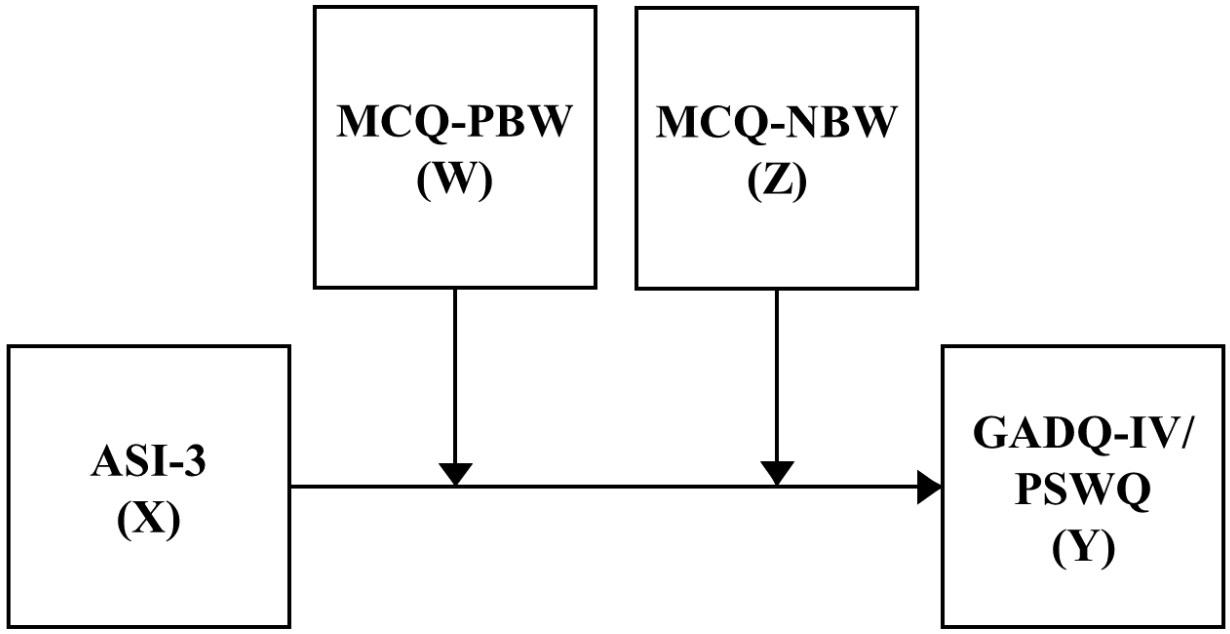
Data Screening

A total of 86 single data point additions were made. All were completed by calculating an average of existing scale/subscale data points and rounding to the nearest whole value. Five additions were made for GADQ-IV items. The PSWQ required 26 additions to be made. A total of 19 additions were made on ASI-3 items, with four being ASI-physical items, 11 ASI-social items, and four ASI-cognitive items. A total of 13 data point additions were made on MCQ-NBW items, and three on MCQ-PBW items. The highest number of items that were inserted for any single participant was three.

Only one outlying data point was found and corrected in the dataset. This was done on a single participant's PSWQ score. In analyzing skewness and kurtosis, it was found that GADQ-IV, PSWQ, ASI-physical and ASI-cognitive subscales were not normally distributed. By dividing skewness by standard error of skewness, it was found that GADQ-IV and PSWQ scores were substantially negatively skewed, while ASI-physical and ASI-cognitive scores were substantially positively skewed. Skewedness such as this is anticipated when using scales of

Figure 1.

Planned moderation analysis



Note. ASI-3 = Anxiety Sensitivity Index-3; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry; GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; PSWQ = Penn State Worry Questionnaire.

pathological symptoms and dysfunctional beliefs in large samples, with studies simulating similar data (Edgell & Noon, 1984; Hayes, 1996) showing that this skewedness does not affect the validity of statistical inferences (Hayes, 2018). All other scales were normally distributed.

Descriptive statistics consisting of mean, standard deviation, and observed range were computed along with Cronbach's alpha coefficients for all measures (see Table 1). All scales demonstrated good to excellent internal reliability, with the lowest being the GADQ-IV, $\alpha = .81$. Bivariate correlations of all measures (see Table 2) indicated moderate to strong relationships between all variables excluding MCQ-PBW. MCQ-PBW showed weak to moderate correlations with all other measures. Utilizing the recommended cut-off of 5.7 on the GADQ-IV for a likely clinical GAD diagnosis (Newman et al., 2002), a total of 79.6% of participants would screen positive for GAD. When using the recommended cut-off of 62 on the PSWQ (Behar et al., 2003), a total of 52.7% of participants indicated a likely GAD diagnosis.

Main Analyses

The first moderation analysis was conducted with ASI-3 total scores entered as the X variable, GADQ-IV entered as the Y variable, MCQ-NBW entered as the W variable, and MCQ-PBW entered as the Z variable (see Fig. 1). This model accounted for 66.9% of variance in GADQ-IV scores, F (5, 565) = 228.57, $p < .0001$. It was found that ASI-3 total scores had a significant negative interaction effect with MCQ-NBW, $t = -4.86$, $p < .0001$, and that ASI-3 total scores had a significant negative interaction effect with MCQ-PBW, $t = -3.44$, $p = .0006$. These negative moderators are graphically represented in Figure 2. For readability, many of the tables showing main effects, interactions, and conditional effects are contained in Appendix D. Overall interpretations and key findings will be highlighted. For the main effects and interaction effects of this first moderation analysis see Table D1 in Appendix D. For conditional effects see table

Table 1.

Psychometric properties of measures in Study 1

	Mean	*SD*	Observed Range	Cronbach's Alpha
GADQ-IV	8.35	3.16	0-13	.81
PSWQ	60.10	13.36	20-80	.93
ASI-3	25.28	17.19	0-70	.94
ASI-physical	6.72	6.27	0-24	.89
ASI-social	11.20	6.61	0-24	.87
ASI-cognitive	7.34	6.62	0-24	.92
MCQ-NBW	15.30	5.07	6-24	.89
MCQ-PBW	12.66	4.53	6-24	.88

Note. Observed Range = Range of Participants' Scores; GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; PSWQ = Penn State Worry Questionnaire; ASI-3 = Anxiety Sensitivity Index-3; ASI-physical = Anxiety Sensitivity Index Physical; ASI-social = Anxiety Sensitivity Index Social; ASI-cognitive = Anxiety Sensitivity Index cognitive; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table 2.

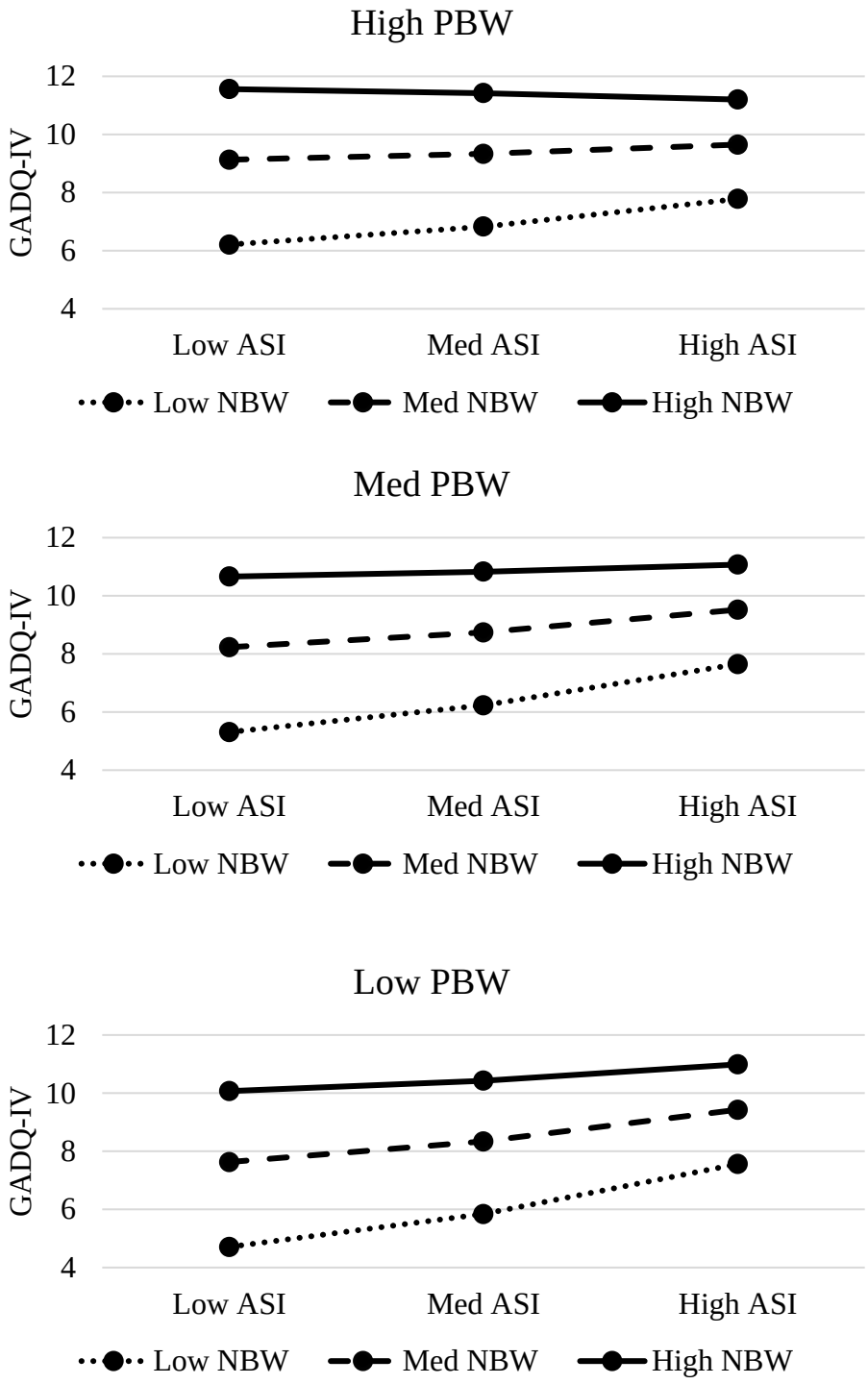
Bivariate correlations of measures in Study 1

	1	2	3	4	5	6	7	8
1. GADQ-IV	-	.83**	.51**	.46**	.40**	.50**	.79**	.34**
2. PSWQ		-	.53**	.47**	.45**	.49**	.80**	.36**
3. ASI-3			-	.88**	.87**	.90**	.53**	.23**
4. ASI-physical				-	.62**	.72**	.47**	.19**
5. ASI-social					-	.66**	.39**	.19**
6. ASI-cognitive						-	.54**	.23**
7. MCQ-NBW							-	.27**
8. MCQ-PBW								-

Note. GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; PSWQ = Penn State Worry Questionnaire; ASI-3 = Anxiety Sensitivity Index-3; ASI-physical = Anxiety Sensitivity Index Physical; ASI-social = Anxiety Sensitivity Index Social; ASI-cognitive = Anxiety Sensitivity Index cognitive; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry. ** indicates 2-tailed sig. <.01.

Figure 2.

Moderation analyses using ASI-3 total scores, with GADQ-IV scores as the dependent variable



D2.

The pick-a-point approach was used to examine the “relatively low”, “moderate”, and “relatively high” (16th, 50th, and 84th percentiles of the distribution) values of MCQ-NBW and MCQ-PBW to determine when there were conditional effects of ASI-3 total scores on GADQ-IV scores. The values for MCQ-NBW were 10.0, 16.0, and 21.0. The values for MCQ-PBW were 8.0, 12.0, and 18.0. These values were the same across all subsequent analyses. It was found that ASI-3 total scores had a significantly stronger effect on GADQ-IV scores when MCQ-NBW and MCQ-PBW scores were both relatively low, were both moderate, and when one was low while the other was high. When MCQ-NBW or MCQ-PBW scores were both high, or when one was high and the other was moderate, ASI-3 total scores did not have an enhanced effect on GADQ-IV scores.

The second moderation analysis was conducted with ASI-physical scores entered as the X variable, GADQ-IV entered as the Y variable, MCQ-NBW entered as the W variable, and MCQ-PBW entered as the Z variable. This model accounted for 66.1% of variance in GADQ-IV scores, F (5, 566) = 220.87, $p < .0001$. It was found that ASI-physical had a significant negative interaction effect with MCQ-NBW, $t = -4.02$, $p < .0001$, and that ASI-physical had a significant negative interaction effect with MCQ-PBW, $t = -2.92$, $p = .0036$. These results effectively mirrored the results found in the first analysis, and through this similarity are effectively represented in Figure 2. For main effects and interaction see Table D3, and for conditional effects see table D4. The pick-a-point approach found that ASI-physical scores had a significantly stronger effect on GADQ-IV scores when MCQ-NBW and MCQ-PBW scores were both relatively low, were both moderate, and when one was low while the other was high. When

MCQ-NBW or MCQ-PBW scores were both high, or when one was high and the other was moderate, ASI-physical scores did not have an enhanced effect on GADQ-IV scores.

The third moderation analysis was conducted with ASI-social scores entered as the X variable, GADQ-IV entered as the Y variable, MCQ-NBW entered as the W variable, and MCQ-PBW entered as the Z variable. This model accounted for 65.8% of variance in GADQ-IV scores, F (5, 567) = 218.32, $p < .0001$. It was found that ASI-social had a significant negative interaction effect with MCQ-NBW, $t = -3.97$, $p < .0001$, and that ASI-social had a significant negative interaction effect with MCQ-PBW, $t = -2.57$, $p = .0104$. These results also mirrored those found in the first analysis, and through this similarity are effectively represented in Figure 2. For main effects and interaction see Table D5, and for conditional effects see table D6. The pick-a-point approach found that ASI-social scores had a significantly stronger effect on GADQ-IV scores when MCQ-NBW and MCQ-PBW scores were both relatively low, were both moderate, and when MCQ-NBW was low and MCQ-PBW was high. When MCQ-NBW was high, or when MCQ-PBW was high and MCQ-NBW was moderate, ASI-social scores did not have an enhanced effect on GADQ-IV scores.

The fourth moderation analysis was conducted with ASI-cognitive scores entered as the X variable, GADQ-IV entered as the Y variable, MCQ-NBW entered as the W variable, and MCQ-PBW entered as the Z variable. This model accounted for 66.6% of variance in GADQ-IV scores, F (5, 566) = 225.32, $p < .0001$. It was found that ASI-cognitive had a significant negative interaction effect with MCQ-NBW, $t = -4.57$, $p < .0001$, and that ASI-cognitive had a significant negative interaction effect with MCQ-PBW, $t = -3.54$, $p = .0004$. Again, these results mirrored those found in the first analysis, and through this similarity are effectively represented in Figure 2. For main effects and interaction see Table D7, and for conditional effects see table D8. The

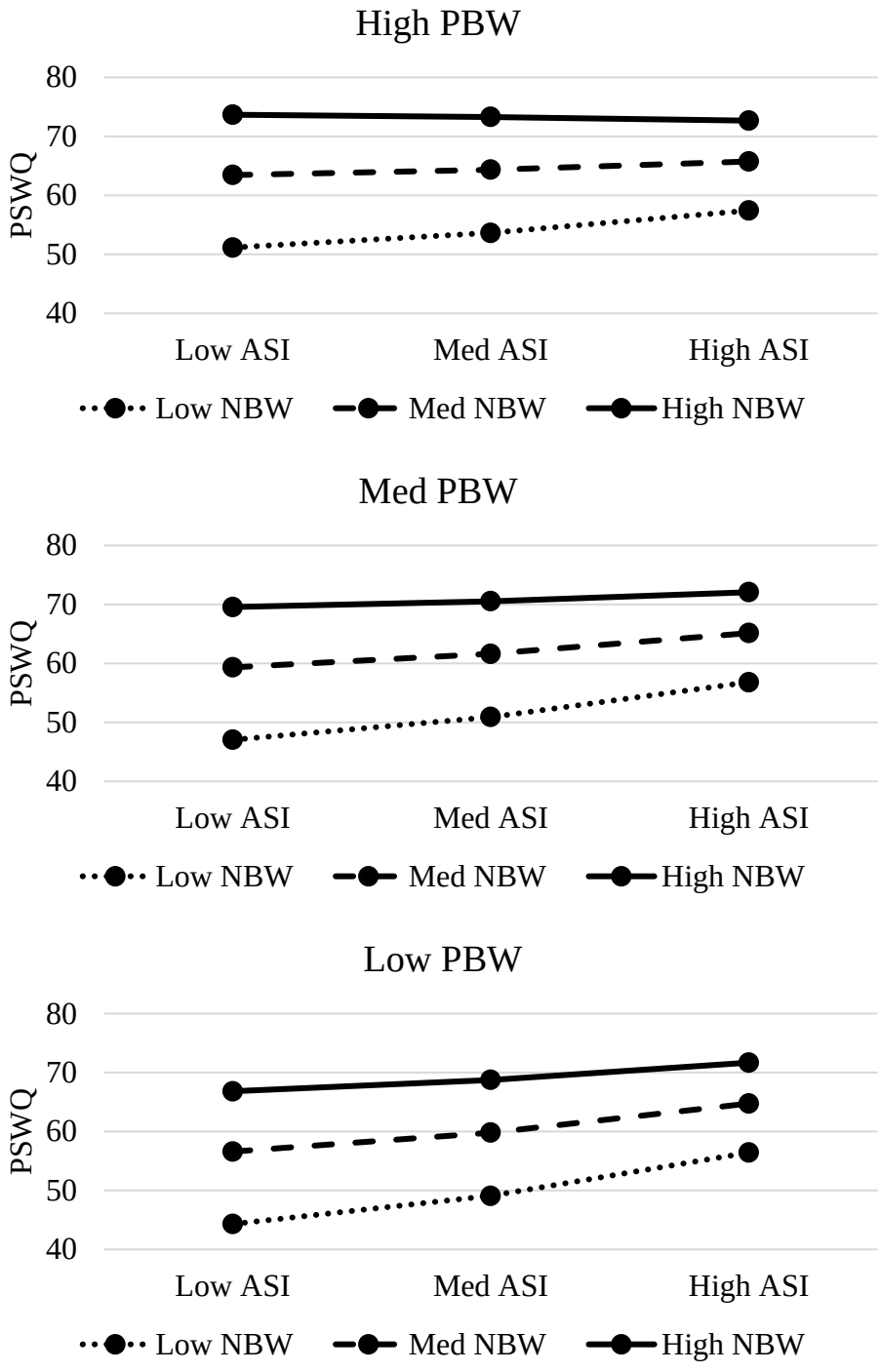
pick-a-point approach found that ASI-cognitive scores had a significantly stronger effect on GADQ-IV scores when MCQ-NBW and MCQ-PBW scores were both relatively low, were both moderate, and when one was low while the other was high. When MCQ-NBW and MCQ-PBW scores were both high, or when one was high and the other was moderate, ASI-cognitive scores did not have an enhanced effect on GADQ-IV scores.

The fifth moderation analysis was conducted with ASI-3 total scores entered as the X variable, PSWQ entered as the Y variable, MCQ-NBW entered as the W variable, and MCQ-PBW entered as the Z variable. This model accounted for 70.1% of variance in PSWQ scores, F (5, 565) = 265.10, $p < .0001$. It was found that ASI-3 total scores had a significant negative interaction effect with MCQ-NBW, $t = -4.55$, $p < .0001$, and that ASI-3 total scores had a significant negative interaction effect with MCQ-PBW, $t = -3.90$, $p = .0001$. These negative moderators are graphically represented in Figure 3, although these results were also markedly similar to those found in the first analysis when GADQ-IV scores served as the dependent variable. For main effects and interaction see Table D9, and for conditional effects see table D10. The pick-a-point approach found that ASI-3 total scores had a significantly stronger effect on PSWQ scores when MCQ-NBW and MCQ-PBW scores were both relatively low, were both moderate, when one was low while the other was high, and when one was moderate and the other was high. When MCQ-NBW and MCQ-PBW scores were both high, ASI-3 total scores did not have an enhanced effect on PSWQ scores.

The sixth moderation analysis was conducted with ASI-physical scores entered as the X variable, PSWQ entered as the Y variable, MCQ-NBW entered as the W variable, MCQ-PBW entered as the Z variable. This model accounted for 70.0% of variance in PSWQ scores, F (5, 566) = 264.70, $p < .0001$. It was found that ASI-physical had a significant negative interaction

Figure 3.

Moderation analyses using ASI-3 total scores, with PSWQ scores as the dependent variable



effect with MCQ-NBW, t = -4.43, p < .0001, and that ASI-physical had a significant negative interaction effect with MCQ-PBW, t = -4.22, p < .0001. These results mirrored those found in the moderation using ASI-3 total scores, and through this similarity are effectively represented in Figure 3. For main effects and interaction see Table D11, and for conditional effects see table D12. The pick-a-point approach found that ASI-physical scores had a significantly stronger effect on PSWQ scores when MCQ-NBW and MCQ-PBW scores were both relatively low, were both moderate, when one was low while the other was high, and when MCQ-NBW was high and MCQ-PBW was moderate. When MCQ-NBW and MCQ-PBW scores were both high, or when MCQ-NBW was moderate and MCQ-PBW was high, ASI-physical scores did not have an enhanced effect on PSWQ scores.

The seventh moderation analysis was conducted with ASI-social scores entered as the X variable, PSWQ entered as the Y variable, MCQ-NBW entered as the W variable, and MCQ-PBW entered as the Z variable. This model accounted for 69.5% of variance in PSWQ scores, F (5, 567) = 258.45, $p < .0001$. It was found that ASI-social had a significant negative interaction effect with MCQ-NBW, $t = -3.75$, $p = .0002$, and that ASI-social had a significant negative interaction effect with MCQ-PBW, $t = -2.57$, $p = .0105$. These results also mirrored those found previously, and through this similarity are effectively represented in Figure 3. For main effects and interaction see Table D13, and for conditional effects see table D14. The pick-a-point approach found that ASI-social scores had a significantly stronger effect on PSWQ scores when MCQ-NBW and MCQ-PBW scores were both relatively low, were both moderate, when one was low while the other was high, and when MCQ-NBW was moderate and MCQ-PBW was high. When MCQ-NBW was high and MCQ-PBW was moderate, or when both were high, ASI-social scores did not have an enhanced effect on PSWQ scores.

The eighth moderation analysis was conducted with ASI-cognitive scores entered as the X variable, PSWQ entered as the Y variable, MCQ-NBW entered as the W variable, MCQ-PBW entered as the Z variable. This model accounted for 68.3% of variance in PSWQ scores, F (5, 566) = 243.43, $p < .0001$. It was found that ASI-cognitive had a significant negative interaction effect with MCQ-NBW, $t = -3.08$, $p = .0022$, and that ASI-cognitive had a significant negative interaction effect with MCQ-PBW, $t = -3.47$, $p = .0006$. Once again, these results mirrored those found previously, and through this similarity are effectively represented in Figure 3. For main effects and interaction see Table D15, and for conditional effects see table D16. The pick-a-point approach found that ASI-cognitive scores had a significantly stronger effect on PSWQ scores when MCQ-NBW and MCQ-PBW scores were both relatively low, were both moderate, and when MCQ-NBW was high while MCQ-PBW was low. When MCQ-NBW was high and MCQ-PBW was moderate, or when MCQ-PBW was high, ASI-cognitive scores did not have an enhanced effect on PSWQ scores.

Study 1 Discussion

Overall, the results of Study 1 indicate that positive and negative beliefs about worry had a consistent negative moderating effect on the relationship AS has with worry severity and with GAD symptoms. When positive or negative beliefs were higher, the relationship between AS and GAD symptoms and worry severity tended to decrease in strength. This is counter to the findings of Gorday and Bardeen (2022), who found that positive and negative beliefs positively moderated the relationship between AS and anxiety. In other words, Gorday and Bardeen (2022) found that when people were higher in positive or negative beliefs about worry, the relationship between AS and anxiety became stronger. One possible reason for the difference between our results and theirs is the dependent measures given to participants. While we utilized the GADQ-

IV and PSWQ, Gorday and Bardeen (2022) utilized the anxiety subscale of the Depression Anxiety Stress Scales (Lovibond & Lovibond, 1995). While our anxiety measures were specifically targeted at the symptoms of GAD and chronic worry, the anxiety subscale of the Depression Anxiety Stress Scales is not targeted at one specific disorder. Another possible reason for the difference was the way in which the moderation analysis was run. While we modeled positive and negative beliefs about worry as simultaneous moderators, Gorday and Bardeen (2022) ran two separate moderation analyses: one for positive beliefs about worry, and another for negative beliefs about worry. Yet, it is unlikely that this difference in statistical modeling accounted for the different moderation effects.

Instead, we suspect that the main factor for the differing results between the present study and Gorday and Bardeen (2022) came from the high scores our sample reported on the worry severity and GAD symptom measures. Rather than the relationships between AS and worry severity and GAD becoming weaker as positive and negative beliefs increased, it is possible that the high scores observed on our worry severity and GAD symptom measures created a ceiling effect. This resulted from a larger than expected proportion of participants scoring near the top of the worry severity and GAD measures, and not allowing for a wide enough range of scores to draw conclusions from. In contrast to the elevated worry severity and GAD measures scores of the present study, the mean anxiety score found by Gorday and Bardeen (2022) on the anxiety subscale of the Depression Anxiety Stress Scales was slightly below a typical mean (Lovibond & Lovibond, 1995). This would have decreased the likelihood that Gorday and Bardeen (2022) would have encountered a ceiling effect like the one that may have been present in he current study.

This difference could have resulted in an inability in the present study to detect a relationship in individuals with higher GAD and chronic worry scores, rather than a weaker relationship existing between AS and GAD/chronic worry in these individuals. Had this ceiling effect not occurred, it is possible that we may have detected no moderation effect whatsoever, or detected a positive moderation effect like that found by Gorday and Bardeen (2022).

Study 2

In the second study, a wider sample drawn from the general population of Canada was utilized with the aim of minimizing the likelihood of the high worry severity and GAD symptoms scores that may have caused the possible ceiling effect seen in Study 1. In addition to investigating the possible moderating effect of positive and negative beliefs about worry on the relationships AS has with worry severity and GAD, an analysis of the possible moderating effect of positive and negative beliefs about worry on the relationships neuroticism and IU have with worry severity and GAD was also conducted. As a secondary aim, an analysis of the possible mediating role of AS and IU in the relationships between neuroticism and worry severity and GAD was conducted.

Participants

To determine the minimum necessary sample size, a priori power analyses to were conducted using G*Power 3.1.9.7 software (Faul et al., 2009). A linear multiple regression: fixed model, R^2 increase test was conducted, with a small effect size of $f^2 = 0.02$, an alpha error probability of 0.05, and a 1-beta error probability of 0.80. This again provided a minimum sample size of 485 to attain an actual power of 0.8002080. To account for incomplete data, it was again planned to recruit an additional 115 participants, yielding a target of 600 participants.

Participants consisted of Canadians aged 18 to 65, that were recruited by the online survey company Qualtrics. In order to ensure a sufficiently diverse population, a sample of not more than approximately 50% female, and not more than 50% Caucasian was targeted, with Qualtrics being responsible for all advertising and recruitment to gain this sample. A total of 832 individual entries were initially recorded prior to Qualtrics screening the data for invalid responses. After screening, Qualtrics determined that 627 verified participants entered the study before recruitment was discontinued. After removing participants that failed embedded attention checks, the final sample was 624. Approximately half of participants identified their sex assigned at birth as female (51.1%), and half identified sex assigned at birth as male (48.7%). Approximately half of participants identified as a Woman (50.3%), and half as a Man (48.6%), with Non-Binary (0.8%) being the next largest group. Ages ranged from 18 to 65, with a mean of 43.20 years. Roughly half identified as Caucasian/White (52.9%), with East Asian (10.7%) and Southeast Asian (8.7%) being the next largest groups. Participants were most likely to be currently Married/Common law (49.5%), speak English as their first language (74.4%), be employed full-time (56.7%), and have completed an undergraduate degree/college diploma (44.4%). Ontario (40.2%) was the most common place of birth, with outside of Canada (13.8%) and Quebec (11.5%) being the next most common. Ontario (45.4%) was also the most common place of current residence, with Alberta (15.1%) and Quebec (11.7%) being the next most common. Roughly one third (32.7%) self-reported being diagnosed with at least one mental health disorder.

Measures

All measures utilized in Study 1 were also included in Study 2. Given the considerable overlap in measures used in both Study 1 and in Study 2, duplicate descriptions are not listed for Study 2. All additional measures or modifications to measures are listed below.

Demographic Characteristics Questionnaire

Participants first completed a demographics questionnaire that was similar but modified from that of Study 1. This consisted of questions on sex assigned at birth, gender, age, ethnicity, marital status, first language, employment status, highest level of education, province/territory of birth, province/territory of current residence, and mental health diagnoses.

Generalized Anxiety Disorder Questionnaire-IV (GADQ-IV)

The GADQ-IV (Newman et al., 2002) was unchanged from Study 1. Please refer to the methods section of Study 1 for details and psychometric properties.

Penn State Worry Questionnaire (PSWQ)

The PSWQ (Meyer et al., 1990) was unchanged from Study 1. Please refer to the methods section of Study 1 for details and psychometric properties.

Anxiety Sensitivity Index-3 (ASI-3)

The ASI-3 (Taylor et al., 2007) was unchanged from Study 1. Please refer to the methods section of Study 1 for details and psychometric properties.

Metacognitions Questionnaire-30 (MCQ-30)

The MCQ-30 (Wells & Cartwright-Hatton, 2004) was unchanged from Study 1. Please refer to the methods section of Study 1 for details and psychometric properties.

Intolerance of Uncertainty Scale-18 (IUS-18)

The IUS-18 (Hong & Lee, 2015) was used to assess intolerance of uncertainty. This 18-item scale uses a 5-point Likert-type scale that ranges from one (not at all characteristic of me) to

five (entirely characteristic of me). Total scores range from 18 to 90, with higher scores indicating greater levels of intolerance of uncertainty. The IUS-18 contains two subscales, relating to the prospective (IUS-P) and inhibitory (IUS-I) subfactors of intolerance of uncertainty. Each subscale consists of nine items, and ranges in score from 9 to 45. The IUS-18 has been found to possess high construct, discriminant, and convergent validity (Hong & Lee, 2015).

Big Five Inventory-2 (BFI-2)

Neuroticism and extraversion were measured using the BFI-2 (Soto & John, 2017). The full version of this inventory contains 60 items, rated on a five-point Likert-type scale that ranges from one (strongly disagree) to five (strongly agree). The full scale consists of five subscales relating to the personality domains of negative emotionality (i.e., neuroticism; BFI-N), extraversion, agreeableness, conscientiousness, and open-mindedness. Each domain subscale contains 12 items with scores ranging from 5 to 60, with the subscales demonstrating good convergent and construct validity (Soto & John, 2017). In the interest of removing unnecessary questions for participants, only the 24 items pertaining to negative emotionality and extraversion were administered to participants, alternating between items of each subscale.

Procedure

The MacEwan University Research Ethic Board provided ethical approval for this study (File No: 102186). Prior to data collection, study procedures were pre-registered with the Open Science Framework (https://doi.org/10.17605/OSF.IO/HBDM4). Participants were recruited using the online survey service Qualtrics' participant recruitment service (https://www.qualtrics.com). To use their participant recruitment service, which included initial data screening, an amount of $6167.70 CAD was paid to Qualtrics to recruit and compensate

participants. All recruitment and compensation were administered by Qualtrics. Prospective participants recruited by Qualtrics were directed to the online survey hosted on Qualtrics.

Like Study 1, prospective participants were first presented an informed consent form containing information about the study (see Appendix E). Consenting participants were given a demographics form, followed by all previously mentioned questionnaires in a randomized order (see Appendix F). Participants were then presented a debriefing form further outlining the study and providing additional resources (see Appendix G). The study was designed to take approximately 25 minutes, and all questionnaires were completed online through Qualtrics.

Data Screening & Statistical Analyses

Prior to receiving the data, Qualtrics pre-screened all data for signs of erroneous responding (e.g., the entire study being completed in under one minute). A total of 205 participants were removed during Qualtrics' pre-screening of the data. Three attention checks were again embedded into the questionnaires provided to participants. These were identical to those utilized in Study 1. A total of 3 participants failed two or more embedded attention checks, and were removed due to their data being considered unreliable. No participants were removed due to substantially incomplete data, leaving a total of 624 participants.

As done in Study 1, in the event a participant was found to be missing less than 20% of responses to a given scale or subscale, an average of their existing responses would be computed and used to replace the missing data points. Outlier data point corrections were made consistent with the recommendations of Tabachnick and Fidell (2013). Skewness and kurtosis were also examined for all scales and subscales.

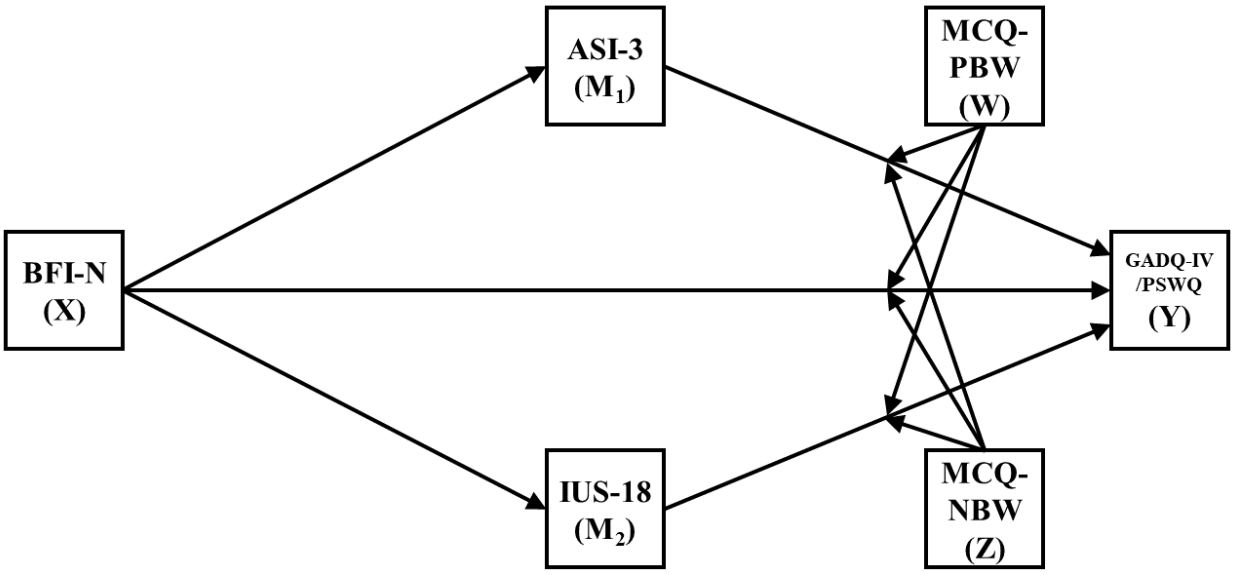
All statistical analyses were conducted using IBM SPSS 28 software. Zero order correlations were computed between all scales and subscales utilized for analysis. Analyses were conducted using Hayes' (2018) PROCESS, with all seeds set to 201407.

The first analysis utilized a moderated mediation with Hayes (2018) Model 17. The X variable (predictor variable) was set to the BFI-N, the M_1 variable (first mediator variable) was set to ASI-3 total score, the M_2 variable (second mediator) was set to IUS-18 total score, and the Y variable (outcome variable) was set to GADQ-IV total score. The W variable (first moderator) was set as MCQ-PBW scores, and the Z variable (second moderator) was set as MCQ-NBW scores (see Fig. 4). If any pathway was not found to be moderated, the model would be re-run as described, with the moderation effect removed from pathways where it had not been significant. In other words, the model would be re-run, with only the significant moderation effects retained, but all the mediation pathways retained. In the event no pathways were found to be moderated, the model would be re-run as described, but only investigating mediational effects, without any moderating effects.

The second analysis was identical, with the only modification being the substitution of the mediating M_n variables. In this analysis, the subscale scores for the ASI-3 and the IUS-18 were examined, rather than their respective total scores. The X variable (predictor variable) was set to BFI-N, M_1 was set as ASI-physical, M_2 was set as ASI-cognitive, M_3 was set as ASI-social, M_4 was set as IUS-prospective, M_5 was set as IUS-inhibitory, and the Y variable (outcome variable) was set to GADQ-IV total score. The W variable (first moderator) was set as MCQ-PBW scores, and the Z variable (second moderator) was set as MCQ-NBW scores (see Fig. 5). Again, if any pathway was not found to be moderated, the model would be re-run as

Figure 4.

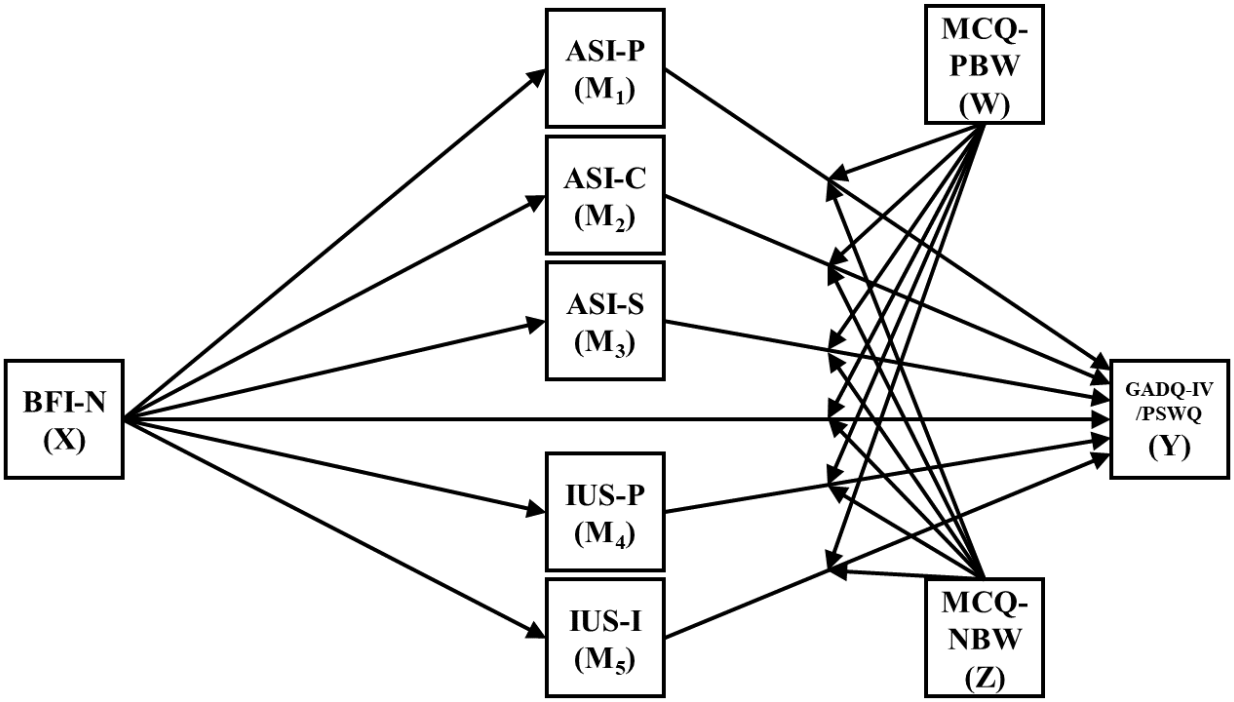
Planned moderated mediational analysis using ASI-3 and IUS-18 total scores



Note. ASI-3 = Anxiety Sensitivity Index-3; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry; GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; PSWQ = Penn State Worry Questionnaire; IUS-18 = Intolerance of Uncertainty Scale-18; BFI-N = Big Five Inventory-2 Negative Emotionality.

Figure 5.

Planned moderated mediational analysis using ASI-3 and IUS-18 subscale scores



Note. ASI-P = Anxiety Sensitivity Index Physical; ASI-S = Anxiety Sensitivity Index Social; ASI-C = Anxiety Sensitivity Index Cognitive; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry; GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; PSWQ = Penn State Worry Questionnaire; IUS-P = Intolerance of Uncertainty Scale Prospective; IUS-I = Intolerance of Uncertainty Scale Inhibitory; BFI-N = Big Five Inventory-2 Negative Emotionality.

described, with the moderation effect removed from pathways where it had not been significant. In other words, the model would be re-run, with only the significant moderation effects retained, but all the mediation pathways retained. In the event no pathways were found to be moderated, the model would be re-run as described, but only investigating mediational effects, without any moderating effects.

The third analysis was identical to the first analysis, with the only modification being PSWQ scores were utilized as the outcome variable instead of GADQ-IV (see Fig. 4). The fourth analysis was identical to the second analysis, with the only modification again being PSWQ scores were utilized as the outcome variable instead of GADQ-IV (see Fig. 5). Again, for both analyses, simplified pathway models were re-run to eliminate non-significant moderations.

In total, two moderated mediation analyses were run with the GADQ-IV set as the Y variable. Similarly, a total of two of these analyses were run with PSWQ total scores entered as the Y variable.

The index of moderated mediation was used to determine whether positive beliefs about worry scores or negative beliefs about worry scores moderate the indirect effects. If the 95% bootstrap confidence intervals of the index of moderated mediation does not include zero, then that pathway would be considered moderated. Similarly, we examined whether the appropriate 95% bootstrap confidence intervals include zero to determine which indirect pathways were statistically meaningful.

To test if the direct effect is moderated, we used the standard $p < .05$ criteria for determining whether the interaction products are significant. The standard $p < .05$ criteria was also used to determine whether any of the conditional direct effects are significant.

Study 2 Results

Data Screening

A total of 9 single data point additions were made. All were completed in the same manor as Study 1, by calculating an average of existing scale/subscale data points and rounding to the nearest whole value. Two additions were made for GADQ-IV items. Two additions were made on ASI-3 items, with one being an ASI-social item, and one being an ASI-cognitive item. One data point addition was made on an MCQ-PBW item, and one on an MCQ-NBW item. The highest number of items that were inserted for any single participant was two.

No outlying data points were found on any measures used in this study and no outlier corrections were made. In analyzing skewness and kurtosis, it was found that MCQ-PBW, ASI-physical, and ASI-cognitive subscales were not normally distributed. By dividing skewness by standard error of skewness, it was found that all three were substantially positively skewed. As with Study 1, this skewedness is anticipated given the sample size and use of scales measuring pathological symptoms and dysfunctional beliefs, and no negative affects on statistical validity is expected (Edgell & Noon, 1984; Hayes, 1996; Hayes, 2018). All other scales were normally distributed.

Descriptive statistics consisting of mean, standard deviation, observed range were computed along with Cronbach's alpha coefficients for all measures (see Table 3). All scales demonstrated good to excellent internal reliability, with the lowest being the GADQ-IV, $\alpha = .85$. Bivariate correlations of all measures (see Table 4) indicated moderate to strong relationships between all variables excluding MCQ-PBW. MCQ-PBW showed weak to moderate correlations with all other measures. Utilizing the recommended cut-off of 5.7 on the GADQ-IV for a likely clinical GAD diagnosis (Newman et al., 2002), a total of 44.9% of participants would screen positive for GAD. When using the recommended cut-off of 62 on the PSWQ (Behar et al., 2003),

Table 3.

Psychometric properties of measures in Study 2

	Mean	*SD*	Observed Range	Cronbach's Alpha
GADQ-IV	5.44	3.83	0-13	.85
PSWQ	48.89	15.73	16-80	.95
ASI-3	24.78	18.25	0-72	.96
ASI-physical	7.80	6.67	0-24	.91
ASI-social	10.04	6.41	0-24	.87
ASI-cognitive	6.92	6.78	0-24	.93
MCQ-NBW	12.96	5.22	6-24	.90
MCQ-PBW	10.95	4.38	6-24	.90
IUS-18	50.12	17.62	18-90	.96
IUS-prospective	27.07	8.91	9-45	.92
IUS-inhibitory	23.05	9.58	9-45	.94
BFI-N	35.30	11.48	12-60	.93

Note. Observed Range = Range of Participants' Scores; GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; PSWQ = Penn State Worry Questionnaire; ASI-3 = Anxiety Sensitivity Index-3; ASI-physical = Anxiety Sensitivity Index Physical; ASI-social = Anxiety Sensitivity Index Social; ASI-cognitive = Anxiety Sensitivity Index Cognitive; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry; IUS-18 = Intolerance of Uncertainty Scale-18; IUS-prospective = Intolerance of Uncertainty Scale Prospective; IUS-Inhibitory = Intolerance of Uncertainty Scale Inhibitory; BFI-N = Big Five Inventory-2 Negative Emotionality.

Table 4.

Bivariate correlations of measures in Study 2

	1	2	3	4	5	6	7	8	9	10	11	12
1. GADQ-IV	-	.85**	.74**	.63**	.70**	.72**	.79**	.44**	.78**	.72**	.76**	.81**
2. PSWQ		-	.73**	.62**	.69**	.70**	.81**	.52**	.81**	.75**	.79**	.83**
3. ASI-3			-	.93**	.90**	.93**	.75**	.49**	.76**	.68**	.76**	.66**
4. ASI-physical				-	.74**	.80**	.66**	.41**	.65**	.59**	.64**	.55**
5. ASI-social					-	.75**	.67**	.48**	.73**	.66**	.72**	.63**
6. ASI-cognitive						-	.74**	.45**	.71**	.61**	.74**	.63**
7. MCQ-NBW							-	.47**	.77**	.69**	.76**	.72**
8. MCQ-PBW								-	.52**	.50**	.50**	.39**
9. IUS-18									-	.95**	.96**	.77**
10. IUS-Prospective										-	.82**	.69**
11. IUS-Inhibitory											-	.77**
12. BFI-N												-

Note. GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; PSWQ = Penn State Worry Questionnaire; ASI-3 = Anxiety Sensitivity Index-3; ASI-physical = Anxiety Sensitivity Index Physical; ASI-social = Anxiety Sensitivity Index Social; ASI-cognitive = Anxiety Sensitivity Index Cognitive; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry; IUS-18 = Intolerance of Uncertainty Scale-18; IUS-prospective = Intolerance of Uncertainty Scale Prospective; IUS-Inhibitory = Intolerance of Uncertainty Scale Inhibitory; BFI-N = Big Five Inventory-2 Negative Emotionality. ** indicates 2-tailed sig. <.01.

a total of 25.0% of participants indicated a likely GAD diagnosis.

Main Analyses

The first moderated mediation analysis was conducted with Hayes' (2018) Model 17, with BFI-N entered as the X variable. ASI-3 total scores were entered as the M_1 variable, IUS-18 total scores were entered as the M_2 variable, and GADQ-IV scores were entered as the Y variable. MCQ-PBW scores were entered as the W variable, and MCQ-NBW scores were entered as the Z variable. This model accounted for 77.0% of variance in GADQ-IV scores, F (11, 610) = 185.48, $p < .0001$.

It was found that the direct effect of BFI-N on GADQ-IV was not moderated by MCQ-PBW, t = -0.18, p = .86, and was not moderated by MCQ-NBW, t = 0.70, p = .48. The indirect pathway from BFI-N to GADQ-IV, through ASI-3, was not moderated by MCQ-PBW, as the index of partial moderated mediation was -.0005, with a 95% bootstrapped confidence interval (CI) that crosses 0 of -.0036 to .0023. This pathway was also not moderated by MCQ-NBW, index = -.0013 (95% CI -.0042, .0014). It was also found that the indirect pathway from BFI-N to GADQ-IV, through IUS-18 was not moderated by MCQ-PBW, index = -.0004 (95% CI -.0050, .0046). This pathway was also not moderated by MCQ-NBW, index = .0002 (95% CI -.0040, .0044). In sum, the direct and indirect pathways were not moderated by MCQ-PBW or MCQ-NBW.

Next, a purely mediational analysis was run to examine the mediational pathways without controlling for the effects of the non-significant moderations. This was done utilizing Hayes' (2018) Model 4. BFI-N was entered as the X variable, ASI-3 total scores were entered as the M_1 variable, IUS-18 total scores were entered as the M_2 variable, and GADQ-IV scores were entered as the Y variable. This model accounted for 74.7% of variance in GADQ-IV scores, F (3,

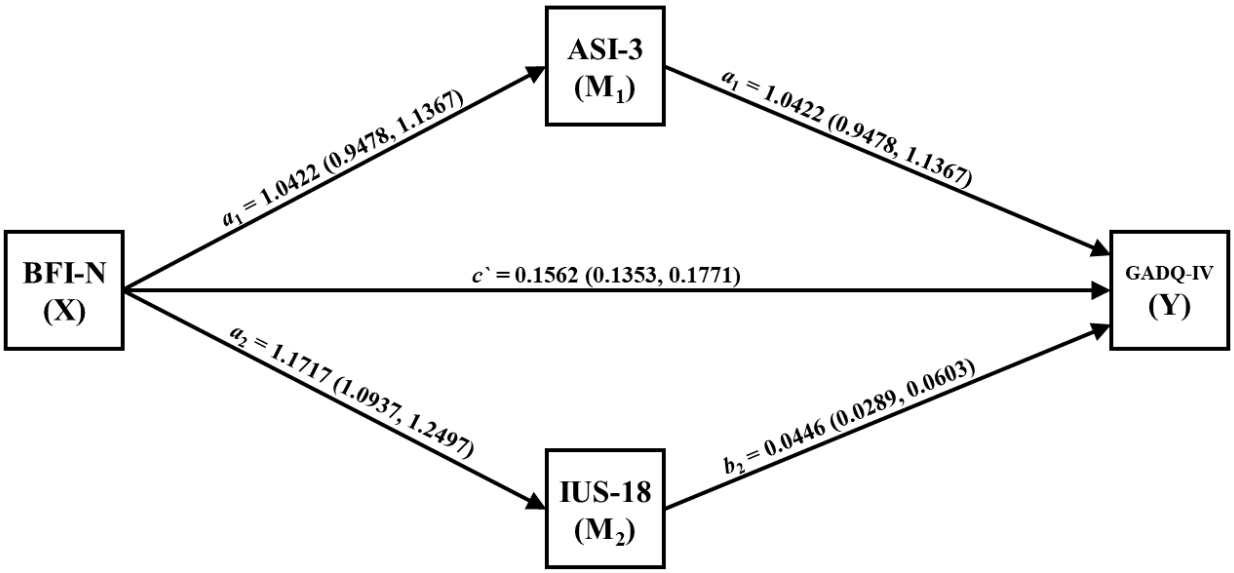
618) = 608.17, $p < .0001$. It was found that the direct effect of BFI-N on GADQ-IV was significant, $t = 14.70$, $p < .0001$. BFI-N had an indirect effect on GADQ-IV through ASI-3 total scores as the indirect effect coefficient was .0611 (95% CI .0464 to .0758). BFI-N also had an indirect effect on GADQ-IV through IUS-18 total scores, coefficient = .0522 (95% CI .0321, .0727). In sum, BFI-N scores had a direct effect on GADQ-IV scores, as well as an indirect effect on GADQ-IV scores through both ASI-3 total scores and IUS-18 total scores (see Fig. 6).

The second moderated mediation analysis was conducted with Hayes' (2018) Model 17. BFI-N was entered as the X variable, ASI-physical scores were entered as the M_1 variable, ASI-cognitive scores were entered as the M_2 variable, ASI-social scores were entered as the M_3 variable, IUS-prospective scores were entered as the M_4 variable, IUS-Inhibitory scores were entered as the M_5 variable, and GADQ-IV scores were entered as the Y variable. MCQ-PBW entered as the W variable, and MCQ-NBW entered as the Z variable (see Fig. 5). This model accounted for 78.0% of variance in GADQ-IV scores, F (20, 601) = 106.00, $p < .0001$.

It was found that the direct effect of BFI-N on GADQ-IV was not moderated by MCQ-PBW, $t = -0.09$, $p = .93$, and was not moderated by MCQ-NBW, $t = 0.92$, $p = .36$. The indirect pathways from BFI-N to GADQ-IV through ASI-physical was not moderated by MCQ-PBW, as the index of partial moderated mediation was -.0011, with a 95% bootstrapped CI -.0045 to .0017), or moderated by MCQ-NBW, index = .0007 (95% CI -.0021, .0032). The indirect pathways from BFI-N to GADQ-IV through ASI-cognitive was not moderated by MCQ-PBW, index = -.0012 (95% CI -.0048, .0030), or moderated by MCQ-NBW, index = -.0024, (95% CI -.0058, .0013). The indirect pathways from BFI-N to GADQ-IV through ASI-social was not moderated by MCQ-PBW, index = .0024, (95% CI -.0015, .0057), or moderated by MCQ-NBW, index = -.0007 (95% CI -.0039, .0026). The indirect pathway from BFI-N to GADQ-IV through

Figure 6.

Final pathways from BFI-N to GADQ-IV with ASI-3 and IUS-18 total scores



Indirect effect of ASI-3 (a_1b_1) = 0.0611 (0.0464, 0.0758)
Indirect effect of IUS-18 (a_2b_2) = 0.0522 (0.0321, 0.0727)

Note. ASI-3 = Anxiety Sensitivity Index-3; GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; IUS-18 = Intolerance of Uncertainty Scale-18; BFI-N = Big Five Inventory-2 Negative Emotionality; Numbers inside brackets indicate the 95% confidence interval.

IUS-prospective was not moderated by MCQ-PBW, index = -.0011 (95% CI -.0048, .0028). However, the indirect pathway from BFI-N to GADQ-IV through IUS-prospective, was moderated by MCQ-NBW, index = .0032 (95% CI .0001, .0065). The indirect pathways from BFI-N to GADQ-IV through IUS-inhibitory, was not moderated by MCQ-PBW, index = .0000 (95% CI -.0050, .0059), or moderated by MCQ-NBW, index = -.0026 (95% CI -.0078, .0019). In sum, the indirect pathway from BFI-N to GADQ-IV through IUS-prospective being moderated by MCQ-NBW, was the only significantly moderated pathway found in this model.

Based on the existence of a single moderating effect of MCQ-NBW on the pathway from BFI-N to IUS-prospective to GADQ-IV, a modified moderated mediational analysis was run using a customized version of Hayes' (2019) Model 14 to investigate this moderation effect in isolation. In this model, BFI-N was entered as the X variable, ASI-physical scores were entered as the M_1 variable, ASI-cognitive scores were entered as the M_2 variable, ASI-social scores were entered as the M_3 variable, IUS-prospective scores were entered as the M_4 variable, and IUS-Inhibitory scores were entered as the M_5 variable. GADQ-IV scores were entered as the Y variable, and MCQ-NBW was entered as the W variable. In order to investigate the moderating effect of MCQ-NBW on the pathway between BFI-N and GADQ-IV through IUS-prospective, the model was customized such that MCQ-NBW was specified to moderate only this single pathway. All other pathways were modeled as purely mediational pathways between BFI-N and GADQ-IV through each respective M_n variable. This model accounted for 77.5% of variance in GADQ-IV scores, F (8, 613) = 264.70, $p < .0001$. In this model, it was found that MCQ-NBW no longer moderated the pathway between BFI-N and GADQ-IV through IUS-prospective, as the index of moderated mediation was .0003, with a 95% bootstrapped CI of -.0013 to .0020. In sum, none of the indirect pathways from BFI-N through the ASI-3 subscales and the IUS-18

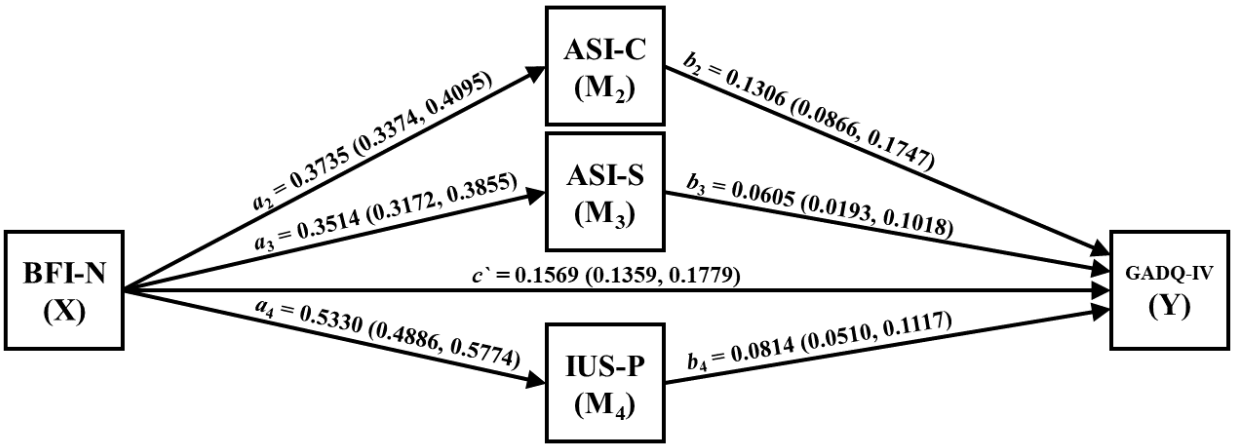
subscales to GADQ-IV were found to be moderated by MCQ-PBW or MCQ-NBW. MCQ-PBW and MCQ-NBW also did not moderate the direct effect of BFI-N on GADQ-IV.

Next, a purely mediational analysis was run to examine the mediational pathways without controlling for the non-significant moderation effects. This was done utilizing Hayes' (2018) Model 4. BFI-N was entered as the X variable, ASI-physical scores were entered as the M_1 variable, ASI-cognitive scores were entered as the M_2 variable, ASI-social scores were entered as the M_3 variable, IUS-prospective scores were entered as the M_4 variable, IUS-Inhibitory scores were entered as the M_5 variable, and GADQ-IV scores were entered as the Y variable. This model accounted for 75.1% of variance in GADQ-IV scores, F (6, 615) = 313.57, $p <$ .0001. This revealed that the direct effect of BFI-N on GADQ-IV was significant, t = 14.68, $p <$ .0001. No indirect effect of BFI-N on GADQ-IV through ASI-physical was found, as this had an indirect effect coefficient of .0006, and a 95% bootstrapped CI of -.0140 to .0152. BFI-N was found to have an indirect effect on GADQ-IV through ASI-cognitive, coefficient = .0488 (95% CI .0315, .0672). BFI-N also had an indirect effect on GADQ-IV through ASI-social, coefficient = .0213 (95% CI .0055, .0370), and IUS-prospective, coefficient = .0434 (95% CI .0270, .0610). BFI-N did not have an indirect effect on GADQ-IV though IUS-inhibitory, coefficient = -.0014 (95% CI -.0246, .0223). In sum, BFI-N scores had a direct effect on GADQ-IV scores, as well as an indirect effect on GADQ-IV scores through ASI-cognitive, ASI-social, and IUS-prospective scores (see Fig 7).

The third moderated mediation analysis was conducted with Hayes' (2018) Model 17. BFI-N was entered as the X variable, ASI-3 total scores were entered as the M_1 variable, IUS-18 total scores were entered as the M_2 variable, and PSWQ were entered as the Y variable. MCQ-PBW entered as the W variable, and MCQ-NBW entered as the Z variable (see Fig. 4). This

Figure 7.

Final pathways from BFI-N to GADQ-IV with ASI-3 and IUS-18 subscale scores



Indirect effect of ASI-C (a_2b_2) = 0.0488 (0.0315, 0.0672)
Indirect effect of ASI-S (a_3b_3) = 0.0213 (0.0055, 0.0370)
Indirect effect of IUS-P (a_4b_4) = 0.0434 (0.0270, 0.0610)

Note. ASI-P = Anxiety Sensitivity Index Physical; ASI-S = Anxiety Sensitivity Index Social; ASI-C = Anxiety Sensitivity Index Cognitive; GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; IUS-P = Intolerance of Uncertainty Scale Prospective; IUS-I = Intolerance of Uncertainty Scale Inhibitory; BFI-N = Big Five Inventory-2 Negative Emotionality; Numbers inside brackets indicate the 95% confidence interval.

model accounted for 81.6% of variance in PSWQ scores, F (11, 611) = 247.00, p < .0001.

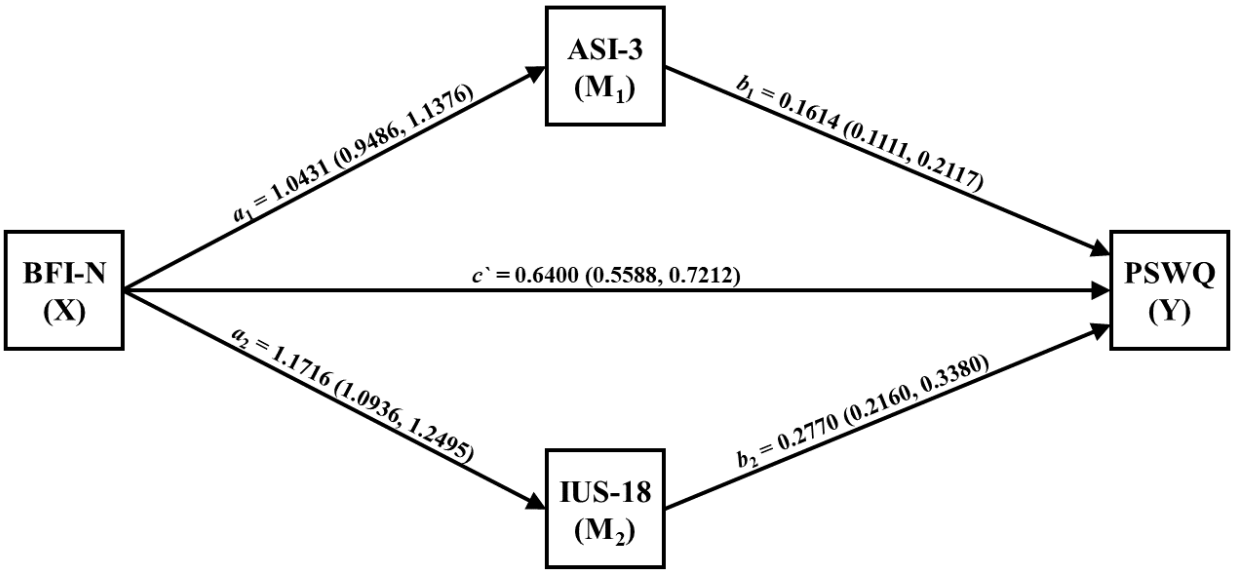
It was found that the direct effect of BFI-N on PSWQ was not moderated by MCQ-PBW, t = -1.05, p = .29, and was not moderated by MCQ-NBW, t = -0.19, p = .85. The indirect pathway from BFI-N to PSWQ through ASI-3 was not moderated by MCQ-PBW, as the index of partial moderated mediation was -.0083, with a 95% bootstrapped CI of -.0196 to .0027. The pathway was also not moderated by MCQ-NBW, index = -.0027 (95% CI -.0143, .0080). It was also found that the indirect pathway from BFI-N to GADQ-IV through IUS-18 was not moderated by MCQ-PBW, index = -.0019 (95% CI -.0173, .0135), or moderated by MCQ-NBW, index = .0120 (95% CI -.0028, .0269). In sum, the direct and indirect pathways were not found to be moderated by MCQ-PBW or MCQ-NBW.

Next, a purely mediational analysis was run to assess the mediational pathways without controlling for the effects of the non-significant moderation effects. This was done utilizing Hayes' (2018) Model 4. BFI-N was entered as the X variable, ASI-3 total scores were entered as the M_1 variable, IUS-18 total scores were entered as the M_2 variable, and PSWQ entered as the Y variable. This model accounted for 77.4% of variance in PSWQ scores, F (3, 619) = 704.51, p < .0001. This revealed that the direct effect of BFI-N scores on PSWQ scores was significant, t = 15.48, p < .0001. BFI-N had an indirect effect on PSWQ scores through ASI-3 total scores with an indirect coefficient of .1683, and a 95% bootstrapped CI of .1103 to .2288. BFI-N also had an indirect effect on PSWQ through IUS-18 total scores, coefficient = .3245 (95% CI .2476, .4056). In sum, BFI-N scores had a direct effect on PSWQ scores, as well as an indirect effect on PSWQ scores through both ASI-3 total scores and IUS-18 total scores (see Fig 8).

The fourth moderated mediation analysis was conducted with Hayes' (2018) Model 17. BFI-N was entered as the X variable, ASI-physical scores were entered as the M_1 variable, ASI-

Figure 8.

Final pathways from BFI-N to PSWQ with ASI-3 and IUS-18 total scores



Indirect effect of ASI-3 (a_1b_1) = 0.1683 (0.1103, 0.2288)
Indirect effect of IUS-18 (a_2b_2) = 0.3245 (0.2476, 0.4056)

Note. ASI-3 = Anxiety Sensitivity Index-3; PSWQ = Penn State Worry Questionnaire; IUS-18 = Intolerance of Uncertainty Scale-18; BFI-N = Big Five Inventory-2 Negative Emotionality; Numbers inside brackets indicate the 95% confidence interval.

cognitive scores were entered as the M_2 variable, ASI-social scores were entered as the M_3 variable, IUS-prospective scores were entered as the M_4 variable, and IUS-Inhibitory scores were entered as the M_5 variable. PSWQ scores were entered as the Y variable, MCQ-PBW scores were entered as the W variable, and MCQ-NBW scores were entered as the Z variable (see Fig. 5). This model accounted for 82.5% of variance in PSWQ scores, F (20, 602) = 141.96, p < .0001.

It was found that the direct effect of BFI-N on PSWQ was not moderated by MCQ-PBW, t = -1.32, p = .19, and was not moderated by MCQ-NBW, t = 0.48, p = .63. The indirect pathways from BFI-N to PSWQ through ASI-physical was negatively moderated by MCQ-PBW, with an index of partial moderated mediation of -.0180, and a 95% bootstrapped CI of -.0283 to -.0077, but not moderated by MCQ-NBW, index = -.0009 (95% CI -.0110, .0081). The indirect pathways from BFI-N to PSWQ through ASI-cognitive was not moderated by MCQ-PBW, index = .0119 (95% CI -.0002, .0240), or moderated by MCQ-NBW, index = -.0075 (95% CI -.0196, .0046). The indirect pathways from BFI-N to PSWQ through ASI-social was not moderated by MCQ-PBW, index = .0036 (95% CI -.0085, .0152), or moderated by MCQ-NBW, index = .0085 (95% CI -.0027, .0202). The indirect pathway from BFI-N to PSWQ through IUS-prospective was not moderated by MCQ-PBW, index = -.0004 (95% CI -.0154, .0135), but was positively moderated by MCQ-NBW, index = .0172 (95% CI .0045, .0313). The indirect pathways from BFI-N to PSWQ through IUS-inhibitory was not moderated by MCQ-PBW, index = -.0060 (95% CI -.0245, .0162), or moderated by MCQ-NBW, index = -.0103 (95% CI -.0287, .0064). In sum, the indirect pathway from BFI-N to PSWQ through ASI-physical was negatively moderated by MCQ-PBW, and the indirect pathway from BFI-N to PSWQ through IUS-18 was

positively moderated by MCQ-NBW. These were the only two significantly moderated indirect pathways

Based on the existence of only two moderating pathways, a modified moderated mediational analysis was conducted utilizing a customized version of Hayes' (2018) Model 17, to investigate these moderation effects in isolation, and to assess the effect of the mediational pathways without controlling for the effects of the non-significant moderation effects. This was done with BFI-N entered as the X variable, ASI-physical scores entered as the M_1 variable, ASI-cognitive scores entered as the M_2 variable, ASI-social scores entered as the M_3 variable, IUS-prospective scores entered as the M_4 variable, and IUS-Inhibitory scores entered as the M_5 variable. PSWQ scores were entered as the Y variable, MCQ-PBW scores were entered as the W variable, and MCQ-NBW scores were entered as the Z variable. In order to investigate the moderating effect of MCQ-PBW on the pathway between BFI-N and PSWQ through ASI-physical, and the moderating effect of MCQ-NBW on the pathway between BFI-N and PSWQ through IUS-prospective, the model was customized such that MCQ-PBW and MCQ-NBW would each only moderate those specific pathways. This model accounted for 82.1% of variance in PSWQ scores, F (10, 612) = 281.25, $p < .0001$.

In this model, it was found that MCQ-PBW still negatively moderated the indirect pathway from BFI-N to PSWQ through ASI-physical, with an index of moderated mediation of -.0126, and a 95% bootstrapped CI of -.0191 to -.0063. This was further assessed by examining the strength of the indirect pathway at relatively low, moderate, and relatively high levels of MCQ-PBW. Of the observed MCQ-PBW scores, the 16th percentile was utilized as the relatively low level, 50th percentile as the moderate level, and 84th percentile as relatively high level. This revealed that at the 16th percentile of MCQ-PBW scores there was not an indirect pathway from

BFI-N to PSWQ through ASI-physical, as the indirect coefficient was 0.0621, with a 95% CI of -0.0017 to 0.1278. At the 50th percentile of MCQ-PBW scores, there was also not an indirect pathway from BFI-N to PSWQ through ASI-physical, coefficient = 0.0118 (95% CI -0.0396, 0.0612). At the 84th percentile of MCQ-PBW scores, there was an indirect pathway from BFI-N to PSWQ through ASI-physical, coefficient = -0.0637 (95% CI -0.1176, -0.0141). In sum, an indirect pathway from BFI-N to PSWQ through ASI-physical only existed at the 84th percentile of MCQ-PBW scores.

This model also found that MCQ-NBW still positively moderated the indirect pathway from BFI-N to PSWQ through IUS-prospective, index = .0099 (95% CI .0035, .0166). The same approach was utilized to further examine the indirect pathway at relatively low, 16th percentile, moderate, 50th percentile, and relatively high, 84th percentile, levels of MCQ-NBW. At the 16th percentile of MCQ-NBW scores, there was an indirect pathway from BFI-N to PSWQ through IUS-prospective as the indirect coefficient was 0.0894 with a 95% CI of .0158 to .1682. At the 50th percentile of MCQ-NBW scores, there was an indirect pathway from BFI-N to PSWQ through IUS-prospective, coefficient = 0.1391 (95% CI .0751, .2075). At the 84th percentile of MCQ-NBW scores, there was an indirect pathway from BFI-N to PSWQ through IUS-prospective, coefficient = .2087 (95% CI .1363, .2867). In sum, an indirect pathway from BFI-N to PSWQ through IUS-prospective existed at the 16th, 50th, and 84th percentile of MCQ-NBW scores.

Additionally, this model found that the direct pathway from BFI-N to PSWQ was significant, $t = 13.71$, $p < .0001$. BFI-N had an indirect effect on GADQ-IV through ASI-social as the indirect coefficient was .0568, with a 95% bootstrapped CI of .0039 to .1102. BFI-N did not have an indirect effect on PSWQ through ASI-cognitive, coefficient = .0343 (95% CI -.0262,

.0950), or by IUS-inhibitory, coefficient = -.0012 (95% CI -.0932, .0909; see Fig. 9).

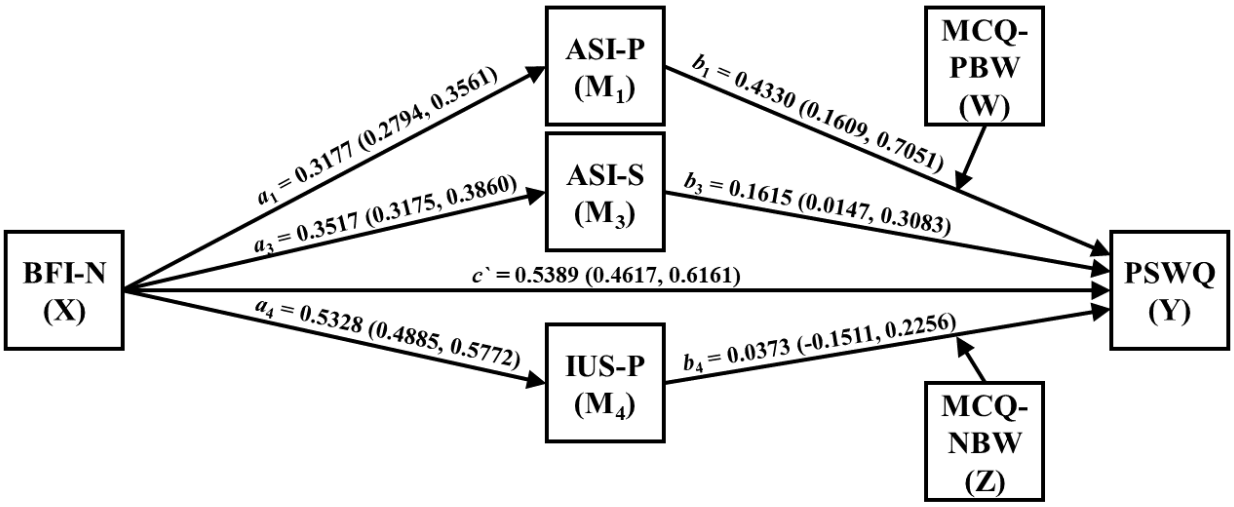
Study 2 Discussion

Overall, these results did not suggest that metacognitions play a moderating role in the direct or indirect pathways from neuroticism to GAD symptoms. However, it was found that AS and IU may play a mediating role in the relationships from neuroticism to GAD symptoms. The pathways from neuroticism to GAD symptoms through overall AS and IU were both found to be significant. When looking at the subfactors of AS and IU, it was found that the pathways from neuroticism to GAD symptoms through social AS, cognitive AS, and prospective IU were all significant. The results of this study also suggest that metacognitions may play a moderating role on the indirect pathways from neuroticism to chronic worry through subfactors of AS and IU. More specifically, positive beliefs about worry may have a negative moderating effect on the pathway from neuroticism to chronic worry through physical AS, and negative beliefs about worry may have a positive moderating effect on the pathway from neuroticism to chronic worry through prospective IU. These moderating effects were not seen with the pathways from neuroticism to chronic worry though overall AS and IU. Although there was no moderating effect on these pathways through AS and IU, the indirect pathways from neuroticism to chronic worry through overall AS and IU were themselves both significant. In investigating subfactors of AS and IU, the indirect pathway from neuroticism to chronic worry though social AS was significant, as well as the pathways through physical AS and prospective IU.

There was a temporary indication that the pathway from neuroticism to GAD symptoms through prospective IU may have been positively moderated by negative beliefs about worry. However, under further investigation this moderation effect became non-significant, and no moderation effects were found on the direct or indirect pathways from neuroticism to GAD

Figure 9.

Final pathways from BFI-N to PSWQ with ASI-3 and IUS-18 subscale scores



Indirect effect of ASI-P (a_1b_1)
- At 84th percentile of MCQ-PBW = -0.0637 (-0.1176, -0.0141)
- Index of moderated mediation = -.0126 (-.0191, -.0063)

Indirect effect of ASI-S (a_3b_3) = 0.0568 (0.0039, 0.1102)

Indirect effect of IUS-P (a_4b_4)
- At 16th percentile of MCQ-NBW = 0.0894 (0.0158, 0.1682)
- At 50th percentile of MCQ-NBW = 0.1391 (0.0751, 0.2075)
- At 84th percentile of MCQ-NBW = 0.2087 (0.1363, 0.2867)
- Index of moderated mediation = .0099 (.0035, .0166)

Note. ASI-P = Anxiety Sensitivity Index Physical; ASI-S = Anxiety Sensitivity Index Social; ASI-C = Anxiety Sensitivity Index Cognitive; PSWQ = Penn State Worry Questionnaire; IUS-P = Intolerance of Uncertainty Scale Prospective; IUS-I = Intolerance of Uncertainty Scale Inhibitory; BFI-N = Big Five Inventory-2 Negative Emotionality; Numbers inside brackets indicate the 95% confidence interval.

symptoms. This would indicate that the direct pathway from neuroticism to GAD symptoms is not exacerbated or mitigated by metacognitions. This would also indicate that the indirect pathways from neuroticism to GAD through AS and IU to are also not exacerbated or mitigated by metacognitions. While these findings do not suggest that any of these mechanisms are unrelated to GAD symptoms, they do suggest that how neuroticism, AS, and IU contribute the GAD symptoms is not influenced my metacognitions.

When investigating the effect of metacognitions on the pathways from neuroticism to chronic worry, two moderation effects were found. The first of these was a negative moderation effect of positive beliefs about worry on the indirect pathway from neuroticism to chronic worry through physical AS. Interestingly, when individuals' levels of positive beliefs about worry were moderate or relatively low, no indirect pathway from neuroticism to chronic worry through physical AS was found. It was only when individuals' level of positive beliefs about worry were relatively high that a negative indirect effect from neuroticism to chronic worry through physical AS was found. This would indicate that a heightened fear and vigilance of the physical consequences of anxiety may serve to decrease chronic worry, if someone is already high in positive beliefs about worry.

The second moderation effect was that of negative beliefs about worry positively moderating the indirect pathway from neuroticism to chronic worry through prospective IU. This indirect pathway was consistently significant when individuals' levels of positive beliefs about worry were relatively low, moderate, or relatively high. As levels of negative beliefs about worry increased, the strength of the indirect pathway from neuroticism to chronic worry though prospective IU increased. This resembled a classic positive moderation, with the strength of the indirect pathway's effect on chronic worry increasing as levels of negative beliefs about worry

increased. This would mean that for individuals high in prospective IU, higher levels of negative beliefs about worry would interact with their prospective IU to exacerbate their chronic worry.

Neuroticism was found to contribute directly to the symptoms of GAD, as well as indirectly through AS and IU. When the subfactors of AS were examined, it was found that the indirect pathways from neuroticism to GAD symptoms went through both cognitive and social AS, but not physical AS. This would indicate that the social and cognitive aspects of AS are key to neuroticism indirect path to GAD through AS, and that physical aspects of AS are not as important. Examination of the subfactors of IU found that the indirect path from neuroticism to GAD symptoms went through prospective IU, but not inhibitory IU. Overall, this indicated that social AS, cognitive AS, and prospective IU were the key subfactors for neuroticism to contribute to GAD symptoms through.

A similar but different pattern of pathways from neuroticism to chronic worry was also found. Neuroticism was found to directly contribute to chronic worry, as well as contribute indirectly through AS and IU. When subfactors of AS were examined, it was found that neuroticism indirectly contributed to chronic worry through both physical and social AS, but not through cognitive AS. The pathway from neuroticism through physical AS was found to only be present when individuals were relatively high in positive beliefs about worry. No indirect pathway was found when individuals had relatively low or moderate levels of positive beliefs about worry. The indirect effect of neuroticism on chronic worry through physical AS also differed as it was the only indirect effect that was found to be negative. When subfactors of IU were examined, it was found that neuroticism indirectly contributed to chronic worry through prospective IU, but not inhibitory IU. This indirect pathway from neuroticism to chronic worry through prospective IU was also positively moderated by negative beliefs about worry, such that

the pathway became stronger at higher levels of negative beliefs about worry. Overall, this indicated that the indirect pathways from neuroticism to chronic worry went through physical AS, social AS, and prospective IU.

Past research has hieratically modelled neuroticism as contributing to chronic worry and GAD symptoms, both directly and indirectly (Norton et al., 2005; Norton & Mehta, 2007; Sexton et al., 2003). While some of these models have found IU, but not AS, to play a mediating role in the indirect pathways from neuroticism to chronic worry/GAD symptoms (Norton et al., 2005; Norton & Mehta, 2007), other research has suggested that both AS and IU play a mediating role (Sexton et al., 2003). The findings of the current study support that both AS and IU playing a mediating role in the indirect pathways from neuroticism to chronic worry and GAD symptoms. Additionally, only some of the subfactors of AS and IU appear to be responsible for these indirect effects.

General Discussion

The main purpose of these studies was to investigate the possible moderating role that positive and negative beliefs about worry may play in neuroticism, AS, and IU's contributions to the symptoms of GAD and chronic worry. Study 1 investigated whether positive and negative beliefs about worry would moderate AS's contributions to GAD and chronic worry. This study consistently found negative moderation effects of both positive and negative beliefs about worry on the relationship between AS and GAD symptoms, and on the relationship between AS and chronic worry. These negative moderation effects were found regardless of whether overall AS was investigated, or whether the physical, social, or cognitive subfactors of AS were investigated. These findings were substantially different from the past research of Gorday and Bardeen (2022), who found that both positive and negative beliefs about worry had significant

positive moderation effects on the relationship between AS and anxiety. Several factors may have accounted for these differing results, including different outcome variables, different models of moderation, and the elevated GAD and chronic worry scores seen in Study 1.

Study 2 investigated the direct contributions of neuroticism to GAD symptoms and chronic worry, the indirect contributions of neuroticism to GAD and chronic worry through AS and IU, and how positive and negative beliefs about worry may moderate these direct and indirect pathways. It was found that neuroticism directly contributed to GAD symptoms, as well as indirectly through both AS and IU. When the subfactors of AS and IU were investigated, it was found that neuroticism indirectly contributed to GAD symptoms through social and cognitive AS, and through prospective IU. It was also found that neuroticism directly contributed to chronic worry, and indirectly contributed through AS and IU. Specifically, it was found that neuroticisms contributed to chronic worry through social AS, and prospective IU. Neuroticism also had a negative indirect effect on chronic worry through physical AS. The pathway from neuroticism to chronic worry was also negatively moderated by positive beliefs about worry, such that it only emerged when levels of positive beliefs about worry were relatively high, but not when they were moderate or relatively low. The pathway from neuroticism to chronic worry through prospective IU was positively moderated by negative beliefs about worry, such that the effect of the pathway increased in size at higher levels of negative beliefs about worry.

While Study 2 did not find that metacognitions played a moderating role in any of the investigated pathways, it is important to note that past research has shown that positive beliefs about worry, and especially negative beliefs about worry, play a large role in GAD (Wells, 2005). Negative beliefs about worry are a useful predictor of GAD, and they have been found to help differentiate cases of GAD from high level worriers (Penney et al., 2013; Ruscio&

Borkovec, 2004). While negative beliefs about worry are related to other disorders, they have been found to be highly associated with GAD (Penney et al., 2020), and can serve to help differentiate GAD from other emotional disorders (Wells & Carter, 2001). Given the strong association between negative beliefs about worry and GAD, and the lack of moderation effects observed in the current research, future research may wish to investigate metacognitions in other roles in relation to GAD. One area of future study could be modeling metacognitions as parallel mediators in a hierarchal model connecting to neuroticism to GAD through mediating constructs like the model proposed by van der Heiden and colleagues (2010). Another area for future research could be investigating the role of metacognitions as a possible serial mediator in a pathway from neuroticism to AS and IU, to metacognitions, to GAD symptoms.

Even though no moderation effects were observed on the pathways from neuroticism to GAD symptoms, two moderation effects on the pathways from neuroticism to chronic worry were found. The first of these was the indirect pathway from neuroticism to chronic worry through physical AS. This pathway was negatively moderated by positive beliefs about worry. When levels of positive beliefs about worry were moderate or relatively low, no indirect pathway from neuroticism to chronic worry was observed. When levels of positive beliefs about worry were relatively high, a negative indirect effect of the pathway from neuroticism to chronic worry emerged. This could suggest that if individuals are already high in positive beliefs about worry, having more fear about the physical consequences of anxiety may result in lower levels of chronic worry. While this negative moderation effect was the only effect found in Study 2 which resembled the negative moderation effects found in Study 1, more research is needed to replicate this finding. The second moderation effect was the on pathway from neuroticism to chronic worry through prospective IU. This was found to be positively moderated by negative beliefs

about worry. This pathway through prospective IU was found to exist at relatively low, moderate, and relatively high levels of negative beliefs about worry. At higher levels of negative beliefs about worry, it was found that the size of the effect of this pathway became stronger. This would indicate that prospective IU plays a larger role in contributing to chronic worry if individuals are higher in negative beliefs about worry. However, like the previous moderation effect, more research is needed to replicate this finding.

The secondary aim of Study 2 was to investigate the mediational pathways from neuroticism to GAD and chronic worry though AS and IU. Several mediational pathways were found including the pathways from neuroticism to GAD symptoms through overall AS and IU. When investigating the subfactors of AS and IU, it was found that neuroticism had indirect effects on GAD symptoms specifically through cognitive AS, social AS, and prospective IU. Neuroticism was also found to have an indirect effect on chronic worry through overall AS and IU. When subfactors were investigated, it was found that neuroticism had an indirect effect on chronic worry specifically through physical AS, social AS, and prospective IU. It is important to note that the indirect effect of neuroticism through physical AS was negative, and negatively moderated such that it only emerged when participants' levels of positive beliefs about worry were relatively high. It is also worth noting that the indirect pathway from neuroticism through prospective IU was positively moderated by negative beliefs about worry, but was consistently present at all levels of negative beliefs about worry.

These mediational findings are consistent with hierarchal models that describe the pathways from neuroticism to chronic worry as being mediated through AS and IU (Sexton et al., 2003). However, it is important to note that many similar hierarchal models have found that only IU, and not AS, mediated the relationship from neuroticism to GAD and chronic worry

(Norton et al., 2005; Norton & Mehta, 2007). The current findings expand upon these models by suggesting that AS moderates these relationships alongside IU, and that they do so for both the relationship between neuroticism and worry severity, and the relationship between neuroticism and GAD.

The finding that neuroticism contributed to GAD symptoms through social and cognitive AS is consistent with past research that has found that social AS, and especially cognitive AS, are more closely associated with GAD than physical AS (Baek et al., 2019; Naragon-Gainey, 2010). This is contrasted by the finding that neuroticism had indirect pathways to chronic worry through physical and social AS, but not cognitive AS. This may suggest that fears of the social consequences of anxiety might be a shared factor that connects neuroticism to both GAD and chronic worry. The absence of a pathway from neuroticism to chronic worry through cognitive AS may also suggest that cognitive AS is more specific to GAD and could help differentiate it from chronic worry.

It was also found that neuroticism contributed to both GAD symptoms and chronic worry through prospective IU, but not inhibitory IU. This would indicate that prospective IU is more central to GAD and chronic worry than inhibitory IU is, which is consistent with past research that has found that prospective IU has the greater association with GAD (Hong & Lee, 2015; Mahoney & McEvoy, 2012; McEvoy & Mahoney, 2011; Penney et al., 2020). Only the indirect pathway from neuroticism to chronic worry through inhibitory IU was moderated by negative beliefs about worry. However, it is worth noting that the indirect path from neuroticism to GAD symptoms through inhibitory IU initially appeared to also be moderated by negative beliefs about worry, before becoming non-significant under further examination. Further research

should be conducted to replicate the current study's finding for both pathways to substantiate the existence and non-existence of moderation effects.

Overall, the findings of the present studies generally do not support that positive and negative beliefs about worry have a moderating effect on neuroticism, AS, and IU's relationships to GAD. They indicate that some moderation relationships may exist for the indirect pathways between neuroticism and chronic worry through AS and IU, and support that both AS and IU mediate the indirect pathways from neuroticism to GAD symptoms and chronic worry.

Strengths

A priori power analyses were utilized prior to data collection in order to ensure sufficient statistical power. Because of this, all analyses had a minimum statistical power of 0.80. To ensure the following of data collection and analysis plans, procedures for both Study 1 (https://doi.org/10.17605/OSF.IO/J9G8C) and Study 2 (https://doi.org/10.17605/OSF.IO/HBDM4) were pre-registered with the Open Science Framework prior to data collection. Given the elevated scores observed on the GADQ-IV and PSWQ in Study 1, it may be the case that this sample demonstrated a greater representation of clinical population. The use of Canada-wide sampling in Study 2, may have also increased generalizability of its findings to the general population of Canada.

Limitations

While the sample utilized in Study 1 may have provided a better representation of clinical populations, the elevated GADQ-IV and PSWQ scores of this sample may also limit its generalizability to a typical population. Given that clinically high GADQ-IV and PSWQ scores were also not a part of any selection criteria for participation, this also limits generalizability to clinical populations. The sample of Study 1 was also fully a convenience sample of

undergraduate students, who were relatively young with a mean age of 20.84 years. This sample was also predominantly female (76.8%) and Caucasian/White (55.1%). It is also important to note that data collection for Study 1 took place between September and December 2022. As many of the participants were introductory psychology students, this may have been their first period of on-campus learning following the COVID-19 pandemic. It is possible that this could have influenced aspects of participant anxiety. Given these aspects of the sample, it is possible the data obtained from Study 1 may not generalize to the general population.

Given the Canada-wide sampling procedures utilized in Study 2, it is likely that the community sample obtained may have been more representative of the general population of Canada. However, the recruitment procedures that were employed present unique limitations. As participant advertising and recruitment was conducted by the survey company Qualtrics, the exact online methods of sample collection are not known. It is possible that the online areas that participants were recruited from may have over-included, or limited access to certain populations. Participant compensation was also conducted by Qualtrics. Although it was assured by Qualtrics that participant compensation would be minor monetary or non-monetary in nature, the exact amounts and types of compensation are not known. This also presents the possibility that certain populations may have been over-included, or limited from participation.

While this study did not aim to investigate the GAD symptoms and chronic worry in isolation from other disorders, future research may wish to control for pre-existing diagnoses or the symptoms of other related disorders. Pathways from neuroticism, through AS and IU, to panic disorder, obsessive-compulsive disorder, and health anxiety have been found in past hierarchal models (Norton et al., 2005; Norton & Mehta, 2007; Sexton et al., 2003). Given this, these disorders may be of particular interest. The cross-sectional nature of this study also limits

its ability to draw any causal or long-term conclusions. Future research investigating the longitudinal development of pathways to GAD and chronic worry would be valuable for assessing their growth and targeting early interventions.

Conclusion

Taken together, the two present studies generally do not support the idea that metacognitions play a moderating role in the relationships that neuroticism, AS, and IU have with GAD. A series of negative moderating effects were found within Study 1. Two moderating effects were found in Study 2. These were on pathways connecting neuroticism to chronic worry through physical AS and prospective IU. However, due to a number of factors including higher than expected GAD and worry severity scores and a lack of correspondence in the findings between studies 1 and 2, further replication is needed. In assessing mediational effects on the pathways from neuroticism to GAD and chronic worry, it was found that both AS and IU, had mediational effects in these indirect pathways. These indirect pathways were mediated by some, but not all, subfactors of AS and IU. Even when these indirect pathways were accounted for, neuroticism still maintained significant direct pathways to both GAD and chronic worry. This supports previous studies on hierarchal models connecting neuroticism to worry severity (Norton et al., 2005; Norton & Mehta, 2007; Sexton et al., 2003) and expands upon them by suggesting that both AS and IU play a mediating role, and that this relationship extends to both GAD and chronic worry.

References

American Psychiatric Association. (2022). *Diagnostic and statistical manual of mental disorders* (5th ed., text rev.). https://doi.org/10.1176/appi.books.9780890425787

Bailey, R., & Wells, A. (2013). Does metacognition make a unique contribution to health anxiety when controlling for neuroticism, illness cognition, and somatosensory amplification? *Journal of Cognitive Psychotherapy*, *27*(4), 327–337. https://doi.org/10.1891/0889-8391.27.4.327

Bailey, R., & Wells, A. (2015). Metacognitive beliefs moderate the relationship between catastrophic misinterpretation and health anxiety. *Journal of Anxiety Disorders*, *34*, 8–14. https://doi.org/10.1016/j.janxdis.2015.05.005

Bailey, R., & Wells, A. (2016). Is metacognition a causal moderator of the relationship between catastrophic misinterpretation and health anxiety? A prospective study. *Behaviour Research and Therapy*, *78*(1), 43–50. https://doi.org/10.1016/j.brat.2016.01.002

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

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

Brown, T. A., Barlow, D. H., & Liebowitz, M. R. (1994). The empirical basis of generalized anxiety disorder. *The American Journal of Psychiatry*, *151*(9), 1272–1280. https://doi.org/10.1176/ajp.151.9.1272

Brown, T. A., Campbell, L. A., Lehman, C. L., Grisham, J. R., & Mancill, R. B. (2001). Current and lifetime comorbidity of the DSM-IV anxiety and mood disorders in a large clinical sample. *Journal of Abnormal Psychology, 110*(4), 585–599. https://doi.org/10.1037/0021-843X.110.4.585

Denovan, A., Dagnall, N., & Lofthouse, G. (2019). Neuroticism and somatic complaints: Concomitant effects of rumination and worry. *Behavioural and Cognitive Psychotherapy*, *47*(4), 431–445. https://doi.org/10.1017/S1352465818000619

Dugas, M. J., Savard, P., Gaudet, A., Turcotte, J., Laugesen, N., Robichaud, M., Francis, K., & Koerner, N. (2007). Can the components of a cognitive model predict the severity of generalized anxiety disorder? *Behavior Therapy*, *38*(2), 169–178. https://doi.org/10.1016/j.beth.2006.07.002

Dupuy, J.-B., & Ladouceur, R. (2008). Cognitive processes of generalized anxiety disorder in comorbid generalized anxiety disorder and major depressive disorder. *Journal of Anxiety Disorders*, *22*(3), 505–514. https://doi-org/10.1016/j.janxdis.2007.05.010

Edgell, S. E., & Noon, S. M. (1984). Effect of violation of normality on the t test of the correlation coefficient. *Psychological Bulletin*, *95*(3), 576–583. https://doi.org/10.1037/0033-2909.95.3.576

Erickson, T. M., & Newman, M. G. (2005). Cognitive behavioral psychotherapy for generalized anxiety disorder: A primer. *Expert Review of Neurotherapeutics*, *5*(2), 247–257. https://doi.org/10.1586/14737175.5.2.247

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*, 1149-1160. https://doi.org/10.3758/BRM.41.4.1149

Gentes, E. L., & Ruscio, A. M. (2011). A meta-analysis of the relation of intolerance of uncertainty to symptoms of generalized anxiety disorder, major depressive disorder, and obsessive–compulsive disorder. *Clinical Psychology Review*, *31*(6), 923–933. https://doi.org/10.1016/j.cpr.2011.05.001

Gorday, J. Y., & Bardeen, J. R. (2022). The interactive effect of anxiety sensitivity and metacognitive beliefs on anxiety. *Journal of Cognitive Psychotherapy*, *36*(1), 60–69. https://doi.org/10.1891/JCPSY-D-20-00054

Hale, W. W., III, Klimstra, T. A., & Meeus, W. H. J. (2010). Is the generalized anxiety disorder symptom of worry just another form of neuroticism? A 5-year longitudinal study of adolescents from the general population. *The Journal of Clinical Psychiatry*, *71*(7), 942–948. https://doi.org/10.4088/JCP.09m05506blu

Hayes, A. F. (1996). The permutation test is not distribution-free: Testing H_0: $\rho = 0$. *Psychological Methods*, *1*(2), 184–198. https://doi.org/10.1037/1082-989X.1.2.184

Hayes, A. F. (2018). *An Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach* (2nd ed.). Guilford Press.

Ho, M.-H., Auerbach, R., Jun, H., Abela, J., Zhu, X., & Yao, S. (2011). Understanding anxiety sensitivity in the development of anxious and depressive symptoms. *Cognitive Therapy & Research*, *35*(3), 232–240. https://doi.org/10.1007/s10608-009-9280-8

Hong, R. Y. (2010). Neuroticism, anxiety sensitivity thoughts, and anxiety symptomatology: Insights from an experience-sampling approach. *Cognitive Therapy & Research*, *34*(3), 254–262. https://doi.org/10.1007/s10608-009-9231-4

Hong, R. Y., & Lee, S. S. (2015). Further clarifying prospective and inhibitory intolerance of uncertainty: Factorial and construct validity of test scores from the Intolerance of

Uncertainty Scale. *Psychological Assessment, 27,* 605-620. https://doi.org/10.1037/pas0000074

Huntley, C. D., Young, B., Smith, C. T., Jha, V., & Fisher, P. L. (2022). Assessing metacognitive beliefs in test anxiety: Psychometric properties of the Metacognitions Questionnaire, 30 (MCQ-30) among university students. *Current Psychology*, *41*(3), 1425–1433. https://doi.org/10.1007/s12144-020-00662-y

Keller, M. B. (2002). The long-term clinical course of generalized anxiety disorder. *The Journal of Clinical Psychiatry*, *63*(Suppl 8), 11–16.

Kemper, C. J., Lutz, J., Bähr, T., Rüddel, H., & Hock, M. (2012). Construct validity of the Anxiety Sensitivity Index–3 in clinical samples. *Assessment*, *19*(1), 89–100. https://doi.org/10.1177/1073191111429389

Koerner, N., Mejia, T., & Kusec, A. (2017). What's in a name? Intolerance of uncertainty, other uncertainty-relevant constructs, and their differential relations to worry and generalized anxiety disorder. *Cognitive Behaviour Therapy*, *46*(2), 141–161. https://doi.org/10.1080/16506073.2016.1211172

Laposa, J. M., Katz, D. E., Lisi, D. M., Hawley, L. L., Quigley, L., & Rector, N. A. (2022). Longitudinal changes in intolerance of uncertainty and worry severity during CBT for generalized anxiety disorder. *Journal of Anxiety Disorders*, *91*, 1–9. https://doi.org/10.1016/j.janxdis.2022.102623

LeBlanc, N. J., Bartuska, A., Blanchard, L., Baker, A., & Bui, E. (2021). Cognitive-behavioral treatment for generalized anxiety disorder: Theoretical foundations and empirically supported strategies. *Psychiatric Annals*, *51*(5), 210–215. https://doi.org/10.3928/00485713-20210412-02

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, *33*(3), 335–343. https://doi.org/10.1016/0005-7967(94)00075-U

Mackintosh, M.-A., Gatz, M., Wetherell, J. L., & Pedersen, N. L. (2006). A twin study of lifetime generalized anxiety disorder (GAD) in older adults: Genetic and environmental influences shared by neuroticism and GAD. *Twin Research and Human Genetics*, *9*(1), 30–37. https://doi.org/10.1375/twin.9.1.30

Mahoney, A. E. J., & McEvoy, P. M. (2012). Trait versus situation-specific intolerance of uncertainty in a clinical sample with anxiety and depressive disorders. *Cognitive Behaviour Therapy*, *41*(1), 26–39. https://doi.org/10.1080/16506073.2011.622131

McEvoy, P. M., Hyett, M. P., Shihata, S., Price, J. E., & Strachan, L. (2019). The impact of methodological and measurement factors on transdiagnostic associations with intolerance of uncertainty: A meta-analysis. *Clinical Psychology Review*, *73*, Article 101778. https://doi.org/10.1016/j.cpr.2019.101778

McEvoy, P. M., & Mahoney, A. E. J. (2011). Achieving certainty about the structure of intolerance of uncertainty in a treatment-seeking sample with anxiety and depression. *Journal of Anxiety Disorders*, *25*(1), 112–122. https://doi.org/10.1016/j.janxdis.2010.08.010

McEvoy, P. M., & Mahoney, A. E. J. (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

McCrae, R. R., Terracciano, A., De Fruyt, F., De Bolle, M., Gelfand, M. J., & Costa, P. T., Jr. (2010). The validity and structure of culture-level personality scores: Data from ratings of young adolescents. *Journal of Personality, 78*(3), 815–838. https://doi.org/10.1111/j.1467-6494.2010.00634.x

Merino, H., Senra, C., & Ferreiro, F. (2016). Are worry and rumination specific pathways linking neuroticism and symptoms of anxiety and depression in patients with generalized anxiety disorder, major depressive disorder and mixed anxiety-depressive disorder? *PLoS ONE*, *11*(5), e0156169. https://doi.org/10.1371/journal.pone.0156169

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. https://doi.org/10.1016/0005-7967(90)90135-6

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*, 215-233. http://doi.org/10.1016/S0005-7894(02)80026-0

Naragon-Gainey, K. (2010). Meta-analysis of the relations of anxiety sensitivity to the depressive and anxiety disorders. *Psychological Bulletin, 136*(1), 128-150. https://doi.org/10.1037/a0018055

Nordahl, H., Ebrahimi, O. V., Hoffart, A., & Johnson, S. U. (2022). Trait versus state predictors of emotional distress symptoms: The role of the Big-5 personality traits, metacognitive beliefs, and strategies. *The Journal of Nervous and Mental Disease*, *210*(12), 943–950. https://doi.org/10.1097/NMD.0000000000001557

Nordahl, H., Hjemdal, O., & Wells, A. (2021). Metacognitive beliefs uniquely contribute to interpersonal problems: A test controlling for adult attachment, Big-5 personality traits, anxiety, and depression. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.694565

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

Norton, P. J., Sexton, K. A., Walker, J. R., & Ron Norton, G. (2005). Hierarchical model of vulnerabilities for anxiety: Replication and extension with a clinical sample. *Cognitive Behaviour Therapy*, *34*(1), 50–63. https://doi.org/10.1080/16506070410005401

Olatunji, B. O., & Wolitzky-Taylor, K. B. (2009). Anxiety sensitivity and the anxiety disorders: A meta-analytic review and synthesis. *Psychological Bulletin*, *135*(6), 974-999. https://doi.org/10.1037/a0017428

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. https://doi.org/10.1037/a0027623

Penney, A. M., Rachor, G. S., & Deleurme, K. A. (2020). Differentiating the roles of intolerance of uncertainty and negative beliefs about worry across emotional disorders. *Journal of Experimental Psychopathology*, *11*(4), 1-22. https://doi.org/10.1177/2043808720970072

Reiss, S., Peterson, R. A., Gursky, D. M., & McNally, R. J. (1986). Anxiety sensitivity, anxiety frequency and the predictions of fearfulness. *Behaviour Research and Therapy*, *24*(1), 1-8. https://doi.org/10.1016/0005-7967(86)90143-9

Robinson, C. M., Klenck, S. C., & Norton, P. J. (2010). Psychometric properties of the Generalized Anxiety Disorder Questionnaire for DSM-IV among four racial groups. *Cognitive Behaviour Therapy*, *39*(4), 251–261. https://doi.org/10.1080/16506073.2010.486841

Rubio, G., & López-Ibor, J. J. (2007). Generalized anxiety disorder: A 40-year follow-up study. *Acta Psychiatrica Scandinavica*, *115*(5), 372–379. https://doi.org/10.1111/j.1600-0447.2006.00896.x

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*, 1469–1482. https://doi.org/10.1016/j.brat.2003.10.007

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

Soto, C. J., & John, O. P. (2017). The next Big Five Inventory (BFI-2): Developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power. *Journal of Personality and Social Psychology*, *113*(1), 117–143. https://doi.org/10.1037/pspp0000096

Tabachnick, B. G., & Fidell, L. S. (2013) Using multivariate statistics (6th ed.). Pearson Education.

Taylor, S., Zvolensky, M. J., Cox, B. J., Deacon, B., Heimberg, R. G., Ledley, D. R., Abramowitz, J. S., Holaway, R. M., Sandin, B., Stewart, S. H., Coles, M., Eng, W., Daly, E. S., Arrindell, W. A., Bouvard, M., & Cardenas, S. J. (2007). Robust dimensions of

anxiety sensitivity: Development and initial validation of the Anxiety Sensitivity Index-3. *Psychological Assessment, 19*(2), 176-188. https://doi.org/10.1037/1040-3590.19.2.176

van der Heiden, C., Melchior, K., Muris, P., Bouwmeester, S., Bos, A. E. R., & van der Molen, H. T. (2010). A hierarchical model for the relationships between general and specific vulnerability factors and symptom levels of generalized anxiety disorder. *Journal of Anxiety Disorders, 24*(2), 284–289. https://doi.org/10.1016/j.janxdis.2009.12.005

van Rijsoort, S., Emmelkamp, P., & Vervaeke, G. (1999). The Penn State Worry Questionnaire and the Worry Domains Questionnaire: Structure, reliability and validity. *Clinical Psychology & Psychotherapy*, *6*(4), 297–307. https://doi.org/10.1002/(SICI)1099-0879(199910)6:4<297::AID-CPP206>3.0.CO;2-E

Watson, D., Levin-Aspenson, H. F., Waszczuk, M. A., Conway, C. C., Dalgleish, T., Dretsch, M. N., Eaton, N. R., Forbes, M. K., Forbush, K. T., Hobbs, K. A., Michelini, G., Nelson, B. D., Sellbom, M., Slade, T., South, S. C., Sunderland, M., Waldman, I., Witthöft, M., Wright, A. G. C., … Krueger, R. F. (2022). Validity and utility of Hierarchical Taxonomy of Psychopathology (HiTOP): III. Emotional dysfunction superspectrum. *World Psychiatry*, *21*(1), 26–54. https://doi.org/10.1002/wps.20943

Wells, A. (2005). The Metacognitive Model of GAD: Assessment of meta-worry and relationship with DSM-IV generalized anxiety disorder. *Cognitive Therapy and Research*, *29*(1), 107-121. https://doi.org/10.1007/s10608-005-1652-0

Wells, A., & Carter, K. (2001). Further tests of a cognitive model of generalized anxiety disorder: Metacognitions and worry in GAD, panic disorder, social phobia, depression, and nonpatients. *Behavior 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

Yang, Z., Wang, R., Chen, H., & Ding, J. (2015). Personality and worry: The role of intolerance of uncertainty. *Social Behavior and Personality, 43*(10), 1607–1616. http://dx.doi.org/10.2224/sbp.2015.43.10.1607

Appendix A

Study 1 Consent Form

MacEwan UNIVERSITY | PSYCHOLOGY

Consent Form

Project Title: Examining anxiety sensitivity, metacognitions, and anxiety symptoms

Researchers:

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Purpose of the Research:

This study aims to investigate the role metacognitions (i.e., the beliefs you have about your thoughts) may play in the relationship between anxiety sensitivity (i.e., the beliefs you have about experiencing anxiety) and excessive worry/generalized anxiety disorder symptoms.

Procedures:

- You will be asked to complete a series of questionnaires regarding your general level of anxiety and worry, as well as your thoughts/beliefs about anxiety and worry.
- You may complete the survey anywhere that you feel comfortable and that has a secure internet connection.
- The study should not take more than 20 minutes to complete.

Potential Risks:

- The study is of minimal risk. There are no known or anticipated risks associated with participating in this research.
- Although 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.
- After completing the study, you will be provided with a debriefing form that will contain contact information for a list of services at your disposal should you experience any residual distress.

Potential Benefits:

- You will gain knowledge about how research in the field of psychology is conducted.

- You will be contributing to the psychological literature on anxiety sensitivity, metacognitions, worry, and generalized anxiety disorder.
- You will leave with a better understanding of your own worries, thoughts, and anxiety.

Compensation:

- You may be eligible to receive up to a 2% course-credit for your participation in this study, as determined by Department of Psychology protocols. You may contact the research pool coordinator, Danielle Striemer (striemerd@macewan.ca), if you have questions regarding research participation credits.

Confidentiality/Anonymity:

- Your participation in this study is both anonymous and voluntary.
- You may skip any questions you do not wish to answer and/or discontinue the study at any time without penalty
- Please do not include any personally identifying information on survey materials (i.e., do not include your name).
- Data is recorded through Qualtrics, an Irish and American company, and all data collected through Qualtrics will be subject to the privacy and security laws of Ireland, the European Union, and the United States of America. Qualtrics may record the IP address of participants completing surveys, however Qualtrics claims this information will in no way be connected the information recorded from participant surveys. Additional information on Qualtrics privacy and security policies can be found at http://www.qualtrics.com/security-statement/ and http://www.qualtrics.com/privacy-statement/.

Right to Withdraw:

- Your participation in this study is voluntary. You are not obligated to answer any 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. To withdraw from the study simply exit your browser.
- Whether you decide to participate or not in the study will not affect your treatment or standing within your class.

- Once you submit your survey, the researchers will be unable to withdraw your data as it contains no identifying information.

Anticipated use of the data and dissemination of the results:

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

Questions or Concerns:

- If you have questions or concerns regarding this study, please contact Kevin Styba-Nelson (stybanelsonk@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.

Filling out this form indicates that I have read and understand the description provided. I consent to participate in the research project.

___ I consent, and wish to participate in the study

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

Appendix B

Study 1 Scales

We want to quickly remind you that this is a scientific research project. The findings of psychological research at MacEwan University are published in scientific journals. Our research aims to advance the collective understanding of important topics, such as mental health.

The advancement of psychological science relies on you for your careful and serious participation.

This study will not take long to complete. So, please think carefully about each questionnaire, and answer each item honestly. Answering honestly will ensure that the findings from this study are accurate and meaningful.

Thank you!

___ I understand and wish to continue

___ I do not wish to continue

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
___ X - Not Listed (please specify): _____
___Unsure/don't know
___Prefer not to specify

2) What is your current gender/gender identity?

___Man
___Woman
___Trans Man - Female to Male (FtM)
___Trans Woman - Male to Female (MtF)
___Two-Spirit
___Non-Binary
___Not Listed (please specify): _____
___Unsure/Don't know
___Prefer not to specify

3) What is your age in years? _____

4) Which of the following <u>best</u> describes how you identify?

___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
___Not Listed (please specify): _____
___Unsure/Don't know
___Prefer not to specify

5) What is your current marital status?

__Single
__Dating
__Married/common law
__Divorced/separated
__Widowed

6) Do you consider English to be your first language (often called one's mother/native tongue)?

__Yes
__No

7) Are you currently employed?

__Full Time
__Part Time
__Retired
__No

8) Are you currently a MacEwan University student?

__Yes – Full Time
__Yes – Part Time
__No

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

___None/Not applicable
Condition A: _____
Condition B: _____
Condition C: _____
Condition D: _____
Condition E: _____
Condition F: _____

GADQ-IV

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? Please select 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.?

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)?

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. To ensure the validity of your responses, please select number 3 for this item

1 2 3 4

26. It is bad to think certain thoughts

1 2 3 4

27. I do not trust my memory

1 2 3 4

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

1 2 3 4

29. I need to worry in order to work well

1 2 3 4

30. I have little confidence in my memory for actions

1 2 3 4

31. I constantly examine my thoughts

1 2 3 4

PSWQ

Please select the option 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.	To ensure the validity of your responses, please select number 2 for this item.	1	2	3	4	5
8.	I am always worrying about something.	1	2	3	4	5
9.	I find it easy to dismiss worrisome thoughts.	1	2	3	4	5
10.	As soon as I finish one task, I start to worry about everything else I have to do.	1	2	3	4	5
11.	I never worry about anything.	1	2	3	4	5
12.	When there is nothing more that I can do about a concern, I don't worry about it anymore.	1	2	3	4	5
13.	I've been a worrier all my life.	1	2	3	4	5
14.	I notice that I have been worrying about things.	1	2	3	4	5
15.	Once I start worrying, I can't stop.	1	2	3	4	5
16.	I worry all the time.	1	2	3	4	5
17.	I worry about projects until they are done.	1	2	3	4	5

ASI-3

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

Very little	A little	Some	Much	Very Much
0	1	2	3	4

1. It is important for me not to appear nervous.

0 1 2 3 4

2. When I cannot keep my mind on a task, I worry that I might be going crazy.

0 1 2 3 4

3. It scares me when my heart beats rapidly.

0 1 2 3 4

4. When my stomach is upset, I worry that I might be seriously ill.

0 1 2 3 4

5. It scares me when I am unable to keep my mind on a task.

0 1 2 3 4

6. When I tremble in the presence of others, I fear what people might think of me.

0 1 2 3 4

7. When my chest feels tight, I get scared that I won't be able to breathe properly.

0 1 2 3 4

8. When I feel pain in my chest, I worry that I am going to have a heart attack.

0 1 2 3 4

9. To ensure the validity of your responses, please select number 4 for this item.

0 1 2 3 4

Very little	A little	Some	Much	Very Much
0	1	2	3	4

10. I worry that other people will notice my anxiety.

0 1 2 3 4

11. When I feel “spacey” or spaced out I worry that I may be mentally ill.

0 1 2 3 4

12. It scares me when I blush in front of people.

0 1 2 3 4

13. When I notice my heart skipping a beat, I worry that there is something seriously wrong with me.

0 1 2 3 4

14. When I begin to sweat in a social situation, I fear people will think negatively of me.

0 1 2 3 4

15. When my thoughts seem to speed up, I worry that I might be going crazy.

0 1 2 3 4

16. When my throat feels tight, I worry that I could choke to death.

0 1 2 3 4

17. When I have trouble thinking clearly, I worry that there is something wrong with me.

0 1 2 3 4

18. I think it would be horrible for me to faint in public.

0 1 2 3 4

19. When my mind goes blank, I worry there is something terribly wrong with me.

0 1 2 3 4

Appendix C

Study 1 Debriefing Form

MacEwan UNIVERSITY | PSYCHOLOGY

Debriefing Form

Thank you for completing the study!

The purpose of the study you just completed is to analyse the relationship between anxiety sensitivity and metacognitions, and how they may interact to predict worry severity/symptoms of generalized anxiety disorder (GAD). Specifically, we are investigating if a person's level of metacognitions will influence the degree to which anxiety sensitivity is predictive of GAD.

GAD is a relatively common mental disorder that is defined by excessive and difficult to control worry. Anxiety sensitivity is an anxiety-related mechanism that is commonly defined as the fear of anxiety and its consequences. Metacognitions are a type of thought that focuses on one's own thoughts. We are particularly interested in two metacognitive beliefs known as positive beliefs about worry and negative beliefs about worry. Positive beliefs about worry are metacognitions that worrying has beneficial or positive outcomes. Negative beliefs about worry are metacognitions that worry is dangerous or uncontrollable.

While there is research establishing relationships between anxiety sensitivity and GAD, and metacognitions and GAD, there is a lack of research examining how anxiety sensitivity and metacognitions may interact in this context. The information you have provided will help further the scientific community's understanding of this relationship and may prove beneficial to the future treatment of those with GAD.

Please note: Your participation in this study does not mean you have GAD.

This study is not intended to diagnose or treat any disorder. Participation in this study is in no way an indication that you have GAD. Participation in this study in no way indicates you have abnormal levels of worry, anxiety, metacognitions, or anxiety sensitivity.

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.
- 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 **780-497-5063**.
- Crisis Response is also available at **780-482-HELP (4357)**.

If you have any further questions about the study, you can contact the researchers directly via email (Kevin Styba-Nelson: **stybanelsonk@mymacewan.ca** or Dr. Alexander Penney: **Alexander.Penney@MacEwan.ca**).

Thank you again for your participation.

Appendix D

Supplimetnal tables

Table D1.

Main and interaction effects of ASI-3, MCQ-NBW, and MCQ-PBW in predicting GADQ-IV

	Coefficient	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
Constant	-2.3894	0.4747	-5.03	<.0001	-3.3217	-1.4571
ASI-3	0.1482	0.0194	7.65	<.0001	0.1102	0.1863
MCQ-NBW	0.5191	0.0270	19.21	<.0001	0.4660	0.5722
Int. 1 ASI-3 x MCQ-NBW	-0.0046	0.0010	-4.86	<.0001	-0.0065	-0.0028
MCQ-PBW	0.1731	0.0311	5.57	<.0001	0.1120	0.2341
Int. 2 ASI-3 x MCQ-PBW	-0.0034	0.0010	-3.44	.0006	-0.0053	-0.0014

Note. GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; ASI-3 = Anxiety Sensitivity Index-3; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D2.

Conditional effects of ASI-3, MCQ-NBW, and MCQ-PBW in predicting GADQ-IV

MCQ-NBW	MCQ-PBW	Effect	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
10.0	8.0	0.0751	0.0095	7.92	<.0001	0.0565	0.0937
10.0	12.0	0.0616	0.0088	7.00	<.0001	0.0443	0.0789
10.0	18.0	0.0414	0.0108	3.83	.0001	0.0202	0.0626
16.0	8.0	0.0473	0.0073	6.45	<.0001	0.0329	0.0618
16.0	12.0	0.0339	0.0056	6.09	<.0001	0.0230	0.0448
16.0	18.0	0.0137	0.0074	1.86	.0635	-0.0008	0.0281
21.0	8.0	0.0242	0.0086	2.82	.0049	0.0074	0.0411
21.0	12.0	0.0108	0.0065	1.67	.0964	-0.0019	0.0234
21.0	18.0	-0.0094	0.0072	-1.32	.1885	-0.0235	0.0046

Note. GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; ASI-3 = Anxiety Sensitivity Index-3; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D3.

Main and interaction effects of ASI-physical, MCQ-NBW, and MCQ-PBW in predicting GADQ-IV

	Coefficient	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
Constant	-1.3753	0.4016	-3.42	0.0007	-2.1641	-0.5865
ASI-physical	0.3597	0.0564	6.37	<.0001	0.2488	0.4705
MCQ-NBW	0.4923	0.0231	21.35	<.0001	0.4470	0.5376
Int. 1 ASI-physical x MCQ-NBW	-0.0111	0.0028	-4.02	.0001	-0.0165	-0.0057
MCQ-PBW	0.1430	0.0261	5.47	<.0001	0.0916	0.1943
Int. 2 ASI-physical x MCQ-PBW	-0.0081	0.0028	-2.92	.0036	-0.0136	-0.0027

Note. GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; ASI-physical = Anxiety Sensitivity Index Physical; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D4.

Conditional effects of ASI- physical, MCQ-NBW, and MCQ-PBW in predicting GADQ-IV

MCQ-NBW	MCQ-PBW	Effect	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
10.0	8.0	0.1840	0.0274	6.71	<.0001	0.1301	0.2379
10.0	12.0	0.1515	0.0257	5.89	<.0001	0.1010	0.2020
10.0	18.0	0.1027	0.0314	3.27	.0011	0.0410	0.1644
16.0	8.0	0.1176	0.0202	5.82	<.0001	0.0779	0.1573
16.0	12.0	0.0851	0.0152	5.60	<.0001	0.0552	0.1150
16.0	18.0	0.0363	0.0207	1.75	.0800	-0.0044	0.0771
21.0	8.0	0.0623	0.0232	2.68	.0075	0.0167	0.1079
21.0	12.0	0.0298	0.0171	1.75	.0813	-0.0037	0.0633
21.0	18.0	-0.0190	0.0196	-0.97	.3325	-0.0574	0.0195

Note. GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; ASI-physical = Anxiety Sensitivity Index Physical; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D5.

Main and interaction effects of ASI-social, MCQ-NBW, and MCQ-PBW in predicting GADQ-IV

	Coefficient	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
Constant	-2.5511	0.5615	-4.54	<.0001	-3.6540	-1.4482
ASI-social	0.2904	0.0489	5.93	<.0001	0.1943	0.3865
MCQ-NBW	0.5426	0.0304	17.83	<.0001	0.4828	0.6023
Int. 1 ASI-social x MCQ-NBW	-0.0098	0.0025	-3.97	.0001	-0.0146	-0.0049
MCQ-PBW	0.1689	0.0356	4.74	<.0001	0.0989	0.2388
Int. 2 ASI-social x MCQ-PBW	-0.0067	0.0026	-2.57	.0104	-0.0119	-0.0016

Note. GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; ASI-social = Anxiety Sensitivity Index Social; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D6.

Conditional effects of ASI-social, MCQ-NBW, and MCQ-PBW in predicting GADQ-IV

MCQ-NBW	MCQ-PBW	Effect	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
10.0	8.0	0.1391	0.0222	6.27	<.0001	0.0955	0.1826
10.0	12.0	0.1122	0.0198	5.66	<.0001	0.0733	0.1511
10.0	18.0	0.0718	0.0256	2.81	.0052	0.0216	0.1221
16.0	8.0	0.0805	0.0181	4.45	<.0001	0.0450	0.1161
16.0	12.0	0.0536	0.0131	4.11	<.0001	0.0280	0.0793
16.0	18.0	0.0133	0.0186	0.71	.4752	-0.0233	0.0499
21.0	8.0	0.0318	0.0228	1.39	.1644	-0.0131	0.0766
21.0	12.0	0.0049	0.0178	0.27	.7842	-0.0301	0.0398
21.0	18.0	-0.0355	0.0205	-1.73	.0845	-0.0758	0.0048

Note. GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; ASI-social = Anxiety Sensitivity Index Social; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D7.

Main and interaction effects of ASI-cognitive, MCQ-NBW, and MCQ-PBW in predicting GADQ-IV

	Coefficient	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
Constant	-1.5170	0.3943	-3.85	.0001	-2.2914	-0.7425
ASI-cognitive	0.3769	0.0513	7.35	<.0001	0.2761	0.4777
MCQ-NBW	0.4935	0.0233	21.16	<.0001	0.4477	0.5393
Int. 1 ASI-cognitive x MCQ-NBW	-0.0116	0.0025	-4.57	<.0001	-0.0166	-0.0066
MCQ-PBW	0.1561	0.0262	5.96	<.0001	0.1046	0.2076
Int. 2 ASI-cognitive x MCQ-PBW	-0.0091	0.0026	-3.54	.0004	-0.0141	-0.0040

Note. GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; ASI-cognitive = Anxiety Sensitivity Index cognitive; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D8.

Conditional effects of ASI-cognitive, MCQ-NBW, and MCQ-PBW in predicting GADQ-IV

MCQ-NBW	MCQ-PBW	Effect	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
10.0	8.0	0.1879	0.0256	7.35	<.0001	0.1377	0.2381
10.0	12.0	0.1515	0.0240	6.32	<.0001	0.1045	0.1986
10.0	18.0	0.0970	0.0292	3.32	.0010	0.0396	0.1543
16.0	8.0	0.1181	0.0197	5.99	<.0001	0.0794	0.1569
16.0	12.0	0.0818	0.0149	5.47	<.0001	0.0524	0.1111
16.0	18.0	0.0272	0.0193	1.41	.1580	-0.0106	0.0651
21.0	8.0	0.0600	0.0229	2.62	.0090	0.0150	0.1050
21.0	12.0	0.0236	0.0169	1.40	.1630	-0.0096	0.0569
21.0	18.0	-0.0309	0.0181	-1.71	.0874	-0.0664	0.0046

Note. GADQ-IV = Generalized Anxiety Disorder Questionnaire-IV; ASI-cognitive = Anxiety Sensitivity Index cognitive; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D9.
Main and interaction effects of ASI-3, MCQ-NBW, and MCQ-PBW in predicting PSWQ

	Coefficient	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
Constant	14.0473	1.9086	7.36	<.0001	10.2985	17.7961
ASI-3	0.6158	0.0779	7.90	<.0001	0.4627	0.7688
MCQ-NBW	2.1682	0.1087	19.95	<.0001	1.9547	2.3817
Int. 1 ASI-3 x MCQ-NBW	-0.0174	0.0038	-4.55	<.0001	-0.0249	-0.0099
MCQ-PBW	0.7932	0.1250	6.34	<.0001	0.5476	1.0387
Int. 2 ASI-3 x MCQ-PBW	-0.0154	0.0039	-3.90	.0001	-0.0231	-0.0076

Note. PSWQ = Penn State Worry Questionnaire; ASI-3 = Anxiety Sensitivity Index-3; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D10.
Conditional effects of ASI-3, MCQ-NBW, and MCQ-PBW in predicting PSWQ

MCQ-NBW	MCQ-PBW	Effect	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
10.0	8.0	0.3188	0.0381	8.37	<.0001	0.2440	0.3937
10.0	12.0	0.2573	0.0354	7.27	<.0001	0.1877	0.3268
10.0	18.0	0.1649	0.0435	3.80	.0002	0.0796	0.2503
16.0	8.0	0.2145	0.0295	7.27	<.0001	0.1566	0.2725
16.0	12.0	0.1530	0.0223	6.85	<.0001	0.1091	0.1969
16.0	18.0	0.0606	0.0296	2.05	.0407	0.0026	0.1187
21.0	8.0	0.1276	0.0345	3.70	.0002	0.0598	0.1954
21.0	12.0	0.0661	0.0260	2.54	.0112	0.0150	0.1171
21.0	18.0	-0.0263	0.0289	-0.91	.3628	-0.0829	0.0304

Note. PSWQ = Penn State Worry Questionnaire; ASI-3 = Anxiety Sensitivity Index-3; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D11.

Main and interaction effects of ASI-physical, MCQ-NBW, and MCQ-PBW in predicting PSWQ

	Coefficient	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
Constant	16.9053	1.5962	10.59	<.0001	13.7702	20.0405
ASI-physical	1.7336	0.2243	7.73	<.0001	1.2930	2.1741
MCQ-NBW	2.1134	0.0916	23.06	<.0001	1.9334	2.2934
Int. 1 ASI-physical x MCQ-NBW	-0.0485	0.0109	-4.43	<.0001	-0.0700	-0.0270
MCQ-PBW	0.7206	0.1039	6.94	<.0001	0.5165	0.9247
Int. 2 ASI-physical x MCQ-PBW	-0.0467	0.0111	-4.22	<.0001	-0.0684	-0.0250

Note. PSWQ = Penn State Worry Questionnaire; ASI-physical = Anxiety Sensitivity Index Physical; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D12.

Conditional effects of ASI-physical, MCQ-NBW, and MCQ-PBW in predicting PSWQ

MCQ-NBW	MCQ-PBW	Effect	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
10.0	8.0	0.8748	0.1091	8.02	<.0001	0.6606	1.0890
10.0	12.0	0.6881	0.1022	6.74	<.0001	0.4874	0.8887
10.0	18.0	0.4080	0.1249	3.27	.0011	0.1628	0.6532
16.0	8.0	0.5836	0.0803	7.26	<.0001	0.4258	0.7414
16.0	12.0	0.3969	0.0604	6.57	<.0001	0.2782	0.5156
16.0	18.0	0.1168	0.0824	1.42	.1568	-0.0450	0.2786
21.0	8.0	0.3409	0.0923	3.69	.0002	0.1597	0.5222
21.0	12.0	0.1542	0.0678	2.28	.0233	0.0211	0.2874
21.0	18.0	-0.1259	0.0778	-1.62	.1061	-0.2786	0.0269

Note. PSWQ = Penn State Worry Questionnaire; ASI-physical = Anxiety Sensitivity Index Physical; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D13.
Main and interaction effects of ASI-social, MCQ-NBW, and MCQ-PBW in predicting PSWQ

	Coefficient	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
Constant	13.7584	2.2408	6.14	<.0001	9.3572	18.1597
ASI-social	1.2317	0.1953	6.31	<.0001	0.8481	1.6153
MCQ-NBW	2.2362	0.1214	18.42	<.0001	1.9977	2.4747
Int. 1 ASI-social x MCQ-NBW	-0.0367	0.0098	-3.75	.0002	-0.0560	-0.0175
MCQ-PBW	0.7161	0.1420	5.04	<.0001	0.4372	0.9951
Int. 2 ASI-social x MCQ-PBW	-0.0268	0.0104	-2.57	.0105	-0.0473	-0.0063

Note. PSWQ = Penn State Worry Questionnaire; ASI-social = Anxiety Sensitivity Index Social; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D14.
Conditional effects of ASI-social, MCQ-NBW, and MCQ-PBW in predicting PSWQ

MCQ-NBW	MCQ-PBW	Effect	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
10.0	8.0	0.6500	0.0885	7.35	<.0001	0.4762	0.8238
10.0	12.0	0.5428	0.0790	6.87	<.0001	0.3875	0.6981
10.0	18.0	0.3820	0.1021	3.74	.0002	0.1816	0.5825
16.0	8.0	0.4296	0.0722	5.95	<.0001	0.2879	0.5713
16.0	12.0	0.3224	0.0521	6.19	<.0001	0.2201	0.4247
16.0	18.0	0.1616	0.0743	2.18	.0300	0.0157	0.3075
21.0	8.0	0.2459	0.0911	2.70	.0071	0.0670	0.4248
21.0	12.0	0.1387	0.0710	1.95	.0513	-0.0008	0.2783
21.0	18.0	-0.0220	0.0819	-0.27	.7880	-0.1829	0.1389

Note. PSWQ = Penn State Worry Questionnaire; ASI-social = Anxiety Sensitivity Index Social; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D15.

Main and interaction effects of ASI-cognitive, MCQ-NBW, and MCQ-PBW in predicting PSWQ

	Coefficient	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
Constant	18.6968	1.6243	11.51	<.0001	15.5064	21.8872
ASI-cognitive	1.2149	0.2114	5.75	<.0001	0.7997	1.6300
MCQ-NBW	2.0664	0.0961	21.50	<.0001	1.8777	2.2552
Int. 1 ASI- cognitive x MCQ-NBW	-0.0323	0.0105	-3.08	.0022	-0.0529	-0.0117
MCQ-PBW	0.6916	0.1080	6.41	<.0001	0.4795	0.9036
Int. 2 ASI- cognitive x MCQ-PBW	-0.0367	0.0106	-3.47	.0006	-0.0575	-0.0159

Note. PSWQ = Penn State Worry Questionnaire; ASI-cognitive = Anxiety Sensitivity Index cognitive; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Table D16.

Conditional effects of ASI-cognitive, MCQ-NBW, and MCQ-PBW in predicting PSWQ

MCQ-NBW	MCQ-PBW	Effect	Std. Error	*t*	*p*	95% CI Lower	95% CI Upper
10.0	8.0	0.5983	0.1053	5.68	<.0001	0.3914	0.8051
10.0	12.0	0.4515	0.0987	4.57	<.0001	0.2575	0.6454
10.0	18.0	0.2312	0.1203	1.92	.0550	-0.0050	0.4674
16.0	8.0	0.4045	0.0812	4.98	<.0001	0.2450	0.5641
16.0	12.0	0.2577	0.0616	4.19	<.0001	0.1368	0.3786
16.0	18.0	0.0375	0.0793	0.47	.6371	-0.1184	0.1933
21.0	8.0	0.2431	0.0943	2.58	.0102	0.0578	0.4284
21.0	12.0	0.0962	0.0697	1.38	.1681	-0.0407	0.2332
21.0	18.0	-0.1240	0.0744	-1.67	.0959	-0.2701	0.0221

Note. PSWQ = Penn State Worry Questionnaire; ASI-cognitive = Anxiety Sensitivity Index cognitive; MCQ-NBW = Metacognitions Questionnaire Negative Beliefs about Worry; MCQ-PBW = Metacognitions Questionnaire Positive Beliefs about Worry.

Appendix E

Study 2 Consent Form

MacEwan UNIVERSITY | PSYCHOLOGY

Consent Form

Project Title: Personality, beliefs, and worry

Researchers:

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Purpose of the Research:

This study aims to investigate how neuroticism (i.e., the personality trait of experiencing negative emotions) relates to peoples' beliefs regarding anxiety and uncertain future events. This study also aims to investigate how these beliefs, alongside metacognitions (i.e., the beliefs you have about your own thoughts), may influence how much your worry.

Procedures:

- You will be asked to complete a series of questionnaires regarding your personality, your beliefs about anxiety and worry, and how much your worry.
- You may complete the survey anywhere that you feel comfortable and that has a secure internet connection.
- The study should take less than 25 minutes to complete.

Potential Risks:

- The study is of minimal risk. There are no known or anticipated risks associated with participating in this research.
- Although unlikely, you may feel discomfort upon disclosing personal information. Please feel free to skip any questions that you feel do not feel comfortable answering. You may also withdraw at any time.
- After completing the study, you will be provided with a debriefing form that will contain contact information for a list of services at your disposal should you experience any residual distress.

Potential Benefits:

- You will gain knowledge about how research in the field of psychology is conducted.
- You will be contributing to the psychological literature on the influence of personality and beliefs on worry and anxiety.
- You will leave with a better understanding of your own worries, thoughts, and anxiety.

Compensation:

- You may be eligible to receive compensation for your participation in this study. The compensation would have been explained to you when you were invited to participate in this study, and you will be compensated the amount you agreed upon before you entered the study. Please note that Kevin Styba-Nelson and Dr. Alexander Penney do not provide direct compensation and cannot assist you with collecting your compensation.

Confidentiality/Anonymity:

- Your participation in this study is both anonymous and voluntary.
- You may skip any questions you do not wish to answer and/or discontinue the study at any time.
- Please do not include any personally identifying information on survey materials (i.e., do not include your name).
- Data is recorded through Qualtrics, an Irish and American company, and all data collected through Qualtrics will be subject to the privacy and security laws of Ireland, the European Union, and the United States of America. Qualtrics may record the IP address of participants completing surveys, however Qualtrics claims this information will in no way be connected the information recorded from participant surveys. Additional information on Qualtrics privacy and security policies can be found at http://www.qualtrics.com/security-statement/ and http://www.qualtrics.com/privacy-statement/.

Right to Withdraw:

- Your participation in this study is voluntary. You are not obligated to answer any 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. To withdraw from the study simply exit your browser.
- The researchers will be unable to withdraw your data as it contains no identifying information.

Anticipated use of the Data and Dissemination of the Results:

- The data collected will only be used for research purposes. The anonymous data gathered in this study may be presented at academic conferences or in research publications. The data will be reported in aggregate form, so that it will not be possible to identify individuals. The anonymized dataset may also be posted to data depository websites, where it would be made available to other researchers and the broader public in perpetuity in support of open and transparent research practices. Your confidentiality is assured.

Questions or Concerns:

- If you have questions or concerns regarding this study, please contact Kevin Styba-Nelson (stybanelsonk@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.

Filling out this form indicates that I have read and understand the description provided. I consent to participate in the research project.

___ I consent, and wish to participate in the study

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

Appendix F

Study 2 Scales

We want to quickly remind you that this is a scientific research project. The findings of psychological research at MacEwan University are published in scientific journals. Our research aims to advance the collective understanding of important topics, such as mental health.

The advancement of psychological science relies on you for your careful and serious participation.

This study will not take long to complete. So, please think carefully about each questionnaire, and answer each item honestly. Answering honestly will ensure that the findings from this study are accurate and meaningful.

Thank you!

___ I understand and wish to continue

___ I do not wish to continue

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
___ X - Not Listed (please specify): _____
___Unsure/Don't know
___Prefer not to specify

2) What is your current gender/gender identity?

___Man
___Woman
___Trans Man - Female to Male (FtM)
___Trans Woman - Male to Female (MtF)
___Two-Spirit
___Non-Binary
___Not Listed (please specify): _____
___Unsure/Don't know
___Prefer not to specify

3) What is your age in years? _____

4) Which of the following <u>best</u> describes how you identify?

___Caucasian/White
___Black
___Indigenous/First Nations/Inuit/Métis
___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
___Not listed (please specify): _____
___Unsure/Don't know
___Prefer not to specify

5) What is your current marital status?

__Single
__Dating
__Married/common law
__Divorced/separated
__Widowed

6) Do you consider English to be your first language (often called one's mother/native tongue)?

__Yes
__No

7) Are you currently employed?

__Full Time
__Part Time
__Retired
__No

8) What is your highest level of education?

__Completed a Masters/Doctoral/Medical/Legal degree
__Completed an undergraduate degree/college diploma
__Some university/college
__Completed high school diploma
__Some high school

9) What province/territory were you born in?

__Alberta
__British Columbia
__Manitoba
__New Brunswick
__Newfoundland and Labrador
__Northwest Territories
__Nova Scotia
__Nunavut
__Ontario
__Prince Edward Island
__Quebec
__Saskatchewan
__Yukon

__Not listed (please specify Nation and Province/Territory/State):
_____

10) What province/territory do you currently reside in?

__Alberta
__British Columbia
__Manitoba
__New Brunswick
__Newfoundland and Labrador
__Northwest Territories
__Nova Scotia
__Nunavut
__Ontario
__Prince Edward Island
__Quebec
__Saskatchewan
__Yukon
__Not listed (please specify Nation and Province/Territory/State):
_____

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

___None/Not applicable

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

GADQ-IV

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? Please select 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.?

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)?

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. To ensure the validity of your responses, please select number 3 (Agree Moderately) for this item

1 2 3 4

26. It is bad to think certain thoughts

1 2 3 4

27. I do not trust my memory

1 2 3 4

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

1 2 3 4

29. I need to worry in order to work well

1 2 3 4

30. I have little confidence in my memory for actions

1 2 3 4

31. I constantly examine my thoughts

1 2 3 4

PSWQ

Please select the option 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

18.	If I don't have enough time to do everything, I don't worry about it.	1	2	3	4	5
19.	My worries overwhelm me.	1	2	3	4	5
20.	I don't tend to worry about things.	1	2	3	4	5
21.	Many situations make me worry.	1	2	3	4	5
22.	I know I shouldn't worry about things, but I just can't help it.	1	2	3	4	5
23.	When I'm under pressure, I worry a lot.	1	2	3	4	5
24.	To ensure the validity of your responses, please select number 2 for this item.	1	2	3	4	5
25.	I am always worrying about something.	1	2	3	4	5
26.	I find it easy to dismiss worrisome thoughts.	1	2	3	4	5
27.	As soon as I finish one task, I start to worry about everything else I have to do.	1	2	3	4	5
28.	I never worry about anything.	1	2	3	4	5
29.	When there is nothing more that I can do about a concern, I don't worry about it anymore.	1	2	3	4	5
30.	I've been a worrier all my life.	1	2	3	4	5
31.	I notice that I have been worrying about things.	1	2	3	4	5
32.	Once I start worrying, I can't stop.	1	2	3	4	5
33.	I worry all the time.	1	2	3	4	5
34.	I worry about projects until they are done.	1	2	3	4	5

ASI-3

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

Very little	A little	Some	Much	Very Much
0	1	2	3	4

1. It is important for me not to appear nervous.

0 1 2 3 4

2. When I cannot keep my mind on a task, I worry that I might be going crazy.

0 1 2 3 4

3. It scares me when my heart beats rapidly.

0 1 2 3 4

4. When my stomach is upset, I worry that I might be seriously ill.

0 1 2 3 4

5. It scares me when I am unable to keep my mind on a task.

0 1 2 3 4

6. When I tremble in the presence of others, I fear what people might think of me.

0 1 2 3 4

7. When my chest feels tight, I get scared that I won't be able to breathe properly.

0 1 2 3 4

8. When I feel pain in my chest, I worry that I am going to have a heart attack.

0 1 2 3 4

9. To ensure the validity of your responses, please select number 4 (Very Much) for this item.

0 1 2 3 4

Very little	A little	Some	Much	Very Much
0	1	2	3	4

10. I worry that other people will notice my anxiety.

0 1 2 3 4

11. When I feel “spacey” or spaced out I worry that I may be mentally ill.

0 1 2 3 4

12. It scares me when I blush in front of people.

0 1 2 3 4

13. When I notice my heart skipping a beat, I worry that there is something seriously wrong with me.

0 1 2 3 4

14. When I begin to sweat in a social situation, I fear people will think negatively of me.

0 1 2 3 4

15. When my thoughts seem to speed up, I worry that I might be going crazy.

0 1 2 3 4

16. When my throat feels tight, I worry that I could choke to death.

0 1 2 3 4

17. When I have trouble thinking clearly, I worry that there is something wrong with me.

0 1 2 3 4

18. I think it would be horrible for me to faint in public.

0 1 2 3 4

19. When my mind goes blank, I worry there is something terribly wrong with me.

0 1 2 3 4

IUS-20

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. Uncertainty keeps me from living a full life.

   1 2 3 4 5

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

   1 2 3 4 5

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

   1 2 3 4 5

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

   1 2 3 4 5

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

    1 2 3 4 5

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

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

1 2 3 4 5

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

1 2 3 4 5

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

1 2 3 4 5

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

1 2 3 4 5

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

1 2 3 4 5

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

1 2 3 4 5

17. The smallest doubt can stop me from acting.

1 2 3 4 5

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

1 2 3 4 5

19. Being uncertain means that I lack confidence.

1 2 3 4 5

20. I must get away from all uncertain situations.

1 2 3 4 5

Big Five Inventory–2 (BFI-2) – Extraversion & Neuroticism Only

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who *likes to spend time with others?* Please choose an option for each statement to indicate the extent to which you agree or disagree with that statement.

Disagree Strongly	Disagree a little	Neutral; no opinion	Agree a Little	Agree Strongly
1	2	3	4	5

I am someone who...

1. Is outgoing, sociable.

   1 2 3 4 5

2. Is relaxed, handles stress well.

   1 2 3 4 5

3. Has an assertive personality.

   1 2 3 4 5

4. Stays optimistic after experiencing a setback.

   1 2 3 4 5

5. Rarely feels excited or eager.

   1 2 3 4 5

6. Is moody, has up and down mood swings.

   1 2 3 4 5

7. Tends to be quiet.

   1 2 3 4 5

8. Can be tense.

   1 2 3 4 5

9. Is dominant, acts as a leader.

   1 2 3 4 5

10. Feels secure, comfortable with self.

    1 2 3 4 5

Disagree Strongly	Disagree a little	Neutral; no opinion	Agree a Little	Agree Strongly
1	2	3	4	5

I am someone who...

11. Is less active than other people.

1 2 3 4 5

12. Is emotionally stable, not easily upset.

1 2 3 4 5

13. Is sometimes shy, introverted.

1 2 3 4 5

14. Worries a lot.

1 2 3 4 5

15. Finds it hard to influence people.

1 2 3 4 5

16. Often feels sad.

1 2 3 4 5

17. Is full of energy.

1 2 3 4 5

18. Keeps their emotions under control.

1 2 3 4 5

19. Is talkative.

1 2 3 4 5

20. Rarely feels anxious or afraid.

1 2 3 4 5

Disagree Strongly	Disagree a little	Neutral; no opinion	Agree a Little	Agree Strongly
1	2	3	4	5

I am someone who...

21. Prefers to have others take charge.

1	2	3	4	5

22. Tends to feel depressed, blue.

1	2	3	4	5

23. Shows a lot of enthusiasm.

1	2	3	4	5

24. Is temperamental, gets emotional easily.

1	2	3	4	5

Appendix G

Study 2 Debriefing Form

MacEwan UNIVERSITY | PSYCHOLOGY

Debriefing Form

Thank you for completing the study!

The purpose of the study you just completed is to investigate how people's tendencies to experience negative emotions, as well as people's beliefs about anxiety and uncertainty, are related to excessive worrying and the symptoms of generalized anxiety disorder. We also plan to investigate how people's beliefs about worry being useful or harmful influence how much they worry.

Generalized anxiety disorder is a relatively common mental disorder where people worry excessively and have a difficult time controlling their worry. People who experience more negative emotions are more likely to worry excessively and develop generalized anxiety disorder, and people who believe that anxiety and uncertainty are harmful are also more likely to experiencing symptoms of generalized anxiety disorder.

We want to investigate if people's tendency to experience negative emotions influences their beliefs about anxiety and uncertainty being harmful, and whether this leads to a higher likelihood of having generalized anxiety disorder symptoms. We also want to investigate how people's beliefs about worrying (i.e., whether you believe it is useful and/or harmful) might influence those other factors.

The information you have provided will help further the scientific community's understanding of these relationships and may prove beneficial to the future treatment of those with generalized anxiety disorder.

Please note: Your participation in this study does not mean you have generalized anxiety disorder.

This study is not intended to diagnose or treat any disorder. Participation in this study is in no way an indication that you have generalized anxiety disorder. Participation in this study in no way indicates you have abnormal levels of worry or 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.
- You may wish to speak to a primary health care professional if you experience any lingering distress following the completion of the study.
- Additional telephone and online mental health services are available here:
    - www.canada.ca/en/public-health/services/mental-health-services/mental-health-get-help.html

If you have any further questions about the study, you can contact the researchers directly via email (Kevin Styba-Nelson: **stybanelsonk@mymacewan.ca** or Dr. Alexander Penney: **Alexander.Penney@MacEwan.ca**).

Thank you again for your participation.