CBT and Interpretation Bias Modification for Generalized Anxiety Disorder: Examining the Roles of Intolerance of Uncertainty and Interpretation Bias in Symptom Reduction

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ABSTRACT

CBT and Interpretation Bias Modification for Generalized Anxiety Disorder: Examining the Roles of Intolerance of Uncertainty and Interpretation Bias in Symptom Reduction

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Generalized Anxiety Disorder (GAD) is characterized by excessive worry and anxiety (APA, 2013). Although cognitive behaviour therapy (CBT) is efficacious, 20-50% of individuals with GAD continue to meet diagnostic criteria following treatment (Hanrahan et al., 2013). To improve outcomes, it is essential that we develop a better understanding of the factors involved in symptom reduction and ensure that these factors are targeted effectively. Two factors that are associated with excessive worry and anxiety are intolerance of uncertainty (IU) and negative interpretation bias (Ladouceur et al., 2000; Rosen & Knaüper, 2009), both of which have been proposed to play a role in the maintenance of GAD symptoms (Hayes & Hirsch, 2007; Koerner & Dugas, 2006). In this program of research, the first goal was to examine the impact of an IU-focused CBT (Dugas & Ladouceur, 2000) on IU and negative interpretation bias and to determine whether these factors played a role in symptom reduction. In Study 1, 80 adults completed CBT for GAD. By post-treatment, CBT was associated with reductions in GAD symptoms, IU and negative interpretation bias. Moreover, reductions in negative interpretation bias predicted reductions in GAD symptoms and this effect was partially mediated by reductions in IU. Cognitive bias modification programs (CBM-I) have also been developed to target interpretation bias, primarily among socially anxious individuals, and have been proposed as low-cost alternatives to CBT (Amir & Taylor, 2012). The second goal in this program of research was to validate a new CBM-I program designed to target interpretation bias in GAD worry domains. In Study 2, participants who completed CBM-I (n = 16) exhibited greater reductions in negative interpretation bias than participants in an interpretation control condition (n = 14). However, CBM-I training did not lead to anticipated reductions in worry or anxiety. Overall, this program of research provided further support for an IU-focused CBT and insight

into change processes during treatment. Although the CBM-I program examined here cannot yet be recommended as a stand-alone intervention, other clinical uses of CBM-I are discussed, including the possibility of implementing CBM-I as an adjunct intervention to enhance the efficacy of CBT.

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CONTRIBUTION OF AUTHORS

The following thesis comprises two manuscripts:

Study 1 (Chapter 2)

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Study 2 (Chapter 4)

Donegan, E., & Dugas, M.J. (2016). *Validation of a Multi-Session Cognitive Bias Modification (CBM-I) Training Program among Individuals with Elevated Worry and Anxiety.* Manuscript in preparation for publication.

I was responsible for choosing the overall focus of this program of research, as well as the focus of the specific studies included here, in consultation with Dr. Michel Dugas. The analyses presented in Study1 formed part of a larger 5-year clinical trial of CBT for GAD at l'Hôpital du Sacré-Coeur de Montréal (PI Dr. Michel Dugas). I was principally responsible for the selection of the specific research questions within this larger clinical trial, selection of relevant measures, statistical analyses, interpretation of findings, and manuscript preparation. Day-to-day coordination of clinical activities was performed by Céline Doucet and treatment was provided by a team of hospital-based clinicians, including Julie Turcotte, Isabelle Geninet, Thu-Van Dao, Pascale Harvey, and Pierre Savard.

In Study 2, I was principally responsible for all aspects of study design and implementation, including selection of stimuli, coordination of computer programming, participant recruitment (via the Psychology Participant Pool at Concordia University and poster advertisements in Montreal and surrounding areas), participant scheduling, data collection, statistical analyses, interpretation of findings, and manuscript preparation. I also provided training and supervision to the research assistants who helped with data collection, including Amélie Cossette (l'Université du Québec à Trois-Rivières) and Claudie Bax-D'Auteuil (l'Université de Sherbrooke). My committee members, including Dr. Adam Radomsky and Dr. Jean-Philippe Gouin, provided recommendations and approved my program of research during a dissertation proposal meeting. Additional feedback on study design and statistical analyses was also provided by Dr. Roisin O'Conner during my dissertation proposal meeting.

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CHAPTER 1
GENERAL INTRODUCTION

Generalized Anxiety Disorder (GAD) first appeared in the anxiety disorders section of the *Diagnostic and Statistical Manual of Mental Disorders for DSM-III* in 1980 (American Psychiatric Association, 1980). Initially described as a relatively mild condition, epidemiological studies in the 1990's began to provide evidence that GAD was in fact associated with considerable impairment (Wittchen, Zhao, Kessler, & Eaton, 1994). GAD is now recognized as a chronic condition characterized by excessive and uncontrollable worry and anxiety, as well as associated symptoms (e.g., restlessness, muscle tension) (APA, 2013). In addition to being one of the most commonly-diagnosed anxiety disorders, with lifetime prevalence rates ranging from 4% to 6%, GAD is also often co-morbid with other anxiety and mood disorders (Kessler et al., 2005). Even when not co-morbid with other conditions, the level of impairment associated with GAD rivals that of Major Depressive Disorder (Kessler, Dupont, Berglund, & Wittchen, 1999).

Cognitive behaviour therapy (CBT) has been recognized as the gold standard psychological treatment for anxiety disorders for at least the past two decades, with meta-analyses indicating that CBT is associated with moderate-to-large effect sizes (e.g., Butler, Chapman, Forman, & Beck, 2006; Hofmann & Smits, 2008). CBT protocols designed to target GAD-specific vulnerabilities have also been demonstrated to be effective. Early studies found, for instance, that CBT was more effective for GAD than no treatment or non-directive therapy (Borkovec & Costello, 1993; Gould, Otto, Pollack, & Yap, 1997) and was associated with mean pre-to-post effect sizes in at least the moderate range (e.g., ESμ = 0.70; Gould et al., 1997). The benefits of CBT were also found to be long-lasting, with gains being maintained up to 12 months following treatment (Borkovec & Costello, 1993; Gould et al., 1997). More recent meta-analyses suggest that gains may be maintained up to 8 or even 10 years following treatment (e.g., Durham, Chambers, MacDonald, Power, & Major, 2003). Despite this treatment success, however, optimism about the overall utility of CBT protocols for GAD has been somewhat muted by the finding that 20% to 50% of individuals continue to meet diagnostic criteria for GAD following treatment (e.g., Fisher, 2006; Hanrahan, Field, Jones, & Davey, 2013). Moreover, the proportion of individuals who experience significant residual symptoms following CBT has been larger than for other anxiety disorders (Gould, Safren, O'Neill, Washington, &

Otto, 1997) and subclinical levels of worry and anxiety can still be associated with significant impairment in functioning (Marcus, Olfson, Pincus, Shear, & Zarin, 1997). Given the considerable costs associated with GAD, having a good understanding of the mechanisms involved in GAD symptom reduction during treatment, and ensuring that our treatments target these mechanisms effectively, is essential if we wish to maximize treatment outcomes.

Cognitive Accounts of Anxiety Disorders

Over the past three decades, cognitive theorists have emphasized the role played by biased information processing in maintaining elevated anxiety (e.g., Beck & Clark, 1997; Beck, Emery, & Greenberg, 1985; Clark & Beck, 2010; Foa & Kozak, 1986). Cognitive biases have been defined as "any selective or non-veridical processing of emotion-relevant information" (Mineka & Sutton, 1992, p. 65). These biases are thought to be specific to particular emotions, content and tasks, often occurring in an automatic manner in specific situations, and contributing to the maintenance, and potentially the onset, of elevated anxiety and anxiety disorders (Beck et al., 1985). Much of the attention in the information-processing literature on anxiety has focused on the roles played by biases in attention, interpretation and memory. There is now strong evidence that individuals with either elevated trait anxiety or an anxiety disorder diagnosis demonstrate preferential attention toward threat-relevant information (e.g., Broadbent & Broadbent, 1988), a tendency toward negative or threatening interpretations of ambiguous information (e.g., Franklin, Huppert, Langner, Leiberg, & Foa, 2005; Hirsch & Mathews, 1997), and at least some evidence for the preferential retrieval of threat-relevant information from memory (e.g., Radomsky & Rachman, 1999; Richards & French, 1991).

Although historically there has been some debate regarding the source of information-processing biases (Craske & Pontillo, 2001), some cognitive theorists have proposed that these biases originate from core belief systems that contain threat-relevant information about the self, the world and the future (e.g., Beck et al., 1985). Specifically, anxious individuals are thought to hold negative beliefs about the level of threat associated with specific situations and their own vulnerability. The content of these negative beliefs may reflect disorder-specific cognitive content (Clark, Beck, & Brown, 1989) that, when activated, leads in turn to biased information processing and to the maintenance and/or onset of anxiety symptoms. In support of this theoretical account, there is now strong evidence that individuals with clinical levels of anxiety

are indeed more likely to endorse negative beliefs, some of which may be disorder-specific, such as negative beliefs about the consequences of making a social error among individuals with Social Anxiety Disorder (Choi & Telch, 2005) or beliefs about the importance of thought control among individuals with Obsessive-Compulsive Disorder (Tolin, Worhunsky, & Maltby, 2005). Of note, the relation between negative beliefs (i.e., cognitive content) and biased information-processing (i.e., cognitive processes) has been proposed to be bidirectional when it comes to the maintenance of anxiety symptoms (e.g., Wenzel, 2012). In other words, while negative or threat-related beliefs may lead to biased information processing in specific situations, the tendency to engage in biased information processing may also serve to strengthen negative beliefs and, ultimately, maintain anxiety. Thus, both negative beliefs and biased information processing may contribute to the maintenance of anxiety symptoms and, by implication, to their reduction during effective treatments.

Cognitive Accounts of GAD

Despite the potential interactions between cognitive content and cognitive processes in the maintenance of anxiety disorders, cognitive accounts of GAD symptoms have tended to focus either on the role played by specific problematic beliefs or by biases in information processing. Theoretical models emphasizing problematic beliefs, for instance, have highlighted the potential roles played by cognitive avoidance and positive beliefs about worry (Borkovec et al., 2004), negative metacognitive beliefs (Wells, 1995) or intolerance of uncertainty (Ladouceur, Gosselin, & Dugas, 2000), in the maintenance and/or onset of GAD symptoms. Although each of these accounts offers an innovative perspective on the mechanisms that may maintain GAD symptoms and has garnered at least some empirical support (see Behar, DiMarco, Hekler, Mohlman, & Staples, 2009 for a review), there has been an increasing interest in particular in the construct of intolerance of uncertainty in recent years.

Intolerance of Uncertainty and GAD

Intolerance of uncertainty (IU) can be defined as a dispositional characteristic that results from a set of negative beliefs about uncertainty and its consequences (Koerner & Dugas, 2006). Freeston, Ladouceur, Dugas and colleagues first proposed an association between IU and GAD in the late 1990's. This proposal was based in part on laboratory studies demonstrating that, when compared to non-worriers, individuals with elevated worry showed greater impairments in

information processing as well as elevated evidence requirements during decision tasks involving ambiguous stimuli (e.g., Metzger, Miller, Cohen, Sofka, & Borkovec, 1990; Tallis, Eysenck, & Mathews, 1991). In a clinical context, Freeston and colleagues also argued that individuals with GAD obtained only minimal benefit from CBT interventions designed to help re-evaluate the probability of feared outcomes and instead appeared to be striving for absolute certainty that specific negative outcomes would not occur (Freeston, Rhéaume, Letarte, Dugas, & Ladouceur, 1994). This led to the idea that individuals with GAD held particularly negative beliefs about uncertainty (e.g., uncertainty is upsetting and should be avoided; being uncertain about the future is unfair; and being uncertain will interfere with one's ability to function) and that these beliefs led, in turn, to elevated worry and anxiety, as well as potentially problematic behavioural responses (e.g., avoidance, over-preparation) (Koerner & Dugas, 2006).

Since the initial proposal of an association between IU and GAD, there has been considerable empirical support for a robust association between IU, excessive worry and anxiety, and GAD diagnostic status. In non-clinical samples, worry and IU are strongly correlated, even when controlling for anxiety and depressive symptoms (de Bruin, Rassin, van der Heiden, & Muris, 2006). Among individuals with GAD, greater GAD symptom severity is associated with greater endorsement of negative beliefs about uncertainty (Dugas et al., 2007). Finally, studies involving the experimental manipulation of IU in non-clinical samples have found that individuals with increased levels of IU exhibit higher levels of worry, whereas individuals with experimentally decreased levels of IU report corresponding reductions in worry (Ladouceur, Gosselin, & Dugas, 2000; Rosen & Knaüper, 2009). Given evidence of a close association between IU and GAD symptoms, IU has been proposed as a causal risk factor in the maintenance (and possibly onset) of excessive worry and anxiety (Koerner & Dugas, 2006).

Interpretation Bias and GAD

In contrast to cognitive accounts of GAD that focus on the role played by specific problematic beliefs, information processing accounts of GAD (e.g., Hayes & Hirsch, 2007; Mathews, 1990) have suggested that biases in information processing play a causal role in the maintenance of excessive worry and anxiety. Although attention and interpretation biases in particular have indeed been observed among individuals with high levels of worry and anxiety (e.g., Fox, Russo, & Dutton, 2001; Hirsch & Mathews, 1997) as well as individuals with a GAD

diagnosis (e.g., Butler & Mathews, 1983; MacLeod, Mathews, & Tata, 1986), one bias that has received considerable attention in the GAD literature is interpretation bias. Although a tendency toward negative interpretation bias has been observed among individuals with other anxiety disorders (e.g., Franklin, Huppert, Langner, Leiberg, & Foa, 2005; Woud, Zhang, Becker, McNally, & Margraf, 2014), there is also strong evidence for a close association between negative interpretation bias, excessive worry, elevated trait anxiety, and GAD diagnostic status (e.g., Butler & Mathews, 1983; Eysenck, MacLeod, & Mathews, 1987; Eysenck, Mogg, May, Richards, & Mathews, 1991; MacLeod & Cohen, 1993; Mathews, Richards, & Eysenck, 1989).

Initial evidence of the association between negative interpretation bias and GAD symptoms was generated in experimental paradigms using homophone or ambiguous scenario tasks in which participants were presented with ambiguous information that could be interpreted in either a negative/threatening manner or in a neutral/benign manner. For example, Butler and Mathews (1983) asked participants to read ambiguous passages and to select the most likely outcome (e.g., "Suppose you wake up with a start in the middle of the night thinking you heard a noise but all is quiet"). Participants with GAD were more likely than non-anxious individuals to select more threatening outcomes (e.g., "It could be a burglar"). Similar evidence of interpretation bias was found among individuals with elevated levels of trait anxiety (e.g., Hirsch & Mathews, 1997; Mogg et al., 1994). Finally, some studies involving the experimental manipulation of interpretation bias have provided evidence in support of a potential causal association between interpretation bias and GAD symptoms by demonstrating that both a negative/threatening interpretation bias or a neutral/benign interpretation bias can be induced in non-anxious individuals and that induced bias can be associated with corresponding changes in anxiety (e.g., Mathews & Mackintosh, 2000; Yiend et al., 2005; cf., Mackintosh et al., 2006).

An Association between Intolerance of Uncertainty and Negative Interpretation Bias in the Context of GAD

In addition to their respective associations with GAD symptoms, there is recent evidence that IU and negative interpretation bias may be directly and strongly associated. When Koerner and Dugas (2008) asked participants to imagine themselves in a series of scenarios with ambiguous but potentially negative outcomes, participants who scored higher on a measure of IU rated the scenarios as more threatening than did individuals with lower levels of IU. Similar

results were found by Dugas, Hedayati and colleagues (2005), even when controlling for participants' scores on measures of worry, anxiety and depressive symptoms. Moreover, when Bredemeier and Berenbaum (2008) examined the association between IU and worry in a non-clinical sample, they found that this association was partially mediated by interpretation bias. The finding that elevated IU is associated with greater interpretation bias is consistent with cognitive accounts of anxiety disorders (e.g., Beck, Emery, & Greenberg, 1985). In the context of GAD, negative beliefs about uncertainty and its consequences may lead individuals to view situations with ambiguous but potentially negative outcomes as more threatening, leading in turn to elevated worry and anxiety about the many ambiguous situations or events that are encountered in daily life.

Interventions Targeting IU and Interpretation Bias

An IU-Focused Cognitive Behaviour Therapy

If IU plays a role in the maintenance of GAD symptoms, by implication, reductions in IU may also serve as a mechanism of symptom reduction during effective treatments. On this basis, Dugas and Ladouceur (2000) developed a CBT protocol designed primarily to target negative beliefs about uncertainty. Other cognitive phenomena that were found to be associated with GAD symptoms are also targeted within this treatment protocol, including positive beliefs about worry, a negative problem-orientation and cognitive avoidance. However, of these cognitive phenomena, only IU has specificity with respect to GAD (Dugas, Marchand, & Ladouceur, 2005) and IU is the primary focus of treatment. Thus far, several clinical trials have demonstrated that this IU-focused CBT is associated with reductions in GAD symptoms and in co-morbid depressive symptoms by post-treatment, as well as the maintenance of symptom gains for periods of up to one year following treatment (e.g., Dugas et al., 2010; Gosselin, Ladouceur, Morin, Dugas, & Baillargeon, 2006; Ladouceur et al., 2000; van der Heiden, Muris, & van der Molen, 2012). Moreover, this IU-focused protocol is associated with significant reductions in IU that have been found to precede and predict subsequent reductions in GAD symptoms (Bomyea et al., 2015), providing further support for the clinical utility of targeting IU during treatment. Encouragingly, post-treatment remission rates have ranged between 60% (Ladouceur et al., 2000) and 80% (van der Heiden et al., 2012) across clinical trials of IU-CBT. However, this also

indicates that at least 20% of participants report clinically significant symptoms following treatment and there continues to be room for improvement in outcomes.

Clinical Applications of Interpretation Bias Modification

Given the initial success of experimental procedures to alter interpretation bias, there has been an increasing interest in their potential therapeutic utility. Cognitive Bias Modification procedures for interpretation bias (CBM-I) have been developed to target interpretation bias in a number of anxiety and associated disorders, including Social Phobia (Murphy, Hirsch, Mathews, Smith, & Clark, 2007), Specific Phobia (Steinman & Teachman, 2011), Post-Traumatic Stress Disorder (Woud, Holmes, Postma, Dalgleish, & Mackintosh, 2012) and Obsessive-Compulsive Disorder (Williams & Grisham, 2013), as well as among individuals with high trait anxiety (Mathews, Ridgeway, Cook, & Yiend, 2007). A majority of these CBM-I paradigms involve variants of homograph or ambiguous scenario tasks and feedback is provided during the tasks to discourage the use of negative or threatening interpretations of ambiguous stimuli or to encourage the use of more neutral or benign interpretations. Thus far, several studies have demonstrated that CBM-I training can be associated with reductions in interpretation bias and in anxiety symptoms following training (e.g., Mathews et al., 2007; Mathews et al., 2007; Steinman & Teachman, 2011; Williams & Grisham, 2013; Wilson, MacLeod, Mathews & Rutherford, 2006; Woud et al., 2012) or lower levels of emotional reactivity in response to a stressor (Murphy et al., 2007; cf. Salemink, van den Hout, & Kindt, 2009).

With respect to GAD, a few studies have examined the effect of CBM-I training on elevated worry and anxiety. As with other CBM-I training programs, these programs have tended to be based on homophone and ambiguous scenario tasks. For instance, when Hayes et al. (2010) provided feedback to encourage participants with GAD to repeatedly access benign meanings of ambiguous scenarios from a range of worry domains (e.g., social relationships, work or academic competence, finances and physical safety), participants receiving CBM-I exhibited greater reductions in interpretation bias and in negative thought intrusions during a worry induction task than participants in an interpretation control condition (Hayes et al., 2010). These findings were replicated by Hirsch, Hayes and Mathews (2009) who also found that participants who received CBM-I training experienced greater reductions in anxiety, and also showed greater residual working memory capacity during a subsequent worry induction task, pointing to potential

cognitive benefits of CBM-I training that go beyond the reduction of worry and anxiety. Overall, CBM-I training programs have been associated with moderate-to-large reductions in negative interpretation bias across the anxiety disorders and, in at least some studies, small-to-moderate reductions in anxiety symptoms (Beard, 2011; Hallion & Ruscio, 2011).

In an effort to enhance the potential impact of CBM-I training, several more recent CBM-I paradigms have been developed. Arguing that many CBM-I protocols were limited to targeting the reduction of negative interpretations in ambiguous scenarios, Beard and Amir (2008) developed a new CBM-I training program designed to both discourage negative interpretations as well as to encourage the use of more neutral or benign interpretations. Using a *Word-Sentence Association Paradigm* (WSAP), a brief computerized CBM-I training program was developed specifically to target interpretation bias among individuals with social anxiety. During each training trial, participants were presented with words (e.g., "embarrassing" or "funny") that could elicit either threatening or non-threatening interpretations of subsequently presented sentences describing ambiguous social scenarios (e.g., "People laugh after something you said"). Participants were then asked whether the word and sentence were related. Feedback (i.e., "You are correct!" or "You are incorrect.") was designed to encourage responses that reflected neutral or benign interpretations (e.g., "funny" and "People laugh after something you said" are related) and to discourage negative or threatening interpretations (e.g., "embarrassing" and "People laugh after something you said" are unrelated). When compared to an interpretation control condition, Beard and Amir (2008) found that individuals who received CBM-I training were more likely to endorse benign and reject threatening interpretations of ambiguous social scenarios, and CBM-I training was also associated with greater reductions in social anxiety. Even when administered in a single training session, the WSAP CBM-I was associated with improvements in interpretation bias, although not in anxiety symptoms (Amir, Bomyea, & Beard 2010). Perhaps not surprisingly, given some evidence of the potential efficacy of CBM-I protocols in targeting interpretation bias and associated emotional distress, CBM-I programs have recently proposed as short-term and cost-effective interventions for anxiety disorders (Amir & Taylor, 2012).

Current Program of Research

Given the potential roles of both IU and interpretation bias in etiological models of GAD symptoms and, by implication, in GAD symptom reduction during treatment, gaining a better

understanding of whether and how these variables interact to produce symptom change will provide greater insight into the processes of change during efficacious treatments. As a result, the first goal in the current program of research was to examine the ways in which reductions in IU and interpretation bias might work together to produce GAD symptom change during an IU-focused CBT (Study 1). Furthermore, if changes in interpretation bias are implicated in symptom reduction during CBT for GAD, developing new and cost-effective ways to target this bias more directly may be of clinical value. Our second goal was therefore to validate a new CBM-I training program, based on the WSAP CBM-I protocols developed by Beard and Amir (2008), that was modified specifically to target interpretation bias in the broad range of worry domains commonly associated with GAD (Study 2). Ultimately, an efficacious and easy-to-implement CBM-I training program that targets interpretation bias specific to GAD might provide researchers and clinicians with an additional low-cost intervention for GAD symptoms and may also be useful as an adjunct to existing empirically-supported CBT protocols for GAD with the potential of improving treatment outcomes.

CHAPTER 2

Cognitive Predictors of Symptom Change during CBT for GAD: Examining the Role of Intolerance of Uncertainty and Interpretation Bias

Generalized anxiety disorder (GAD) is characterized by excessive and uncontrollable worry and anxiety (American Psychiatric Association, 2013). GAD has a lifetime prevalence of 4 to 6% (Kessler et al., 2005) and is associated with substantial impairment in functioning (Hoffman, Dukes, & Wittchen, 2008). Several cognitive behaviour treatments (CBT) have been developed for GAD (e.g., Borkovec & Costello, 1993; Wells & King, 2006) and clinical trials show that CBT is efficacious, with significant reductions in worry and anxiety by post-treatment and maintenance of gains for up to two years following treatment (Hanrahan, Field, Jones, & Davey, 2013). CBT is also associated with reductions in depressive symptoms (Cuijpers et al., 2014), which are frequently co-morbid with GAD. However, meta-analyses of clinical trials suggest that only 50 to 60% of individuals who receive CBT for GAD are recovered by post-treatment (Fisher, 2006; Hanrahan et al., 2013). Several more recent clinical trials are more encouraging, with at least two thirds of participants classified as recovered (e.g., van der Heiden et al., 2012). Nonetheless, a large minority of individuals do not experience clinically meaningful change and there is a need for improvement in treatment outcomes.

The majority of CBT protocols for GAD were derived from theoretical models of GAD symptoms (e.g., Borkovec, Alcaine, & Behar, 2004; Wells, 1995) with the goal of improving outcomes by targeting variables implicated in the etiology of excessive worry and anxiety. An examination of change processes can reveal whether theoretically relevant variables are targeted effectively during treatment and whether change in these variables is associated with symptom reduction. This may in turn provide insight into how treatments can be refined. The goal of this study was to examine change processes during an empirically-supported CBT for GAD.

The CBT protocol examined here was developed from a theoretical model that implicates intolerance of uncertainty (IU) in the etiology of GAD (Dugas, Gagnon, Ladouceur, & Freeston, 1998). One way to define IU is as "a dispositional characteristic resulting from a set of negative beliefs about uncertainty and its implications" (Dugas & Robichaud, 2007, p. 24). Individuals with elevated levels of IU may believe, for instance, that uncertainty is upsetting, will impair functioning, and that uncertain situations should be avoided. Although IU is associated with

other anxiety disorders (Carleton et al., 2012), there is evidence of a strong association between IU, worry, and GAD diagnostic status. IU and worry are strongly related among non-clinical individuals even when controlling for anxiety and depressive symptoms (de Bruin, Rassin, van der Heiden, & Muris, 2006), experimental manipulation of IU leads to corresponding changes in worry (Rosen & Knäuper, 2009), and levels of IU distinguish individuals with moderate or severe GAD from individuals with mild GAD (Dugas et al., 2007).

The efficacy of this CBT protocol has been demonstrated in several clinical trials. CBT was associated with significantly larger reductions in worry, anxiety, and depressive symptoms than a waitlist condition by post-treatment (e.g., Ladouceur et al., 2000; van der Heiden, Muris, & van der Molen, 2012). When compared to non-directive therapy, CBT was associated with higher post-treatment rates of diagnostic remission (65% vs. 20%) (Gosselin, Ladouceur, Morin, Dugas, & Baillargeon, 2006). Finally, when CBT was compared to applied relaxation training, the treatments were approximately equivalent in the magnitude of symptom reduction by post-treatment, but only CBT was associated with continued improvement in worry and anxiety during a 2-year follow-up period (Dugas et al., 2010). An IU-focused therapy can therefore produce significant reductions in GAD symptoms.

Another variable that has received attention in the GAD literature is interpretation bias, or the tendency to interpret ambiguous situations as threatening. Interpretation bias, high trait anxiety and GAD diagnostic status are closely associated. In studies using homophone tasks, participants hear words that could have threatening or benign meanings (e.g., "die/dye"). Individuals with high trait anxiety or GAD are more likely than non-anxious individuals to report having heard the threatening variant (i.e., "die") (Mathews, Richards, & Eysenck, 1989; Richards, Reynolds, & French, 1993). On recognition tasks, when participants with GAD are presented with ambiguous vignettes (e.g., "The doctor examined little Emma's growth"), they are more likely than those without GAD to report having heard a threatening version of the story (i.e., cancer vs. height) (Eysenck, Mogg, May, Richards, & Mathews, 1991). Finally, experimentally manipulating the tendency to make negative or threatening interpretations is associated with corresponding changes in anxiety among individuals with elevated trait anxiety or a GAD diagnosis (e.g., Hayes et al., 2010; Salemink, van den Hout, & Kindt, 2009).

Given evidence of a close association between interpretation bias, trait anxiety and GAD diagnostic status, information processing theorists have proposed that the tendency to make threatening interpretations of ambiguous situations plays a role in the etiology of excessive worry and anxiety (e.g., Hirsch & Mathews, 2012; Mathews, 1990). If so, reductions in threat interpretations may also play a role in symptom reduction during effective treatments for GAD. Moreover, the role played by interpretation bias during an IU-focused CBT is of interest given evidence of a strong association between interpretation bias and IU. For instance, individuals with elevated IU are more likely to interpret ambiguous situations in a threatening manner and interpretation bias is more strongly related to IU than to worry, anxiety or depressive symptoms (Dugas et al., 2005). Finally, it appears to be ambiguity itself that is threatening to individuals with elevated IU. Although elevated IU is associated with greater concern in unambiguously negative and positive situations, IU is most strongly associated with concern in ambiguous situations (Koerner & Dugas, 2008). Conceptually, an association between negative beliefs about uncertainty and interpretation bias is consistent with general cognitive models of the etiology of psychopathology (e.g., Beck, Emery, & Greenberg, 1985) in which negative beliefs about feared stimuli are thought to lead to biased information processing and emotional distress. In the context of GAD, individuals who believe that being uncertain will be distressing, will impair functioning and should be avoided, will be more likely to view ambiguous situations as threatening and experience elevated levels of worry and anxiety as a result.

If IU and interpretation bias are implicated in the etiology of excessive worry and anxiety, both may play a role in GAD symptom reduction during treatment. We examined whether and how these two cognitive phenomena were involved in change processes during CBT for GAD. First, we examined the overall efficacy of the CBT protocol. Based on previous trials, significant reductions in worry, anxiety and in associated depressive symptoms were expected during treatment (*Hypothesis 1*). Second, we examined the effect of this IU-focused CBT on both IU and interpretation bias. Previous research has shown that this CBT is associated with significant reductions in IU, which is targeted explicitly during treatment (e.g., van der Heiden et al., 2012). In contrast, the protocol does not target interpretation bias explicitly. Throughout treatment, however, participants complete exercises in which they repeatedly enter into situations with uncertain (but potentially negative) outcomes. This experience may help anxious

individuals view these situations as less threatening. We therefore expected this CBT protocol to be associated with reductions in both IU and threat interpretations during treatment (*Hypothesis 2*). Finally, we tested a mediation model to examine how reductions in IU and interpretations might work together to produce symptom reduction. Specifically, if reductions in threat interpretations were observed, we wished to know whether these changes predicted change in GAD symptoms during treatment and whether this effect was partially mediated by changes in negative beliefs about uncertainty (*Hypothesis 3*).

Method

Participants

The sample consisted of 80 treatment-seeking adults (n = 61, 76.3% women; mean age = 43.83, SD = 11.52) with a primary diagnosis of GAD. The majority of participants (n = 43, 53.7%) were employed full-time, whereas 16.3% (n = 13) were employed part-time, and 26.3% (n = 21) were not employed (3 participants did not report employment status). In terms of ethnicity, 93.8% (n = 75) identified as White, 2.5% (n = 2) as Middle Eastern, 1.3% (n = 1) as First Nations, and 2.6% (n = 2) as "other." Pre-treatment severity of GAD symptoms was assessed using the 9-point (0-8) Clinician's Severity Rating of the *Anxiety Disorders Interview Schedule for DSM-IV* (ADIS-IV; Di Nardo, Brown, & Barlow, 1994). The mean GAD severity at pre-treatment was 5.83 (SD = 0.72) and participants had experienced GAD symptoms for an average of 10.01 years (SD = 10.92). A majority of participants (n = 63, 78.8%) were diagnosed with at least one comorbid Axis I disorder. Comorbid conditions included panic disorder with or without agoraphobia (n = 22), social anxiety disorder (n = 20), major depressive disorder (n = 18), specific phobia (n = 17), obsessive-compulsive disorder (n = 12), posttraumatic stress disorder (n = 4), substance use disorder (n = 1), and an eating disorder (n = 1). In terms of psychoactive medication, 51.3% (n = 41) of participants were taking anxiolytic or antidepressant medication. Finally, 28.8% (n = 23) had previously received CBT for an anxiety or mood disorder.

Measures

Diagnostic interviews. The *Anxiety Disorders Interview Schedule for DSM-IV* (ADIS-IV; Di Nardo et al., 1994) assesses anxiety disorders and screens for other DSM-IV Axis I conditions, including mood and somatoform disorders, substance use and psychotic disorders,

and medical problems. The severity of each disorder is assessed using the Clinician's Severity Rating (CSR) which ranges from 0 (Absent or none) to 8 (Very severe or very severely disturbing/disabling). A score of 4 or more indicates a clinically significant level of symptoms. The ADIS-IV CSR has been found to have adequate interrater reliability for anxiety disorders and for GAD specifically (Brown, Di Nardo, Lehman, & Campbell, 2001).

The *Mini International Neuropsychiatric Interview, Version 5.0* (MINI; Sheehan et al., 1994) is a brief structured diagnostic interview that assesses current mood and anxiety disorders, substance use disorders, psychotic disorders, eating disorders, and suicidal risk. Sheehan et al. (1997) found that the GAD subscale has excellent interrater reliability, adequate test-retest reliability, and adequate diagnostic concordance with the GAD subscale of the *Structured Clinical Interview for DSM-III-R* (Spitzer et al., 1990). The 9-point Clinician's Severity Rating scale from the ADIS-IV was used to obtain severity ratings for MINI diagnoses.

Primary self-report symptom measures. The *Penn State Worry Questionnaire* (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) is a 16-item self-report measure of the tendency to worry. The PSWQ was designed to assess the intensity and excessiveness of worry regardless of the worry content. The PSWQ has very good to excellent internal consistency and test-retest reliability (Molina & Borkovec, 1994). PSWQ scores can be used to distinguish between individuals with GAD, individuals with other anxiety disorders, and non-clinical samples (Brown, Antony, & Barlow, 1992). The PSWQ has very good internal reliability and test-retest reliability in clinical samples, and convergent validity with other measures of worry and anxiety (Gosselin, Dugas, Ladouceur, & Freeston, 2001). The internal reliability for the PSWQ in the current sample was $\alpha = .83$.

The *Worry and Anxiety Questionnaire* (WAQ; Dugas et al., 2001) is an 11-item self-report measure that assesses the severity of GAD symptoms according to the DSM-IV (and DSM-5) criteria. The WAQ can be scored as a continuous measure or as a dichotomous measure indicating the presence or absence of clinically significant DSM-based GAD symptoms. A continuous scale was used in the current study. The WAQ has adequate test-retest reliability (75.0% agreement for individuals who initially meet GAD diagnostic criteria and 82.4% agreement for individuals who do not). Scores on the WAQ can distinguish between individuals

who do or do not meet GAD criteria by structured diagnostic interview (Dugas et al., 2001). The internal reliability for the WAQ in the current sample was α = .74.

Secondary self-report symptom measures. The *State-Trait Anxiety Inventory-Trait version* (STAI-T; Spielberger, 1977) is a 20-item self-report measure used to assess the degree to which individuals have the stable tendency to experience anxiety. The STAI-T has been shown to have very good internal consistency in a mixed anxiety sample and is correlated with other common measures of anxiety (Beck & Steer, 1990). The internal reliability of the STAI-T was α = .85 in the present sample.

The *Beck Depression Inventory-II* (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item self-report measure that assesses the severity of depressive symptoms over the previous two weeks. The BDI-II has excellent internal consistency and test-retest reliability (Beck et al., 1996). Scores on the BDI-II correlate positively with scores on other measures of depressive symptoms. The internal reliability for the BDI-II in the current sample was α = .89.

Cognitive self-report measures. The *Intolerance of Uncertainty Scale* (IUS; Freeston et al., 1994) is a 27-item scale that assesses negative beliefs about uncertainty. The IUS has excellent internal consistency (Freeston et al., 1994) and adequate test-retest reliability (Dugas, Freeston, & Ladouceur, 1997). The IUS can be used to distinguish between high and low worriers in a non-clinical sample and scores on the IUS are strongly correlated with measures of worry, anxiety, and depressive symptoms, although IUS scores also uniquely predict variance in worry above and beyond scores on measures of anxiety and depressive symptoms (Freeston et al., 1994). The internal reliability of the IUS in the current sample was α = .96.

The *Ambiguous/Unambiguous Situations Diary* (AUSD; Davey et al., 1992) is a 28-item measure to assess interpretation bias in response to positive, negative, or ambiguous scenarios. Each scenario is presented as a fictitious diary entry and scenarios are in the first person. Of the 28 scenarios, 7 have positive outcomes (e.g., "It is beautiful day today. It is easy to be in a good mood when the sun is shining"), 7 have negative outcomes (e.g., "I received a letter from my bank this morning informing me that I had exceeded my withdrawal limit and would have to pay a large fine"), and 14 have ambiguous outcomes (e.g., "Today my teacher handed back my assignment and I was surprised by my mark"). Participants indicate their level of concern in response to each scenario. Only the AUSD-Ambiguous subscale was used in the current study.

Dugas et al. (2005) found that scores on the Ambiguous subscale were significantly correlated with measures of worry (r = .33), anxiety (r = .27), and depressive symptoms (r = .32), but were more strongly correlated with scores on the IUS (r = .50; all p values < .05). The internal reliability of the AUSD-Ambiguous subscale in this sample was α = .82.

Procedure

Participants were recruited from the patient flow at the Anxiety Disorders Clinic of the Hôpital du Sacré-Coeur de Montréal and in advertisements in local newspapers. Individuals who responded to advertisements completed a phone screen by a team psychologist. All potential participants completed two semi-structured diagnostic assessments, intended to maximize the validity of diagnoses, separated by a 1-week interval. The semi-structured interviews were the ADIS-IV (DiNardo et al., 1994), administered by a team psychologist and the MINI (Sheehan et al., 1994), administered by a team psychiatrist. Assessors rated the severity of each diagnosed condition on the 9-point CSR scale. The severity of each disorder was determined by consensus in a team meeting with the Principal Investigator. Individuals who were ineligible were offered treatment within regular clinic services or were referred elsewhere. Inclusion criteria were: (a) a primary diagnosis of GAD (a difference of at least 1 point on the CSR between GAD and any secondary condition); (b) over 18 years old; (c) no change in medication 4 to 12 weeks prior to intake (4 weeks for benzodiazepines and 12 weeks for antidepressants and hypnotics); (d) a stable dose and type of psychoactive medication during treatment; (e) no suicidal intent; (f) no current substance abuse; and (g) no current or past schizophrenia, bipolar disorder, or organic mental disorder.

A total of 703 individuals responded to advertisements and 445 completed the phone screen. Of these, 214 completed the ADIS-IV assessment. A total of 85 individuals were excluded following the ADIS-IV assessment, primarily because GAD was not primary (38.8%) or was not diagnosed (25.9%). Following the ADIS-IV, 110 individuals completed the MINI assessment. An additional 19 individuals were excluded following the MINI interview, primarily because GAD was diagnosed but was not primary (47.4%), and 89 individuals began treatment within the study. Of those who started treatment, 9 individuals discontinued treatment because of the time commitment required (n = 3), they started new psychoactive medication (n = 1), they

did not complete the post-treatment assessment (n = 1) or other study questionnaires (n = 1), they sought other treatment (n = 2) or for unknown reasons (n = 1).

The remaining 80 participants received weekly individual sessions of CBT for GAD (Dugas & Ladouceur, 2000). An experienced clinical psychologist provided treatment. Treatment consisted of five components, including (a) psychoeducation and worry awareness training, in which participants learned to monitor their GAD symptoms daily; (b) re-evaluation of the usefulness of worry, including challenging positive beliefs about worry; (c) uncertainty recognition and behavioural exposure, in which participants entered into situations with uncertain outcomes; (d) problem-solving training; and (e) exposure exercises, where participants practiced exposure to fears about hypothetical scenarios (see Dugas & Robichaud, 2007, for a detailed description). Diagnostic assessments were administered at pre and post-treatment. Self-report measures of symptoms and IU were administered at pre, mid and post-treatment. Measures of threat interpretations (AUSD) were completed at pre and post-treatment.

Results

Preliminary Analyses

Data preparation. Because this study involved an examination of the processes of change during treatment, we wished to include only those individuals who received all components of treatment and a completers-only sample was used. The data were examined for violations of normality and linearity. Post-treatment BDI-II and IUS scores were positively skewed and square root transformations reduced skew to non-significant levels. These transformations did not alter the results of our analyses and untransformed data were therefore used to maintain interpretability. All other data were normally distributed. There were no violations of linearity or missing data.

Interrater agreement. Interrater agreement on the severity of GAD symptoms (i.e., agreement within 1 point on the CSR) was adequate at 83.8% for the sample (N = 80).

Pre-treatment means and correlations. Means and standard deviations of all study measures are presented in Table 1. Pearson correlation coefficients were computed to examine the relations between symptom variables, IU and threat interpretations at pre-treatment. Scores on the AUSD - Ambiguous subscale were positively correlated with scores on the ADIS-IV CSR (r = .27), PSWQ (r = .37), WAQ (r = .27), STAI-T (r = .34) and IUS (r = .43) (all p values <

.05). Participants with a greater tendency to make threatening interpretations of ambiguous scenarios were more likely to hold negative beliefs about uncertainty and to experience greater worry and anxiety. Scores on the AUSD - Ambiguous were not significantly correlated with scores on a measure of depressive symptoms (BDI-II; $r = .19$, $p > .05$).

Treatment outcome. The CBT protocol was designed to be administered over 14 sessions, although therapists were permitted to reduce or extend the number of sessions somewhat as needed. Participants completed an average of 14.41 ($SD = 1.36$) sessions. Treatment efficacy was assessed using one-way repeated-measures ANOVA analyses (Table 1). Large and significant mean decreases were observed on all study variables (with Hedge's *g* values from 0.98 to 2.26). In terms of diagnostic remission, 75.0% ($n = 60$) of participants no longer met GAD diagnostic criteria by post-treatment (i.e., they obtained a score of 3 or less on the ADIS-IV CSR).

Change in cognitive variables. Large and significant reductions were observed in IU and interpretation bias from pre to post-treatment, with a Hedge's *g* value of 0.92 for each variable. An IU-focused treatment was associated with significant reductions in negative beliefs about uncertainty and in the tendency to perceive ambiguous situations as threatening.

Main Analyses

Correlations during treatment. To assess whether changes in threat interpretations were correlated with changes in GAD symptoms and IU during treatment, Pearson correlation coefficients were computed on residualized change (RC) scores for each of the main study variables (Table 2). Positive and significant correlations were found between RC scores on the AUSD - Ambiguous subscale and RC scores on the ADIS-IV PSWQ, WAQ, STAI-T, BDI, and IUS (all p values $< .01$). Participants who experienced significant decreases in concern about ambiguous scenarios during treatment also experienced corresponding decreases in worry, anxiety, depressive symptoms and IU.

Mediation analyses. Three mediation analyses were conducted to determine whether the relation between changes in threat interpretations and GAD symptoms could be partially explained by changes in IU. Residualized change scores were again used as indicators of change over time in each variable. In each mediation analysis, the initial predictor was residualized change in threat interpretations (AUSD - Ambiguous), the mediator was residualized change in

intolerance of uncertainty (IUS), and the outcome was residualized change in GAD symptoms (Figure 1). The three analyses differed only in the measure used to assess GAD symptoms (ADIS-IV CSR, PSWQ or WAQ).

Table 1

Pre and Post-treatment Means in Threat Interpretations, Intolerance of Uncertainty and Symptoms during CBT for GAD (N = 80)

	Pre-treatment	Post-treatment				
Measures	*M (SD)*	*M (SD)*	*F* (1, 79)	*MS* error	95% $CI_{pre\text{-}post}$	Hedge's *g*
AUSD- Ambiguous	41.93 (7.95)	34.58 (8.98)	67.18	32.16	[5.57, 9.14]	0.92
IUS	72.74 (22.10)	54.11 (18.77)	67.50	205.54	[14.11, 23.14]	0.92
ADIS-IV CSR	5.83 (0.72)	3.06 (1.23)	408.95	0.75	[2.50, 3.04]	2.26
WAQ	25.88 (3.44)	19.21 (4.71)	194.04	8.93	[5.64, 7.52]	1.56
PSWQ	62.79 (7.62)	44.68 (10.40)	263.32	49.84	[15.89, 20.33]	1.81
STAI-T	53.87 (7.33)	44.53 (9.97)	135.67	25.68	[7.74, 10.93]	1.30
BDI-II	16.23 (9.70)	8.10 (8.31)	77.10	34.30	[6.29, 9.97]	0.98

Note. CBT = Cognitive-Behavioural therapy; GAD = Generalized Anxiety Disorder; AUSD - Ambiguous = Ambiguous / Unambiguous Situations Diary - Ambiguous subscale; IUS = Intolerance of Uncertainty Scale; ADIS-IV CSR = GAD severity as assessed by the Clinician's Severity Rating of the Anxiety Disorders Interview Schedule for DSM-IV; WAQ = Worry and Anxiety Questionnaire; PSWQ = Penn State Worry Questionnaire; STAI-T = State-Trait Anxiety Inventory - Trait Version; BDI-II = Beck Depression Inventory II.

Table 2

Correlations between Residualized Change Scores of Threat Interpretations, Intolerance of Uncertainty, and Symptoms during CBT for GAD (N = 80)

	1	2	3	4	5	6	7
1. AUSD - Ambiguous	-	.61*	.49*	.52*	.53*	.48*	.31*
2. IUS		-	.59*	.62*	.68*	.65*	.52*
3. ADIS-IV CSR			-	.58*	.57*	.53*	.50*
4. WAQ				-	.73*	.61*	.38*
5. PSWQ					-	.69*	.44*
6. STAI-T						-	.58*
7. BDI-II							-

Note. CBT = Cognitive-Behavioural therapy; GAD = Generalized Anxiety Disorder; AUSD - Ambiguous = Ambiguous / Unambiguous Situations Diary - Ambiguous subscale; IUS = Intolerance of Uncertainty Scale; ADIS-IV CSR = GAD severity as assessed by the Clinician's Severity Rating of the Anxiety Disorders Interview Schedule for DSM-IV; WAQ = Worry and Anxiety Questionnaire; PSWQ = Penn State Worry Questionnaire; STAI-T = State-Trait Anxiety Inventory - Trait Version; BDI-II = Beck Depression Inventory II.

*$p < .01$.

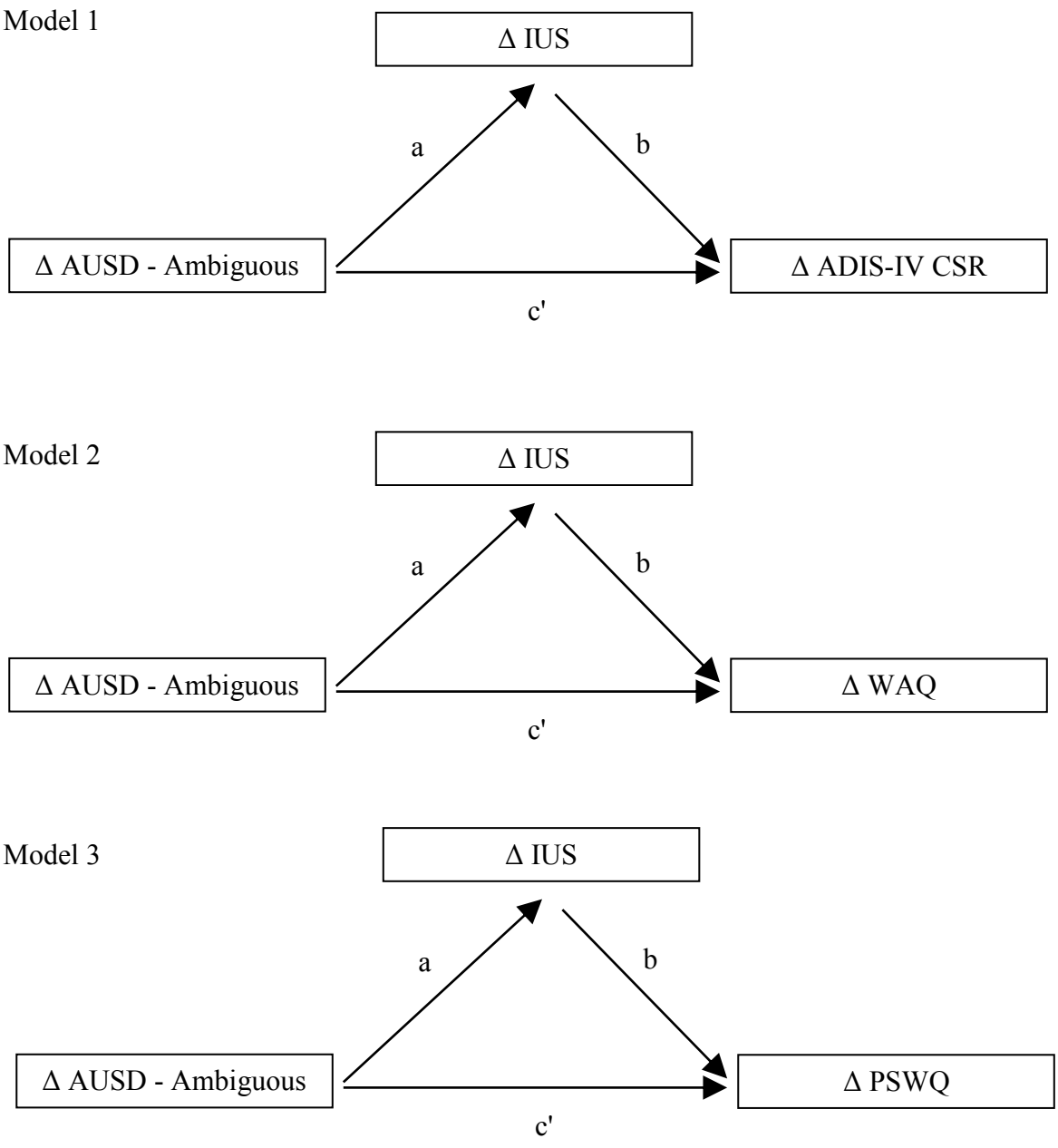

Figure 1. Mediation models. AUSD - Ambiguous = Ambiguous / Unambiguous Situations Diary - Ambiguous subscale; IUS = Intolerance of Uncertainty Scale; ADIS-IV CSR = GAD severity as assessed by the Clinician's Severity Rating of the Anxiety Disorders Interview Schedule for DSM-IV; WAQ = Worry and Anxiety Questionnaire; PSWQ = Penn State Worry Questionnaire. All variables computed as residualized change scores.

Mediation analyses were conducted with bootstrapped samples (5,000 samples and bias corrected 95% confidence intervals) using the PROCESS macro for mediation in SPSS (Hayes, 2013). Percentage of mediation, based on the ratio of indirect to total effect (Shrout & Bolger, 2002), was used to assess the magnitude of mediation in each model. In the first mediation model, GAD symptoms were assessed with the ADIS-IV CSR (Table 3). The total effect, prior to adding the mediator, was statistically significant: reductions in threat interpretations significantly predicted reductions in GAD symptoms during treatment, $b = 0.08$, $SE = 0.02$. $t = 4.93$, 95% CI = [0.04, 0.12]. When the IUS was added as the mediator, the indirect effect was also significant, $ab = .04$, $SE = .01$, 95% CI = [0.02, 0.07], and accounted for 57.1% (95% CI = [0.20, 1.05]) of the total effect. In the second mediation model, GAD symptoms were assessed with the WAQ. The total effect was again significant, $b = 0.29$, $SE = 0.05$, $t = 5.39$, 95% CI = [0.19, 0.10], as was the indirect effect, $ab = 0.16$, $SE = 0.04$, 95% CI = [0.09, 0.25], which accounted for 55.7% (95% CI = [0.27, 0.92]) of the total effect. In the third model, GAD symptoms were assessed using the PSWQ. The total effect was statistically significant, $b = 0.67$, $SE = 0.12$, $t = 5.52$, 95% CI = [0.43, 0.91]. The indirect effect was also significant, $ab = 0.44$, $SE = 0.09$, 95% CI = [0.28 0.65], and accounted for 65.5% (95% CI = [0.42, 1.03]) of the total effect. Thus, in all three mediation models, reductions in interpretation bias predicted reductions in GAD symptoms, and this effect was partially mediated by reductions in IU.

Table 3

Summary of Mediation Analyses during CBT for GAD (N = 80)

Path	Predictor	Outcome	*b*	*SE*	*t*-ratio	*df*	*95% CI*
Model 1 outcome = ADIS-IV CSR							
a	AUSD-Ambiguous	IUS	1.30	0.19	6.70	79	[0.91, 1.69]
b	IUS	ADIS-IV CSR	0.03	0.01	4.06	79	[0.02, 0.05]
c'	AUSD-Ambiguous	ADIS-IV CSR	0.03	0.02	1.85	79	[-0.003, 0.07]
Model 2 outcome = WAQ							
a	AUSD-Ambiguous	IUS	1.30	0.19	6.70	79	[0.91, 1.69]
b	IUS	WAQ	0.12	0.03	4.39	79	[0.07, 0.18]
c'	AUSD-Ambiguous	WAQ	0.13	0.06	2.11	79	[0.01, 0.25]
Model 3 outcome = PSWQ							
a	AUSD-Ambiguous	IUS	1.30	0.19	6.70	79	[0.91, 1.69]
b	IUS	PSWQ	0.34	0.06	5.61	79	[0.22, 0.46]
c'	AUSD-Ambiguous	PSWQ	0.23	0.13	1.78	79	[-0.03, 0.49]

Note. CBT = Cognitive-Behavioural therapy; GAD = Generalized anxiety disorder; AUSD - Ambiguous = Ambiguous / Unambiguous Situations Diary - Ambiguous subscale; IUS = Intolerance of Uncertainty Scale; ADIS-IV CSR = GAD severity as assessed by the Clinician's Severity Rating of the Anxiety Disorders Interview Schedule for DSM-IV; WAQ = Worry and Anxiety Questionnaire; PSWQ = Penn State Worry Questionnaire. All variables computed as residualized change scores. $\alpha = .05$

Discussion

Our main goal was to examine the role played by two cognitive variables - intolerance of uncertainty (IU) and interpretation bias - in symptom reduction during an IU-focused CBT for GAD. Before examining processes of change, treatment efficacy was assessed. Consistent with previous trials, large reductions were observed by post-treatment in worry, anxiety, and co-morbid depressive symptoms (*Hypothesis 1*). Moreover, the post-treatment remission rate for GAD (75%) indicated that a majority of participants no longer met GAD diagnostic criteria. This rate is consistent with previous trials (e.g., Dugas et al., 2010) and compares favorably with remission rates reported in meta-analyses of CBT for GAD (Fisher, 2006).

We next examined the effect of CBT on IU and interpretation bias. We expected that participants receiving CBT for GAD would experience decreases in both IU and threat interpretations (*Hypothesis 2*). With respect to IU, participants were significantly less likely to endorse negative beliefs about uncertainty by post-treatment. Moreover, reductions in IU were significantly correlated with reductions in GAD symptoms, providing support (albeit indirect) for the assumption that this CBT has a beneficial effect on worry in part because it produces decreases in negative beliefs about uncertainty. Significant reductions in threat interpretations were also observed during treatment. The fact that reductions in threat interpretations were associated with reductions in GAD symptoms is consistent with information processing accounts of GAD (e.g., Mathews, 1990) that implicate interpretation bias in the etiology of worry and anxiety and, by implication, in their reduction during treatment.

Finally, we examined how reductions in IU and interpretation bias might work together as mechanisms of symptom change in a series of mediation analyses. It should be noted here that because analyses were conducted using pre- and post-treatment scores, the temporal sequence of change proposed in these mediation models requires further clarification in analyses with a greater number of assessment points. Nonetheless, the results were consistent with the idea that reductions in IU partially mediated the relation between interpretation bias and GAD symptoms during treatment (*Hypothesis 3*). In other words, a decreased tendency to perceive ambiguous situations as threatening predicted reductions in worry and anxiety, and this effect appeared to be explained at least in part by reductions in negative beliefs about uncertainty.

In terms of how an IU-focused CBT might lead to reductions in interpretation bias, one possibility is in the behavioural exposure exercises completed in treatment. These exercises comprise the most direct approach to challenging IU in this protocol and were included to decrease experiential avoidance of uncertainty (Dugas & Robichaud, 2007). Although the mechanisms that explain why exposure-based approaches lead to symptom reduction are debated (Tryon, 2004), systematic exposure to uncertainty may allow for habituation to the associated distress, leading to increased tolerance for uncertainty. Alternatively, this exposure may allow individuals to gather novel or previously ignored information about ambiguous situations that might challenge their perceptions of threat, ultimately increasing tolerance for uncertainty. The possibility that participants in this CBT may use the exposure exercises as a form of behavioural experiment is intriguing given that the current protocol does not include the explicit hypothesis testing that often accompanies behavioural experiments in CBT (Bennett-Levy et al., 2004).

The results presented here provide further support for the efficacy of an IU-focused CBT for GAD. However, although 75% of participants were remitted by post-treatment, 25% still met GAD diagnostic criteria and there is still room for improvement. Despite large reductions in all variables during treatment, IU was also associated with one of the smaller pre-to-post effect sizes (see Table 1). This is surprising given that IU is explicitly targeted during treatment. One possible explanation is that altering long-standing beliefs may be more difficult than altering negative affect in the shorter-term, or perhaps relatively smaller reductions in cognitive variables can produce relatively large changes in negative affect. Another possibility is that this IU-focused protocol could be altered to target IU more effectively.

With this in mind, members of our research group have recently developed a new IU-focused CBT protocol for GAD (Hebert, Geninet, & Dugas, 2015). This protocol is a "distilled" version of the existing protocol because it features an exclusive focus on behavioural exposure to uncertainty and does not include other components of the original protocol that are thought to target IU less directly (e.g., problem-solving training). The main component of the new protocol will involve explicitly testing negative cognitions about uncertainty through behavioural experiments. As mentioned previously, change may be occurring in a number of ways (e.g., habituation, cognitive change or both). The behavioural exercises in the new protocol should allow for similar change processes but the inclusion of explicit hypothesis testing may enhance

the effect of an IU intervention if participants are using the behavioural exposure exercises in the original protocol as experiments to challenge negative cognitions about uncertainty. If this approach proves to be as efficacious as the existing IU-focused CBT, the new protocol will provide another viable treatment option for individuals with GAD and/or high levels of IU.

Another way to refine the existing IU-focused CBT protocol might be to target interpretation bias more explicitly during treatment. Although large reductions in interpretation bias were observed, the pre-to-post effect size for interpretation bias was smaller than the effect sizes for symptom measures. The addition of a treatment component explicitly designed to target interpretation bias might help to improve treatment outcomes beyond the 75% remission rate reported here. Training programs designed to reduce interpretation bias have been developed by several research groups (e.g., Hayes et al., 2010; Mathews et al., 2007). These programs are time-efficient (e.g., 15 to 20 minutes), require minimal effort to implement, and can involve paper-and-pencil or computerized tasks that can be completed in a clinical setting. Furthermore, recent meta-analyses suggest that training programs designed to modify threat interpretations may produce consequent reductions in anxiety (see Hallion and Ruscio, 2011, for a review).

This study had several important limitations. First, the measure of threat interpretation (AUSD-Ambiguous) assessed degree of concern in hypothetical ambiguous situations and was therefore an indirect measure of the tendency to make threat interpretations. Future research should assess the extent to which CBT can produce change in interpretation bias in real-world situations using more direct measures of this tendency. A second limitation was that interpretation bias was assessed only at pre and post-treatment and we were unable to confirm the temporal relations of the proposed mediation models. Future studies should include multiple assessments of theoretically-relevant variables to test a variety of temporal and causal models. Finally, threat interpretations were not assessed during follow-up and it remains to be seen whether this CBT protocol can produce sustained changes in threat interpretations. If cognitive models of anxiety are correct (e.g., Clark and Beck, 2010), longer-term changes in threat interpretations will be essential to the maintenance of treatment gains.

Despite these limitations, the current study provides data that are consistent with the proposed processes of change during an empirically-supported CBT for GAD. This study has allowed us to identify two cognitive variables, intolerance of uncertainty (IU) and interpretation

bias, that appear to play a role in the reduction of excessive worry and anxiety during treatment, and to gain a better understanding of how these variables might work together to produce symptom reduction. Most importantly, studies such as this one, which examine the processes of change during treatment, can provide insight into how existing treatments might be refined.

CHAPTER 3

BRIDGE

The overarching goal of the current program of research was to identify the roles played by two cognitive variables, intolerance of uncertainty (IU) and interpretation bias, in the reduction of symptoms associated with Generalized Anxiety Disorder (GAD). The assumption that these variables are involved in GAD etiology and, by implication, in symptom reduction during treatment comes in part from research studies demonstrating a strong association between GAD symptoms, IU and interpretation bias, and from studies involving experimental manipulations of IU and interpretation bias. These associations are also supported by cognitive theories of anxiety disorders (e.g., Beck, Emery, & Greenberg, 1985), which suggest that anxious individuals hold negative beliefs that, when activated by specific events, lead to biases in information processing, in turn leading to elevated anxiety symptoms. If individuals with GAD hold negative beliefs about uncertainty and this leads to an increased tendency to make threatening interpretations in situations with ambiguous (but potentially negative) outcomes, then targeting both IU and interpretation bias effectively during treatment may be particularly important if we wish to improve treatment outcomes.

In our first study, we examined whether an IU-focused CBT was associated with reductions in IU and interpretation bias, as well as in GAD symptoms. As expected, CBT was associated with large and significant reductions in GAD symptoms (i.e., worry and anxiety) and in depressive symptoms from pre to post-treatment. Large and significant reductions were also observed in both IU and interpretation bias by post-treatment. Moreover, reductions in interpretation bias predicted reductions in GAD symptoms during treatment, and the results were consistent with the idea that this effect was partially explained by reductions in IU. During an IU-focused CBT, individuals who view ambiguous situations as less threatening appear to be less worried and anxious in part because they are less likely to endorse negative beliefs about uncertainty.

Given the potential causal role of interpretation bias in the maintenance of anxiety symptoms, experimental paradigms that were originally used to demonstrate an association between interpretation bias and symptom variables are receiving increasing attention for their potential therapeutic value as Cognitive Bias Modification (CBM-I) training programs (e.g.,

Mathews et al., 2007; Murphy, Hirsch, Mathews, Smith, & Clark, 2007; Salemink, van den Hout, & Kindt, 2009). For instance, Beard, Amir and colleagues (e.g., Beard & Amir, 2008) recently developed a new CBM-I training program to target interpretation bias among socially anxious individuals. This program has been associated, in prior research, with significant reductions in negative interpretation bias and, in at least some studies, reductions in anxiety symptoms (Amir, Bomyea, & Beard, 2010; Amir & Taylor, 2012; Beard & Amir, 2008). To date, however, few CBM-I training programs have been developed to target interpretation bias in the broader range of worry domains commonly associated with GAD (e.g., social, health, financial). In the second study within the current research program, we examined the efficacy of a new CBM-I training program among individuals with elevated worry and anxiety.

CHAPTER 4

Validation of a Multi-Session Cognitive Bias Modification (CBM-I) Training Program among Individuals with Elevated Worry and Anxiety

There is now considerable evidence that Generalized Anxiety Disorder (GAD) is associated with interpretation bias, or the tendency to interpret ambiguous information in a negative or threatening manner. This evidence has been generated through a variety of paradigms, including homophone tasks (e.g., Mathews, Richards, & Eysenck, 1989) and ambiguous sentence or scenario tasks (e.g., Butler & Mathews, 1983), in which participants are presented with ambiguous information that can be interpreted as either threatening or neutral/benign. Across studies, individuals with GAD are more likely than non-anxious individuals to make negative or threatening interpretations of ambiguous information (e.g., Butler & Mathews, 1983; Eysenck, Mogg, May, Richards, & Mathews, 1991; Mathews et al., 1989). Similar evidence of interpretation bias has been found among individuals with elevated trait anxiety (Hirsch & Mathews, 1997; Mogg et al., 1994). Non-anxious individuals, in contrast, are more likely to infer neutral or positive outcomes when confronted with ambiguous information (Eysenck et al., 1991; Hirsch & Mathews, 1997).

Evidence of an association between interpretation bias, GAD, and elevated trait anxiety has led information processing theorists (e.g., Mathews, 1990) to propose that this bias may play a causal role in the etiology of GAD symptoms. Support for a causal role comes from studies involving the experimental manipulation of interpretation bias. In a seminal study, Mathews and Mackintosh (2000) presented non-anxious participants with ambiguous social vignettes that remained ambiguous until the final word. For example: "Your partner asks you to go to an anniversary dinner that their company is holding. You have not met any of their work colleagues before. Getting ready to go, you think that the new people you will meet will find you...." Participants were then presented with a cue toward either a neutral or benign disambiguation (e.g., "fri__y" to cue "friendly") or toward a negative or threatening disambiguation (i.e., "bor__g" to cue "boring"). At test, participants in the threat condition were more likely to interpret subsequent ambiguous social vignettes as threatening and to report higher levels of state anxiety than participants in the neutral/benign condition. More recent studies using similar paradigms have replicated the finding that interpretation bias can be experimentally induced in

non-anxious individuals (Mackintosh, Mathews, Yiend, Ridgeway, & Cook, 2006; Yiend, Mackintosh, & Mathews, 2005), that induced bias can endure for at least 24 hours following training (Yiend et al., 2005) and that this bias can persist despite changes in training and testing contexts (Mackintosh et al., 2006). Several studies have also replicated the finding that induced interpretation bias can be associated with corresponding changes in self-reported anxiety (e.g., Mackintosh et al., 2006, Experiment 2; Yiend et al., 2005) and in emotional reactivity in response to a subsequent stressor (e.g., Mackintosh et al., 2006, Experiment 2; Wilson, MacLeod, Mathews, & Rutherford, 2006).

The use of experimental paradigms to successfully alter interpretation bias has led researchers to consider their therapeutic potential. Cognitive bias modification training programs for interpretation bias (CBM-I) have since been developed with the goal of targeting this bias among individuals with elevated levels of anxiety. Based primarily on the paradigm developed by Mathews and Mackintosh (2000), CBM-I training programs have been associated with significant reductions in negative interpretation bias among individuals with high trait anxiety or an anxiety disorder diagnosis (e.g., Mathews et al., 2007; Murphy, Hirsch, Mathews, Smith, & Clark, 2007; Salemink, van den Hout, & Kindt, 2009), even after a single training session (e.g., Amir, Bomyea, & Beard, 2010). CBM-I training among anxious individuals has also been associated with corresponding reductions in anxiety (e.g., Mathews et al., 2007; Salemink et al., 2009) even up to one week following training (Mathews et al., 2007) and, in at least some studies, with lower levels of emotional reactivity in response to a subsequent stressor (e.g., Murphy et al., 2007). Among individuals with elevated worry, CBM-I training has been associated with reductions in interpretation bias and in the frequency of negative thought intrusions during a worry induction task (Hayes et al, 2010), a finding that has also been replicated among individuals with a GAD diagnosis (Hirsch, Hayes, & Mathews, 2009).

Overall, meta-analyses suggest that CBM-I training can be associated with moderate-to-large reductions in negative interpretation bias among anxious individuals (Beard, 2011; Hallion & Ruscio, 2011). However, the impact of CBM-I on negative affect has been more variable across studies, with effect sizes in the small-to-moderate range (Hallion & Ruscio, 2011), and there has been a recent interest in methods to enhance the efficacy of CBM-I training (Fox, Mackintosh, & Holmes, 2014). One such approach was developed by Beard and Amir (2008),

using a *Word-Sentence Association Paradigm* (WSAP). Arguing that most CBM-I training programs have focused on encouraging either a reduction in threat interpretation *or* an increase in neutral or benign interpretation, Beard, Amir and colleagues (2008, 2009) designed the WSAP CBM-I protocol to provide participants with feedback to promote both the reduction of threat interpretations *and* an increase in neutral/benign interpretations of ambiguous sentences. The WSAP CBM-I training originally involved eight 15-20 minute sessions of a computerized task, administered over a 4-week period and was developed to target the interpretation biases common among individuals with Social Anxiety Disorder. Thus far, WSAP CBM-I training has been associated with greater increases in benign interpretations and greater reductions in threat interpretations among socially anxious individuals when compared to an interpretation control condition (ICC), in which participants received positive feedback for their responses at random in 50% of training trials (Beard & Amir, 2008). Participants receiving CBM-I training also showed greater reductions in social anxiety than participants in the ICC condition. Amir, Bomyea and Beard (2010) also observed significant reductions in interpretation bias among socially anxious individuals after only one session of WSAP CBM-I training, although this shorter program did not lead to significant reductions in negative affect. Finally, Amir and Taylor (2012) evaluated a 12-session WSAP CBM-I protocol as a potential stand-alone intervention for Social Anxiety Disorder. Participants who received CBM-I training exhibited significantly greater reductions in threat interpretations, increases in the tendency to make neutral or benign interpretations, and greater reductions in trait (but not social) anxiety when compared to participants in an ICC condition.

Research on the efficacy of the WSAP CBM-I training program suggests that this training may be useful as a brief and cost-effective intervention to target negative interpretation bias and associated anxiety among socially anxious individuals. Given that concern about social relationships is also a common worry domain in GAD (Davey, Hampton, Farrell, & Davidson, 1992), individuals with GAD might also benefit from WSAP CBM-I training. However, GAD is also associated with a number of additional worry domains (e.g., finances, health, and safety) (Davey et al., 1992; Dugas, Freeston, Doucet, Lachance, & Ladouceur, 1995). In this study, we were interested in examining the efficacy of a new WSAP CBM-I training program that was

developed to target negative interpretation bias in the broader range of worry domains that are commonly associated with GAD.

In addition to examining the efficacy of a GAD-specific CBM-I training program on negative interpretation bias, we were also interested in examining its effects on GAD symptoms (i.e., worry and anxiety) and on another cognitive variable – intolerance of uncertainty – which has also been proposed to play a role in the etiology of excessive worry and anxiety (Dugas & Robichaud, 2007). Intolerance of uncertainty can be defined as a dispositional characteristic resulting from a set of negative beliefs about uncertainty and its consequences (Koerner & Dugas, 2006) and is strongly associated with worry and GAD diagnostic status (de Bruin, Rassin, van der Heiden, & Muris, 2006; Rosen & Knäuper, 2009). Moreover, several recent studies have demonstrated a strong association between intolerance of uncertainty and interpretation bias. Specifically, individuals who endorse negative beliefs about uncertainty (e.g., "A small unforeseen event can spoil everything, even with the best of planning," "I must get away from all uncertain situations") are also more likely to demonstrate a bias toward negative or threatening interpretations of specific ambiguous situations (Dugas et al., 2005; Koerner & Dugas, 2008). A training program that is effective in the reduction of negative interpretation bias may also be effective in helping participants challenge negative beliefs about uncertainty.

Our primary goal in this study was to examine the impact of a new GAD-specific CBM-I training program on interpretation bias, relative to an interpretation control condition (ICC), among individuals with elevated worry and anxiety. Our secondary goal was to examine the impact of CBM-I training on GAD symptoms (i.e., worry and anxiety) and on intolerance of uncertainty. We tested three main hypotheses: Individuals receiving CBM-I training would report greater decreases in interpretation bias than individuals in an interpretation control condition (ICC) which was designed to have no effect on interpretations of ambiguous stimuli (*Hypothesis 1*). Individuals receiving CBM-I training would also report greater decreases in intolerance of uncertainty, worry, and anxiety over the training period than individuals in the ICC condition (*Hypothesis 2*). Finally, gains reported in the CBM-I condition during training would be maintained one week following training (*Hypothesis 3*).

Method

Participants

The sample consisted of 30 adults (n = 23, 76.67% women; mean age = 26.90, SD = 9.72). Participants had completed an average of 15.77 (SD = 3.08) years of education. A majority were enrolled as full-time students (n = 25, 83.33%), while a minority were either employed full-time (n = 1, 3.33%) or part-time (n = 4, 13.33%). In terms of ethnicity, a majority identified as being of European descent or White (n = 20, 66.67%), while a minority identified as Middle Eastern (n = 3, 10.00%), African-Canadian or Black (n = 2, 6.67%), Asian (n = 1, 3.33%), or biracial (n = 1, 3.3%). One participant (3.33%) did not indicate his or her ethnicity. All participants were Francophone.

Prior to the start of the study, all participants met DSM-IV-TR (and DSM-5) diagnostic criteria for GAD as indicated by self-report on the *Worry and Anxiety Questionnaire* (WAQ; Dugas et al., 2001, see **Measures**). In order to compare the initial severity of symptoms in the current analogue sample with clinical samples, GAD symptom severity was also assessed prior to training using the 9-point (0-8) Clinician's Severity Rating of the *Anxiety Disorders Interview Schedule for DSM-IV* (ADIS-IV; Di Nardo, Brown, & Barlow, 1994; see **Measures**). All participants met GAD diagnostic criteria on the ADIS-IV and the mean GAD severity rating at pre-treatment was 5.43 (SD = 1.01; range = 4 to 7). One participant (3.33%) was taking psychoactive medication for anxiety or depression during the study. Finally, 50.00% (n = 15) of participants had received some form of psychological treatment in the past, with 10.00% (n = 3) having received cognitive-behavioural therapy specifically.

Measures

Clinician-administered. The GAD section of the *Anxiety Disorders Interview Schedule for DSM-IV* (ADIS-IV; Di Nardo et al., 1994) was administered to determine the presence and severity of GAD symptoms prior to training. Symptom severity was assessed using the Clinician's Severity Rating scale (CSR) of the ADIS, which ranges from 0 (Absent or none) to 8 (Very severe or very severely disturbing/disabling). A score of 4 or more indicates a clinically significant level of symptoms. The ADIS-IV CSR has adequate interrater reliability for GAD (r = .72) (Brown, Di Nardo, Lehman, & Campbell, 2001).

Self-report symptom measures. The *Worry and Anxiety Questionnaire* (WAQ; Dugas et al., 2001) is an 11-item self-report measure that assesses the severity of GAD symptoms according to the DSM-IV-TR (and DSM-5) criteria. The WAQ can be scored as a dichotomous

measure indicating the presence or absence of clinically significant DSM-based GAD symptoms or as a continuous measure of GAD symptom severity. When scored as a dichotomous measure, the WAQ has adequate test-retest reliability (75.0% agreement for individuals who initially meet GAD diagnostic criteria and 82.4% agreement for individuals who do not). Dichotomous scores on the WAQ can distinguish between individuals who do or do not meet GAD diagnostic criteria by structured diagnostic interview (Dugas et al., 2001). In the current study, a dichotomous scale was used to identify the presence or absence of GAD symptoms during screening. The original WAQ assesses the severity of GAD symptoms over the past six months, as per DSM criteria. A past-week version of the WAQ (WAQ-pw) was developed for this study and was administered just prior to the start of training, post-training and at 1-week follow-up. In the current sample, the internal reliability for the WAQ was $\alpha = .78$ and for the WAQ-pw was $\alpha = .75$.

The *Penn State Worry Questionnaire* (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) is a 16-item self-report measure of the general tendency to worry. The PSWQ assesses the excessiveness of worry regardless of worry content. The PSWQ has adequate internal reliability ($\alpha = .86$ to .95; Molina & Borkovec, 1994) and convergent validity with other measures of worry and anxiety (Gosselin et al., 2001). A past-week version of the PSWQ (PSWQ-pw) was used in the current study. The internal reliability for the PSWQ-pw in the current sample was $\alpha = .75$.

The *Center for Epidemiologic Studies - Depression* scale (CES-D; Radloff, 1977; Fuhrer & Rouillon, 1989) is a 20-item screening tool that assesses the frequency of depressive symptoms over the past week. The CES-D has adequate internal consistency ($\alpha = .88$) and convergent validity with other measures of depressive symptoms (Montgomery & Asberg, 1979). The internal reliability for the CES-D in the current sample was $\alpha = .91$.

The *Catastrophizing Interview* (CI; Provencher, Freeston, Dugas, & Ladouceur, 2000; Vasey & Borkovec, 1992) is a clinician-administered structured worry task designed to assess several aspects of an individual's current worries. Participants identify their most severe worry theme. The experimenter then leads the participant through the catastrophizing phase of the interview by asking "What is it about (insert worry) that worries you?" Once the participant provides a response, the experimenter asks "If (insert worry) were to happen, what are you afraid would happen next?" This process is repeated until the participant can no longer identify additional feared outcomes. Participants then rate the likelihood of each catastrophic step in their

worry process, using a scale from 1 (Not at all likely) to 100 (Extremely likely), as well as the severity of each step on a scale from 1 (Not at all severe) to 8 (Extremely severe). Three outcome variables are generated by the CI, including the number of steps in the worry chain, the average likelihood ratings of the feared outcomes, and the average severity of the steps.

Cognitive self-report measures. The *Intolerance of Uncertainty Scale* (IUS; Freeston, Rhéaume, Letarte, Dugas & Ladouceur, 1994) is a 27-item scale that assesses negative beliefs about uncertainty. The full-scale IUS has adequate internal reliability (α = .91; Freeston et al., 1994), can be used to differentiate between high and low worriers in a non-clinical sample and is strongly correlated with measures of worry (*r* = .63), anxiety (*r* = .57), and depressive symptoms (*r* = .52), although IUS scores also uniquely predict variance in worry above and beyond scores on measures of anxiety and depressive symptoms (Freeston et al., 1994). A 12-item past-week version of the IUS (IUS-pw) was used in the current study. The internal reliability of the IUS-pw at pre-training was α = .75 in the current sample.

The *Ambiguous/Unambiguous Situations Diary* (AUSD; Davey et al., 1992) is a 28-item measure of appraisal bias in response to positive, negative, or ambiguous scenarios. Each scenario is presented as a fictitious diary entry and scenarios are in the first person. Of the 28 scenarios, 7 have positive outcomes (e.g., "It is beautiful day today. It is easy to be in a good mood when the sun is shining"), 7 have negative outcomes (e.g., "I received a letter from my bank this morning informing me that I had exceeded my withdrawal limit and would have to pay a large fine"), and 14 have ambiguous outcomes (e.g., "Today my teacher handed back my assignment and I was surprised by my mark"). Participants indicate their level of concern in response to each scenario. Only the AUSD-Ambiguous subscale was used in the current study. Dugas et al. (2005) found that scores on the Ambiguous subscale were significantly correlated with measures of worry (*r* = .33), anxiety (*r* = .27), and depressive symptoms (*r* = .32), but were more strongly correlated with scores on the IUS (*r* = .50; all *p* values < .05). The internal reliability of the AUSD-Ambiguous subscale in this sample was α = .92.

The *Scrambled Sentence Task* (SST) was created for use in the current study as an additional measure of interpretation bias among individuals with GAD. This measure was developed based on the SST for social anxiety (Standage, Ashwin, & Fox, 2010) but was expanded to assess interpretation bias in a broader range of worry domains that are commonly

found among individuals with GAD (i.e., health, safety, academic, work, finances, social, etc). Participants are presented with a series of 6-word scrambled sentences that appear one-by-one on a computer screen. Although the meaning of each sentence is initially ambiguous, participants are asked to work as quickly as they can to select five of the six words in each sentence and to rearrange them into sentences that are meaningful. Each sentence can be disambiguated, or "unscrambled", to form either a positive sentence (e.g., "My date will be pleased.") or a negative sentence (e.g., "My date will be disappointed"). Moreover, the sentences in the SST were selected to assess the degree to which participants demonstrate either problematic estimates about the likelihood of a negative outcome occurring (e.g., "I am always/rarely vulnerable to disease") or problematic estimates about its cost and their own inability to cope with the outcome (e.g., "Financial mistakes can't/can be fixed"). In order to reduce the likelihood of social desirability effects, participants completed the task under a time constraint (i.e., within four minutes). A cognitive load was also introduced at the start of the task. Specifically, participants were presented with a 6-digit number at the start which they then had to recall at the end of the task. The outcome variable is the ratio of completed sentences that were disambiguated in a negative or threatening manner relative to the total number of meaningful sentences (negative and positive) that the participant formed. A score greater than .5 (or 50%) reflects more negative interpretations whereas a score of less than .5 reflects more positive or neutral interpretations. There were 20 scrambled sentences in each of three versions of the SST created for this study and participants completed one version of the SST at each assessment point (i.e., pre-training, post-training and 1-week follow-up). The order of the three versions of the SST was counterbalanced.

Social stress task. Based on the Trier Social Stress Task (Kirschbaum et al., 1993a), which was developed to elicit social-evaluative concerns and moderate psychological distress in a naturalistic setting, the social stress task involved telling participants, at the end of the final training session, that they would have to complete a 5-minute oral presentation on a pre-selected topic (e.g., factors that are currently influencing the state of the environment) in front of a panel of experts. Participants were asked to rate their level of anxiety, prior to and immediately after being told about this task, on a Visual Analogue Scale (VAS) from 0 (Not at all anxious/worried) to 100 (Severely anxious/worried).

All self-report measures were administered at pre-training, post-training and one week following training. Clinician-administered measures and assessment procedures included the

ADIS-IV, which was administered only at pre-training, and the *Catastrophizing Interview* and social stress task, both of which were administered only a post-training.

Procedure

Participants were recruited from undergraduate psychology courses and through posters distributed on campus at Concordia University in Montreal, Quebec, and Université de Sherbrooke, in Sherbrooke, Quebec. All advertising invited individuals who experienced "excessive and uncontrollable worry about a number of events or situations in their daily lives" to contact researchers for more information. Interested individuals were further screened by completing an online questionnaire, which included the *Worry and Anxiety Questionnaire* (WAQ; Dugas et al., 2001, see **Measures**). Inclusion criteria were: (a) the presence of GAD as per DSM-IV-TR diagnostic criteria, indicated by self-report on the WAQ; (b) at least 18 years of age; (c) no current suicidal ideation; (d) no current substance abuse; (e) no past or current schizophrenia, bipolar disorder or psychosis; (f) no change in psychoactive medication in the past 12 weeks; (g) willingness to maintain a stable dose or type of psychoactive medication during the 3-week study period; (h) no current psychological treatment for difficulties with anxiety or mood; (i) willingness to participate in all study sessions; (j) no uncorrected visual or auditory impairment; and (k) having French as a maternal language.

A total of 157 individuals indicated their interest in the study in response to advertisements and were sent an electronic link for the online screening questionnaire. A total of 120 individuals completed the screening questionnaire. Of these, 90 individuals were ineligible for the study (see Figure 2). The remaining 30 eligible participants were randomized to complete cognitive bias modification training (CBM-I; $n = 16$) or an interpretation control condition, designed to have no effect on interpretation bias (ICC; $n = 14$). Following randomization, participants completed five laboratory visits over a three-week period. Participants were told that they would be completing measures and tasks during these visits that were designed to assess and potentially modify certain "habitual ways of thinking" that are common among individuals with excessive worry and anxiety. During laboratory visits, participants completed four 15-minute training sessions of either CBM-I or ICC as well as self-report and clinician-administered measures of cognitive and symptom variables. Participants were compensated up to $50.

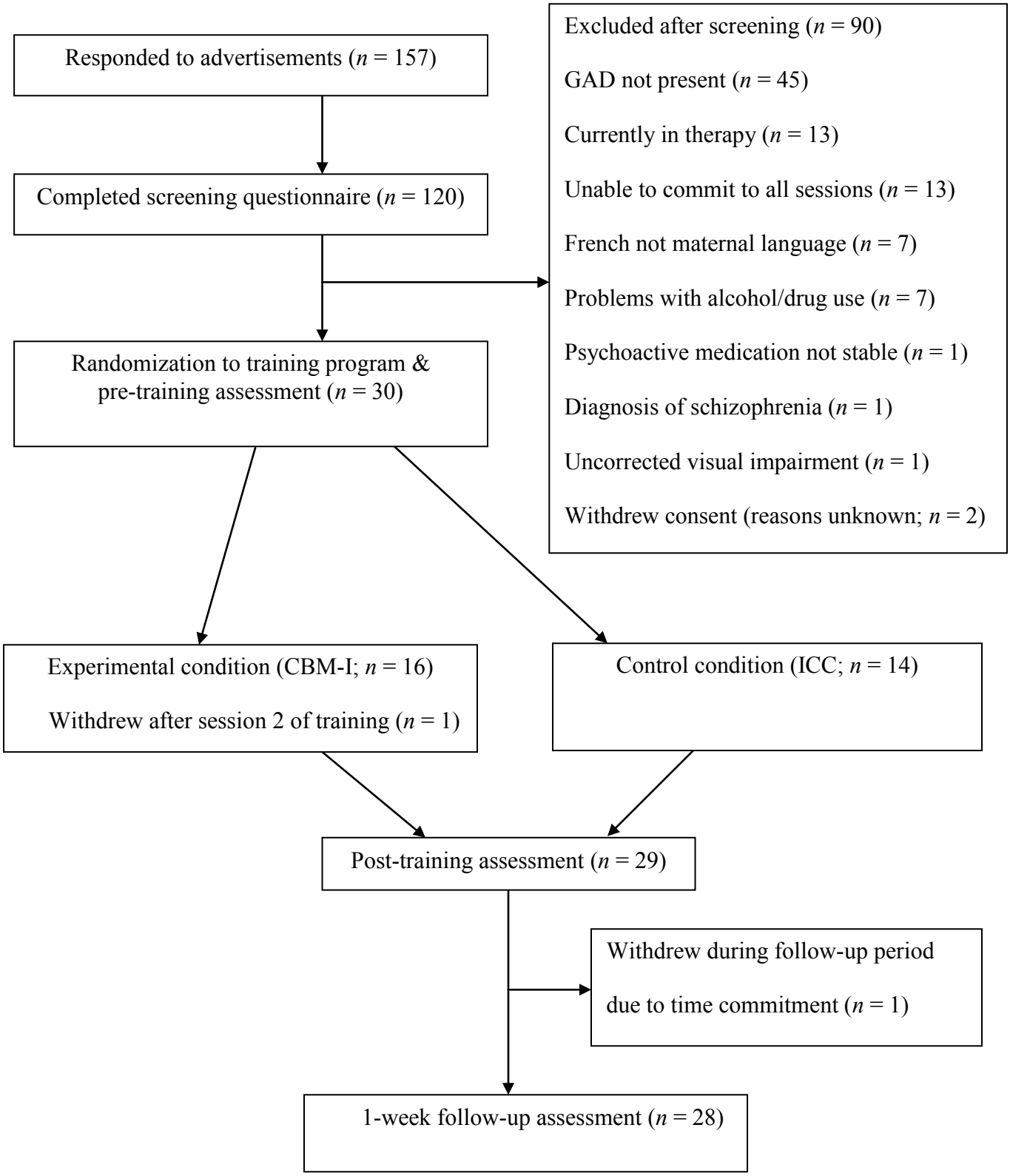

Figure 2. Participant flow through study. GAD = Generalized Anxiety Disorder; CBM-I = Cognitive Bias Modification for interpretation bias; ICC = interpretation control condition.

Cognitive bias modification training (CBM-I). The CBM-I training program developed for this study was based on the *Word-Sentence Association Paradigm* (WSAP) developed by Beard and Amir (2008) but was designed to target interpretation bias in a broad range of worry domains. The stimuli used in the CBM-I condition were obtained from the WSAP assessment procedure developed by Ogniewicz et al. (2014). Each participant in CBM-I completed four 15-minute training sessions. Each CBM-I session was completed individually with participants seated in front of a computer monitor in a testing room. Each session consisted of 124 trials, including four practice trials and 120 training trials. Each trial consisted of five phases (see Figure 3). First, a fixation cross appeared in the centre of the screen for 500ms to alert participants to the start of a new trial. This cross was then replaced by a word that represented either a threat interpretation (e.g., "Missing") or a neutral/benign interpretation (e.g., "Holiday") for 500ms. The word was then replaced by an ambiguous sentence (e.g., "Your child is not at school") and participants were asked: "Was the word related to the sentence?" Participants were then prompted to press #1 on the keyboard if they thought the word and sentence were related or #3 if they thought the word and sentence were not related. Finally, participants were given feedback to indicate whether their response was correct (i.e., "You are correct!") or incorrect (i.e., "You are incorrect."). The goal of the task was to encourage benign interpretations and to discourage threat interpretations in a range of ambiguous situations. Participants were given positive feedback each time they made benign interpretations (i.e., indicating that "Holiday" and "Your child is not at school" were related) and when they rejected threat interpretations (i.e., indicating that "Missing" and "Your child is not at school" were not related). Participants received negative feedback each time they rejected benign interpretations (i.e., indicating that "Holiday" and "Your child is not at school" were not related) or when they endorsed threat interpretations (i.e., indicating that "Missing" and "Your child is not at school" were related).

Interpretation control condition (ICC). Participants in the control condition also completed four 15-minute sessions of the computerized WSAP task. Based on a procedure used by Beard, Weisberg and Amir (2011), all aspects of the ICC condition were identical to those in the CBM-I condition with one exception: each word appearing on the screen just prior to each ambiguous sentence was either related to the ambiguous scenario in only a superficial way (e.g., "Education" – "Your child is not in school") or were unrelated (e.g., "Penny" – "Your child is

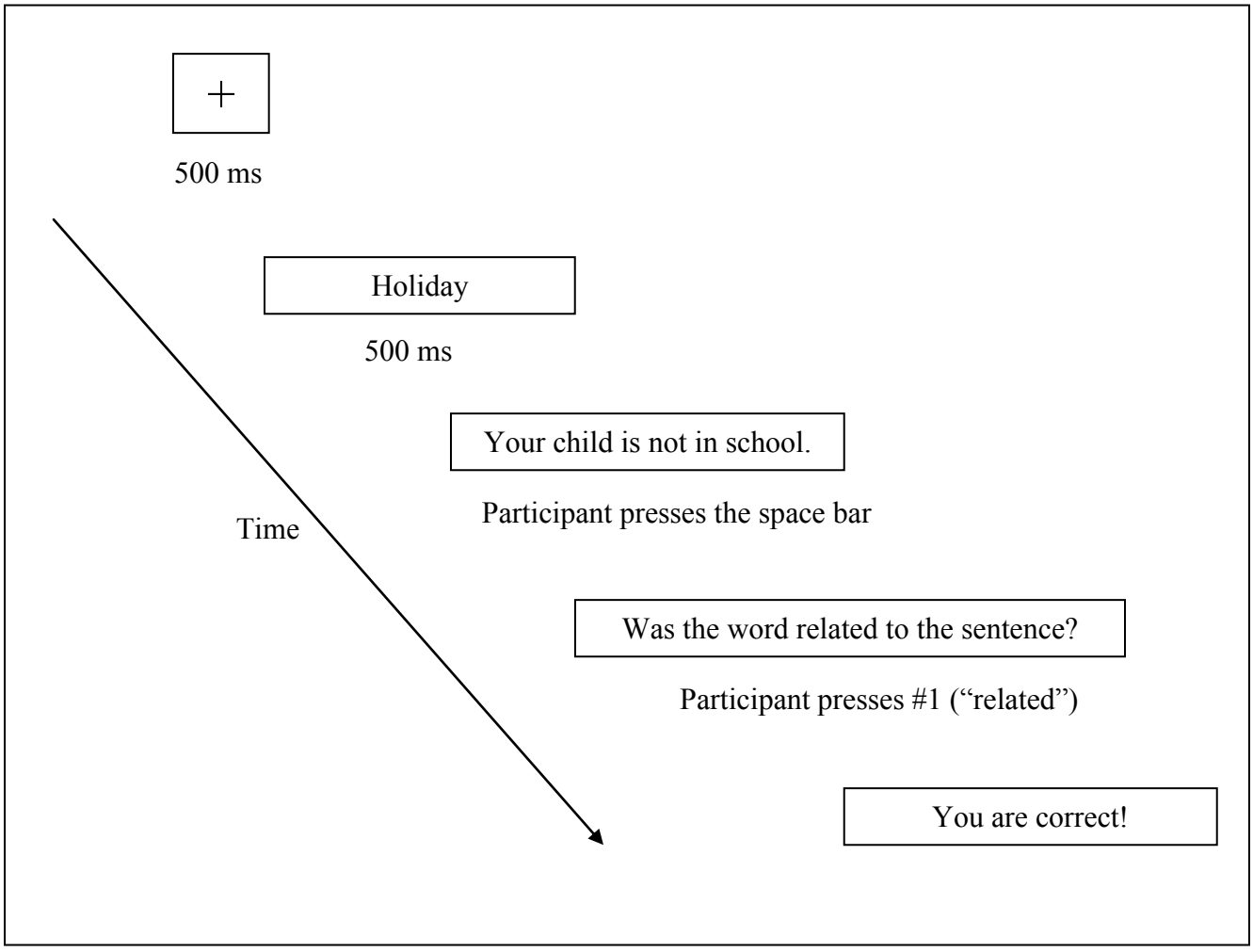

Figure 3. Sample trial in the CBM-I condition.

not in school"). Participants were given positive feedback if they correctly identified that a word and sentence pair were related (i.e., indicating that "Education" and "Your child is not at school" were related) and when correctly rejecting unrelated pairs (i.e., "Penny" and "Your child is not at school"). Participants received negative feedback when they rejected related pairs (i.e., "Education" and "Your child is not at school") or accepted unrelated pairs (i.e., "Penny" and "Your child is not at school"). The related/unrelated words were selected based on pilot data with a separate student sample. Related/unrelated words were retained if they were correctly identified as related or unrelated to their ambiguous sentence at least 80% of the time.

Results

Preliminary Analyses

Comparison of treatment sites at baseline. Participants at Concordia University (n = 21) and Université de Sherbrooke (n = 9) did not differ significantly on any demographic variables (all p values > .05). A comparison of participants at each site on clinical characteristics at pre-training revealed a significant effect of site on the Scrambled Sentence Task (SST), $t(28) = 4.00$, $p < .001$, $g = 1.60$, with participants at Concordia University (M = 43.47%, SD = 0.16) making a higher percentage of threat interpretations of ambiguous situations on the SST than participants at Université de Sherbrooke (M = 19.57%, SD = 11.91). The sites did not differ on a second measure of interpretation bias (AUSD-Ambiguous), $t(28) = 0.84$, $p = .409$, $g = 0.32$. No other between-site differences were found in intolerance of uncertainty (IUS), on measures of GAD (WAQ, PSWQ), nor on a measure of depressive symptoms (CES-D; all p values > .05).

Comparison of treatment conditions at baseline. The CBM-I and ICC conditions did not differ significantly on any measures of demographic or clinical variables at pre-training (all p values > .05). Mean comparisons between conditions at pre-training are presented in Table 4.

Main Effects of Training: From Pre- to Post-Training

A total of 30 participants (CBM-I = 16; ICC = 14) began either CBM-I or ICC training. One participant withdrew from the CBM-I condition mid-training and another participant withdrew from the ICC condition following the post-training assessment, both due to difficulties meeting the time requirements for participation. All analyses presented below are on a completers-only sample both during training (N = 29; CBM-I = 15, ICC = 14) and during the 1-week follow-up period (N = 28; CBM-I = 15, ICC = 13).

Table 4. *Comparison of Pre-Training Sample Characteristics in the CBM-I (n = 16) and ICC (n = 14) Conditions*

	CBM-I	*ICC*	Significance Test	*p*	*d*
Demographic variables					
Sex, *n* (% female)	12 (75.00)	11 (78.57)	$\chi^2(1) = 0.05$	.82	0.04†
Age	28.19 ± 11.26	25.43 ± 7.75	$t(28) = -0.77$	.45	-0.29
Years of education	15.89 ± 3.30	15.64 ± 2.93	$t(28) = -0.20$	.84	-0.08
Full-time work or school, *n* (%)	13 (81.25)	13 (92.86)	$\chi^2(1) = 0.87$	.35	0.17†
Relationship status, *n* (% single)	13 (81.25)	11 (78.57)	$\chi^2(1) = 0.03$	.86	0.03†
Clinical and cognitive variables					
AUSD-Ambiguous	101.38 ± 20.28	101.86 ± 18.43	$t(28) = 0.07$	.95	0.03
SST	0.39 ± 0.21	0.33 ± 0.16	$t(28) = -0.86$	.40	-0.33
IUS	38.44 ± 8.16	35.64 ± 10.84	$t(28) = -0.80$	.43	-0.30
ADIS (CSR)	5.31 ± 1.01	5.57 ± 1.02	$t(28) = 0.70$	.49	0.27
WAQ	35.22 ± 6.57	33.54 ± 8.96	$t(28) = -0.59$	.56	-0.22
PSWQ	54.31 ± 6.94	54.93 ± 7.30	$t(28) = 0.24$	.81	0.09
CES-D	26.69 ± 10.20	22.07 ± 13.14	$t(28) = -1.08$	.29	-0.41

Note. CBM-I = Cognitive bias modification training for interpretation bias; ICC = Interpretation control condition; AUSD-Ambiguous = Ambiguous Unambiguous Situations Diary – Ambiguous subscale; SST = Scrambled Sentence Task; IUS = Intolerance of Uncertainty Scale; ADIS (CSR) = Clinician's Severity Rating of the Anxiety Disorders Interview Schedule for DSM-IV; WAQ = Worry and Anxiety Questionnaire; PSWQ = Penn State Worry Questionnaire; CES-D = Center for Epidemiological Studies – Depression. † = phi coefficients were used to assess effect sizes for χ^2 tests. $\alpha = .05$.

Change in interpretation bias. We first assessed the effect of training on interpretation bias on the ambiguous subscale of the AUSD from pre- to post-training. Means and standard deviations for the completers-only sample are presented in Table 5. Scores on the AUDS-Ambiguous were submitted to a 2 (Group: CBM-I, ICC) x 2 (Time: pre-training, post-training) mixed effect ANOVA analysis (see Table 6 for all mixed effects ANOVA analyses in the completers-only sample). The effect Time was statistically significant, $F(1, 27) = 17.95$, $p < .001$, $\eta^2_p = .37$, as was the Group x Time interaction, $F(1, 27) = 8.40$, $p = .007$, $\eta^2_p = .22$. Follow-up paired-samples *t*-tests revealed a significant and large mean decrease from pre- to post-training on the AUSD-Ambiguous subscale in the CBM-I condition, $t(14) = 3.96$, $p = .001$, $g = 80$. In the ICC condition, no statistically significant change on the AUSD-Ambiguous was observed, $t(13) = 1.47$, $p = .165$, $g = 0.19$. An ANCOVA analysis conducted on post-training scores, while co-varying pre-training scores, revealed that on average participants in the CBM-I condition reported significantly lower levels of concern about ambiguous scenarios by post-training than participants in the ICC group, $F(1, 26) = 7.38$, $p = .012$, $\eta^2_p = .22$.

The effect of training on interpretation bias was also assessed on the SST (see **Measures**). When the SST was submitted to a 2 (Group: CBM-I, ICC) x 2 (Time: pre-training, post-training) mixed effects ANOVA, the effect of Time was statistically significant, $F(1, 27) = 4.79$, $p = .037$, $\eta^2_p = .15$, as was the Group x Time interaction, $F(1, 27) = 10.50$, $p = .003$, $\eta^2_p = .28$. Follow-up paired-samples *t*-tests revealed, in the CBM-I condition, a significant and large mean reduction in the proportion of negatively disambiguated sentences from pre-training ($M = 39.43\%$, $SD = 0.21$) to post-training ($M = 21.66\%$, $SD = 0.24$), $t(14) = 3.18$, $p = .007$, $g = 0.82$. In the ICC condition, in contrast, no statistically significant change was observed in SST scores from pre-training ($M = 33.18\%$, $SD = 0.16$) to post-training ($M = 36.63\%$, SD = 0.16), $t(13) = -1.08$, $p = .298$, $g = -0.22$. An ANCOVA analysis on post-training scores, while co-varying scores at pre-training, revealed that participants in the CBM-I condition reported a significantly smaller mean percentage of negatively disambiguated sentences at post-training when compared to participants in the ICC condition, $F(1, 28) = 9.16$, $p = .006$, $\eta^2_p = .26$.

Table 5

Means and Standard Deviations of Cognitive and Symptom Variables in a Completers-Only Sample

	Pre-training		Post-training		Follow-up	
	CBM-I	ICC	CBM-I	ICC	CBM-I	ICC
	(*n* = 16)	(*n* = 14)	(*n* = 15)	(*n* = 14)	(*n* = 15)	(*n* = 13)
Variable	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*
Interpretation bias						
AUSD-Ambiguous	99.80 (19.95)	102.77 (18.85)	82.40 (25.89)	99.92 (17.64)	81.33 (25.88)	98.38 (18.82)
SST	39.43% (.21)	33.18% (.16)	21.66% (.24)	36.63% (.16)	28.43% (.23)	37.92% (.22)
Intolerance of uncertainty						
IUS	38.87 (8.25)	35.64 (10.84)	31.60 (11.36)	33.36 (.8.39)	34.27 (6.88)	30.92 (9.51)
Symptoms						
WAQ	35.17 (6.80)	33.54 (8.96)	32.43 (9.13)	32.71 (6.00)	32.67 (8.24)	28.08 (8.20)
PSWQ	54.60 (7.08)	54.93 (7.30)	51.47 (9.65)	53.14 (6.84)	52.27 (8.14)	51.69 (8.65)
CES-D	26.93 (10.50)	22.07 (13.14)	22.67 (9.95)	24.43 (10.17)	24.07 (8.88)	17.62 (7.79)

Note. CBM-I = Cognitive bias modification training for interpretation bias; ICC = Interpretation control condition; AUSD-Ambiguous = Ambiguous Unambiguous Situations Diary – Ambiguous subscale; SST = Scrambled Sentence Task; IUS = Intolerance of Uncertainty Scale; WAQ = Worry and Anxiety Questionnaire; PSWQ = Penn State Worry Questionnaire; CES-D = Center for Epidemiological Studies – Depression.

Table 6

Mixed Effects ANOVA Analyses: Comparing Change in CBM-I (n = 15) and ICC (n = 14) Conditions from Pre- to Post-Training

	Group			Time			Group x Time		
Variable	*F*	*p*	η^2_p	*F*	*p*	η^2_p	*F*	*p*	η^2_p
Interpretation bias									
AUSD-Ambiguous	1.51	.230	.05	17.95	<.001	.37	8.40	.007	.22
SST	0.44	.513	.02	4.79	.037	.15	10.50	.003	.28
Intolerance of uncertainty									
IUS	0.07	.799	< .01	4.61	.039	.13	2.04	.163	.06
Symptoms									
WAQ	0.07	.791	< .01	1.46	.238	.05	0.42	.522	.02
PSWQ	0.16	.693	< .01	2.84	.103	.10	0.21	.648	.01
CES-D	0.24	.627	< .01	0.14	.716	.01	1.63	.213	.06

Note. CBM-I = Cognitive bias modification training for interpretation bias; ICC = Interpretation control condition; AUSD-Ambiguous = Ambiguous Unambiguous Situations Diary – Ambiguous subscale; SST = Scrambled Sentence Task; IUS = Intolerance of Uncertainty Scale; WAQ = Worry and Anxiety Questionnaire; PSWQ = Penn State Worry Questionnaire; CES-D = Center for Epidemiological Studies – Depression.

Change in intolerance of uncertainty. Scores on the past-week version of the IUS (see **Measures**) were submitted to a 2 (Group: CBM-I, ICC) x 2 (Time: pre-training, post-training) mixed effects ANOVA (Table 6). The effect of Time was statistically significant, $F(1, 27) = 4.61$, $p = .039$, $\eta^2_p = .13$, whereas the Group x Time interaction was not $F(1, 27) = 2.04$, $p = .163$, $\eta^2_p = .06$. Paired-samples *t*-tests within each condition nonetheless revealed a moderate and statistically significant reduction in IUS scores from pre- to post-training in the CBM-I condition, $t(13) = 2.41$, $p = .030$, $g = 0.77$, whereas no significant change was observed in the ICC condition, $t(13) = 0.67$, $p = .515$, $g = 0.24$. However, when ANCOVA analyses were conducted on IUS scores at post-training, while controlling for pre-training scores, the CBM-I and ICC conditions did not differ significantly in mean levels of intolerance of uncertainty, $F(1, 28) = 0.45$, $p = .509$, $\eta^2_p = .02$.

Change in worry, anxiety and depressive symptoms. To assess the effect of CBM-I training on symptom variables, a series of 2 (Group: CBM-I, ICC) x 2 (Time: pre-training, post-training) mixed effects ANOVA analyses were conducted on symptom measures (see Table 6). When GAD symptoms were assessed with the WAQ, the overall effect of Time was not statistically significant, $F(1, 27) = 1.46$, $p = .238$, $\eta^2_p = .05$, and nor was the Group x Time interaction, $F(1, 27) = 0.42$, $p = .522$, $\eta^2_p = .02$. When scores on the past-week version of the PSWQ were submitted to 2 (Group: CBM-I, ICC) x 2 (Time: pre-training, post-training) mixed effects ANOVA analyses, the effect of Time was not statistically significant, $F(1, 27) = 2.84$, $p = .103$, $\eta^2_p = .10$, and nor was the Group x Time interaction, $F(1, 27) = 0.21$, $p = .648$, $\eta^2_p = .01$. Finally, when the CES-D was the outcome, neither the effect of Time, $F(1, 27) = 0.14$, $p = .716$, $\eta^2_p = .01$, nor the Group x Time interaction was significant, $F(1, 27) = 1.63$, $p = .213$, $\eta^2_p = .06$. In summary, participants in the CBM-I and ICC conditions did not differ significantly in the extent of change experienced from pre- to post-training in either GAD symptoms (WAQ, PSWQ) or in depressive symptoms (CES-D).

Post-training comparisons on a structured worry task. Scores on the *Catastrophizing Interview* (CI; see **Measures**) in the CBM-I and ICC conditions were compared in three separate one-way ANOVA analyses, with condition as the between-subjects factor and scores on the CI (i.e., number of worry steps, the perceived likelihood averaged across worry steps and the perceived severity averaged across worry steps) as the within-subjects factors. No significant

between-group differences were found in the number of worry steps identified by participants, $F(1, 27) = 1.53$, $p = .226$, $\eta^2_p = .05$, nor in the average perceived probability of the worry steps, $F(1, 27) = 0.54$, $p = .468$, $\eta^2_p = .02$. A significant effect of condition was observed, however, in participants' ratings of the average perceived severity of worry. Specifically, participants who had completed CBM-I training reported a significantly lower mean level of severity across worry steps than participants in the ICC condition at post-training, $F(1, 27) = 6.05$, $p = .021$, $\eta^2_p = .18$.

Post-training comparisons on a social stressor task. We next examined whether the receipt of CBM-I training would be associated with lower levels of anxiety when confronted with a real-life social stress task. Levels of anxiety were assessed on a Visual Analogue Scale (VAS) before and after participants were told about the oral presentation task and were submitted to mixed effects ANOVA analysis. The main effect of Time was significant, $F(1, 27) = 21.37$, $p < .001$, $\eta^2_p = .44$, but the Group x Time interaction was not, $F(1, 27) = 1.13$, $p = .298$, $\eta^2_p = .04$. In other words, there was an overall increase in anxiety for all participants (when both conditions were combined) after they were told about the stressor task. However, and contrary to our expectations, the magnitude of this increase in anxiety did not differ between conditions.

Maintenance of Training Gains: From Post-Training to 1-week follow-up

A series of one-way ANCOVA analyses were conducted to compare scores in the CBM-I and ICC conditions on each cognitive and symptom measure at 1-week follow-up, while controlling for pre-training scores.

Interpretation bias. When interpretation bias was assessed with the AUSD-Ambiguous subscale, participants in the CBM-I condition continued to report significantly lower levels of interpretation bias than participants in the ICC condition, $F(1, 25) = 7.38$, $p = .012$, $\eta^2_p = .23$, $g = 0.74$, while controlling for AUSD-Ambiguous scores at pre-training. Similarly, when interpretation bias was assessed with the SST, participants in the CBM-I condition ($M = 28.43\%$, $SD = .23$) continued to score significantly below participants in the ICC condition ($M = 37.92\%$, $SD = .22$), $F(1, 26) = 4.98$, $p = .035$, $\eta^2_p = .17$, $g = 0.42$. Gains made in the CBM-I condition on two measures of interpretation bias were therefore maintained during the 1-week follow-up period.

Intolerance of uncertainty. An ANCOVA analysis at 1-week follow-up, while controlling for pre-training scores, showed that participants in the CBM-I and ICC conditions did

not differ significantly in IUS scores one week following training, $F(1, 25) = 0.45$, $p = .507$, $\eta^2_p = .02$, $g = 0.42$, when directly compared and despite a significant decrease in IUS scores in the CBM-I condition during training.

Worry, anxiety and depressive symptoms. When one-way ANCOVA analyses were conducted on symptom measures at 1-week follow-up, controlling for pre-training scores, the CBM-I and ICC conditions did not differ significantly in scores on the WAQ, $F(1, 25) = 2.03$, $p = .17$, $\eta^2_p = .08$, the PSWQ, $F(1, 26) = 0.83$, $p = .371$, $\eta^2_p = .03$, nor on the CES-D, $F(1, 25) = 2.65$, $p = .116$, $\eta^2_p = .10$.

Discussion

In this study we assessed the validity of a new cognitive bias modification training procedure (CBM-I), designed to modify interpretation bias among individuals with elevated worry and anxiety. Derived from the *Word Sentence Association Paradigm* (WSAP) CBM-I, which was developed by Beard, Amir and colleagues (2008, 2009) to target interpretation bias among individuals with social anxiety, this GAD-focused CBM-I training program is one of the few developed thus far to target interpretation bias in the broad range of worry domains that are commonly associated with GAD (e.g., social relationships, finances, health, and safety). As hypothesized, when compared to an interpretation control condition (ICC), CBM-I training was associated with significantly greater reductions in interpretation bias. Specifically, participants who completed four sessions of CBM-I over a 2-week period exhibited large and statistically significant reductions on two different measures of negative interpretation bias from pre- to post-training, whereas no significant changes were observed in interpretation bias among individuals who received ICC. When directly compared at post-training, participants who had received CBM-I were less likely than participants in the ICC condition to interpret new ambiguous scenarios in a negative or threatening manner and these results were maintained one week following training. These results are comparable in magnitude to other CBM-I training programs (Beard, 2011; Hallion & Ruscio, 2011) and suggest that a 4-session CBM-I training program that targets interpretation bias in a broad range of worry domains is efficacious in the reduction of this bias among individuals with elevated worry and anxiety.

We also examined whether, in comparison to the ICC condition, CBM-I training produced greater reductions in intolerance of uncertainty, which has also been proposed to be a

causal variable in the maintenance of GAD symptoms (Koerner & Dugas, 2006). When the effect of training on IU was examined within each condition, CBM-I was associated with a significant and moderate reduction in negative beliefs about uncertainty from pre- to post-training, whereas no change in intolerance of uncertainty was observed in the ICC condition. Conceptually, it seems reasonable that participants who receive CBM-I training will be less concerned about the outcomes of specific ambiguous (but potentially negative) scenarios and will therefore begin to view uncertainty as less aversive overall. This study provides additional support for the idea that there is a close association between interpretation bias and intolerance of uncertainty among individuals with excessive worry and anxiety. However, it should also be noted that when CBM-I and ICC conditions were directly compared at post-training, the difference in negative beliefs about uncertainty was not statistically significant, despite a moderate between-group effect. Additional studies on the effect of this CBM-I paradigm with larger samples may help clarify the potential impact of this training on intolerance of uncertainty.

Contrary to our expectations, CBM-I was not associated with reductions in negative affect. Although participants who completed CBM-I training described the content of their worries as less severe during the *Catastrophizing Interview* (CI; see **Measures**) at post-training, the CBM-I and ICC groups did not differ in self-reported worry, anxiety or depressive symptoms at post-training or one week following training. In fact, when compared with participants in the ICC condition, those receiving CBM-I reported significantly *greater* anticipatory anxiety and worry in response to an upcoming social stress task (i.e., having to give an impromptu speech before a panel of judges). These findings are not consistent with a number of studies that have found an effect of CBM-I training on negative affect (e.g., Beard & Amir, 2008, 2009; Mathews et al., 2007) and on emotional reactivity in response to a subsequent stressor (e.g., Hoppitt et al., 2014; Murphy et al., 2007; Wilson et al., 2006). These results are also inconsistent with information-processing accounts of GAD (e.g., Mathews, 1990), which suggest that reductions in negative interpretation bias should be associated with corresponding reductions in negative affect. However, meta-analyses indicate that the effects of interpretation bias modification paradigms on emotion variables have tended to be small and variable across studies (Beard, 2011; Hallion & Ruscio, 2011), with some studies finding no effect of training on either negative

affect or emotional vulnerability in response to a subsequent stressor (e.g., Mackintosh et al., 2006, Experiment 1; Salemink et al., 2009; Salemink, Kindt, Rienties, & van den Hout, 2014).

There may be a number of reasons for the lack of impact of CBM-I training on negative affect in the current study. One possibility is that participants may not have received an adequate "dose" of training. Little is known about the ideal number or spacing of training sessions and meta-analyses provide limited guidance, suggesting only that having two or more training sessions is associated with greater reduction in negative affect (Hallion & Ruscio, 2011). Further research is needed to determine the ideal number and spacing of CBM-I training sessions, not only to maximize the impact on interpretation bias and on other theoretically-related cognitive phenomena (e.g., intolerance of uncertainty), but also to determine whether changes in the training schedule (e.g., increased number of training sessions, sessions spaced more closely together in time) might ultimately reveal more consistent beneficial effects on emotion. Nevertheless, it should be noted that in this study CBM-I training was associated with large reductions in negative interpretation bias on two different measures of bias. Moreover, the two measures used to assess interpretation bias (i.e., the *Ambiguous Unambiguous Situations Diary* (AUSD) and the *Scrambled Sentence Task*; see **Measures**) involved stimuli and procedures that differed from those used during the WSAP training sessions, suggesting that the observed improvements in interpretation bias during CBM-I training were relatively robust.

Another possible explanation for the lack of effect on emotion variables is that, despite producing large reductions in negative interpretation bias, CBM-I training may not have adequately targeted the specific interpretations that were most closely associated with participants' worry and anxiety. The content-specificity hypothesis of emotional disorders (e.g., Clark, Beck, & Brown, 1989) suggests that reductions in distress are most likely to occur when the cognitions that elicit distress are targeted in treatment. Consistent with this hypothesis, there is some evidence that the emotional benefits of CBM-I training are more likely to be apparent when there is a close match between the specific appraisals or interpretations targeted during training and those that are elicited during a subsequent stressor task (e.g., Mackintosh, Mathews, Eckstein, & Hoppitt, 2013). These findings point not only to the importance of carefully considering the match between training and testing materials in CBM-I validation studies, but also more broadly to the potential value of a more individualized approach when designing

CBM-I training. An individualized approach may also be particularly important in the context of GAD. Not only might individuals with GAD differ in the specific negative interpretations elicited by ambiguous scenarios within a given worry domain (e.g., worry about social relationships), these individuals may also differ from one another in the extent to which broad domains are associated with worry and anxiety (e.g., social relationships, finances, health, safety, etc). Future research is needed to determine whether a more individualized approach can enhance the impact of CBM-I training on emotion outcomes. This research will be essential before we can consider the therapeutic potential of this training as a stand-alone intervention for GAD.

In addition to a lack of effect on negative affect during training, the CBM-I training did not appear to have a beneficial effect on anxiety when participants were confronted with a social stressor task following training (i.e., having to give an impromptu oral presentation in front of a panel of judges). Specifically, participants in CBM-I and the interpretation control condition both experienced a significant (and equivalent) increase in anxiety after being told about the task. Of note, several other CBM-I studies have revealed a lack of benefit in anxious responding when participants are confronted with a stressor task following training. In fact, in some cases, researchers have found a higher level of anxiety among individuals who received CBM-I training relative to those in an interpretation control condition (Mackintosh et al., 2013; Standage, Harris, & Fox, 2014). One way to explain these findings might be in the way in which anxious participants assimilate (or rather fail to assimilate) more positively disambiguated information during training. Mathews and colleagues (2007) have suggested, for instance, that participants with elevated anxiety may perceive more positively disambiguated scenarios as less realistic or applicable to themselves than more neutrally disambiguated stimuli. Similarly, Standage et al. (2014) noted that anxious individuals are more likely to engage in negative evaluative comparisons (i.e., focusing on the dissimilarities, rather than the similarities, between oneself and another person who is described as functioning well). Standage and colleagues argued that the conditions presented by most CBM-I training paradigms (i.e., asking participants to process highly positive interpretations of ambiguous social scenarios) are such that anxious individuals may actually become more likely to engage in a negative evaluative process (e.g., “my social situation is much worse than the situation described in this scenario”) and, as a result, may be unlikely to assimilate the more positive interpretations into their thinking in other similar

situations and may therefore not experience a reduction in distress. In the current study, the word-and-sentence pairs used as stimuli in CBM-I training contained a combination of positively and neutrally disambiguated content. Further research is needed to determine whether a lack of assimilation of positively disambiguated content can account for the variable effect of CBM-I training on both negative affect generally and on emotional vulnerability following exposure to a stressor. If so, a more graduated approach to CBM-I training might be warranted, similar to that proposed by Mathews et al., 2007, in which participants are encouraged first to make non-negative or neutral interpretations of ambiguous information before being asked to endorse more explicitly positive interpretations.

This study involved several limitations. First, the small sample size may have limited our ability to detect the maximum impact of CBM-I training on interpretation bias, intolerance of uncertainty and negative affect. This limitation is particularly problematic here in that many CBM-I evaluation studies have been characterized by smaller samples, leading some researchers to argue that this has hampered our ability to evaluate the clinical utility of CBM-I training programs (e.g., Cristea, Kok, & Cuijpers, 2015; Emmelkamp, 2012). Further studies with larger samples are needed. Second, although one potential advantage of the WSAP CBM-I training protocol is that it can help participants both endorse fewer negative/threat interpretations *and* more neutral/benign interpretations, the measures used to assess interpretation bias in this study were not designed to assess the extent to which participants were engaging in more neutral/benign interpretations. As a result, we cannot determine whether participants in this study did indeed show an increased tendency toward more benign interpretations (rather than fewer negative interpretations) as a result of CBM-I training. Third, assessments of interpretation bias did not assess the effect of CBM-I training on bias in specific worry domains, and yet the CBM-I training had been designed (and was presumed to be more appropriate) for individuals with GAD by targeting bias in multiple worry domains (e.g., social relationships, finances, personal health and safety). Because the effect of interpretation bias training was not assessed within these domains, future research will be needed to determine whether it is in fact necessary to target bias across multiple domains. It may be possible, for instance, that individuals with GAD would obtain greater benefits from CBM-I training that was focused more intensively on one or two of the worry domains that are most common among individuals with GAD (e.g., social

relationships) or CBM-I training that targets bias in an individualized manner (i.e., targeting bias in the worry domains that are most prominent in a particular individual).

Despite these limitations, this study provides initial validation for a new CBM-I training paradigm, designed specifically to target interpretation bias across the worry domains commonly observed among individuals with GAD. This CBM-I training was associated with large and significant reductions in interpretation bias after only four 15 to 20-minute training sessions over a 2-week period. Given the success of CBM-I training programs to date in producing significant reductions in the cognitive processes that are thought to maintain anxiety symptoms, some research has begun to assess CBM-I training procedures as stand-alone alternatives to other empirically supported treatments for anxiety disorders, and in particular in Social Anxiety Disorder (e.g., Amir & Taylor, 2012). However, given that a number of studies have not found the anticipated impact of CBM-I training on negative affect, further research is needed to determine whether CBM-I training can be reliably used as a stand-alone intervention among individuals with GAD. At present, we cannot conclude that the CBM-I training program examined here can be used as such. In the meantime, we suggest that CBM-I paradigms might be most profitably used as an adjunct to cognitive-behavioural therapy (CBT) for GAD. Although CBT is efficacious in reducing GAD symptoms, a significant proportion of individuals continue to meet diagnostic criteria following treatment (Fisher, 2006; Hanrahan et al., 2013) and there is a need to improve treatment outcomes. Some recent research has shown that CBT is associated with reductions in interpretation bias, and that reductions in this bias have been found to predict symptom reduction during treatment (e.g., Study 1; Reinecke, Rinck, Becker, & Hoyer, 2013). The addition of a brief and cost-effective training program to an already empirically supported treatment is particularly appealing if it provides clinicians with an additional tool to help patients maximize the reductions in interpretation bias that they experience over the course of CBT. Future research in the form of clinical trials is needed to determine whether the addition of CBM-I training enhances the efficacy of CBT for GAD.

CHAPTER 5
GENERAL DISCUSSION

Cognitive behaviour therapy (CBT) is an empirically-supported psychological intervention for Generalized Anxiety Disorder (GAD). Thus far, CBT protocols for GAD have been associated with moderate-to-large reductions in symptoms by post-treatment as well as the maintenance of symptom gains following treatment (Gould et al., 1997). Despite this efficacy, however, a significant proportion of individuals who receive CBT for GAD continue to meet diagnostic criteria following treatment (Fisher, 2006; Hanrahan et al., 2013). In order to improve treatment efficacy, it is essential that we have a good understanding of the mechanisms of symptom reduction and to ensure that these mechanisms are targeted effectively during our interventions. The first goal in this program of research was to examine the roles played by two potentially important cognitive mechanisms, namely intolerance of uncertainty (IU) and negative interpretation bias, in symptom reduction during an IU-focused CBT. The second goal was to assess the efficacy of a new intervention - i.e., a cognitive bias modification training program (CBM-I) - that was designed specifically to target interpretation bias in the many worry domains that are commonly associated with GAD (Davey et al., 1992).

Summary of Findings

Study 1. Adults with a principal diagnosis of GAD received 12 to 14 sessions of an individually-delivered IU-focused CBT. Participants completed measures of GAD symptoms, depressive symptoms, intolerance of uncertainty and interpretation bias at pre and post-treatment. The goals of this study were to (a) confirm the efficacy of this CBT protocol in the treatment of GAD symptoms, (b) to examine the impact of CBT on both interpretation bias and IU, and (c) to examine the roles played by IU and interpretation bias in symptom reduction. Although previous studies had examined the effect of CBT on either IU (Bomyea et al., 2015) or on interpretation bias (Reinecke, Rinck, Becker, & Hoyer, 2013), this study was unique in examining whether and how changes in IU and interpretation bias might work together to bring about symptom reduction during treatment. As hypothesized, CBT was associated with significant and large reductions in GAD and depressive symptoms by post-treatment and a remission rate of 75.0%. CBT was also associated with significant reductions in both IU and negative interpretation bias from pre to post-treatment. Finally, a mediation model was evaluated

to examine cognitive and symptom change processes during treatment. Although these analyses were conducted using pre- and post-treatment assessments, and the proposed temporal sequence of changes during treatment requires further clarification with analyses relying on a greater number of assessment points, the results described here are consistent with the idea that reductions in negative interpretation bias predicted reductions in GAD symptoms and that this effect was partially mediated by reductions in negative beliefs about uncertainty.

Study 2. Study 1 provided support for the idea that CBT was associated with reductions in both negative beliefs about uncertainty and negative interpretation bias and both cognitive variables appeared to play a role in symptom reduction during treatment. Cognitive bias modification training programs, designed specifically to target interpretation bias (CBM-I), have also been associated with significant reductions in negative interpretation bias among individuals with elevated anxiety (e.g., Beard & Amir, 2008; Mathews & Mackintosh, 2000) and have been proposed as brief and cost-effective alternative interventions to CBT protocols (e.g., Taylor & Amir, 2012). In Study 2, we examined the efficacy of a new GAD-specific CBM-I training program designed to target interpretation bias in a number of worry domains (e.g., social relationships, finances, health, and safety). As expected, when compared to an interpretation control condition (ICC), CBM-I training was associated with significantly greater reductions in negative interpretation bias and these gains were maintained at 1-week following training. CBM-I, but not ICC, was also associated with a significant reduction in negative beliefs about uncertainty by post-training. However, CBM-I was not associated with the anticipated reductions in GAD symptoms.

Theoretical Implications

The program of research described here began with an examination of the potential roles played by IU and negative interpretation bias in the reduction of GAD symptoms during an empirically-supported CBT. This treatment protocol was derived from a theoretical model in which intolerance of uncertainty was proposed to play a central role in the maintenance of excessive worry and anxiety (Dugas et al., 1998). Studies involving experimental manipulations of negative beliefs about uncertainty have provided support for a causal role played by IU in maintaining GAD symptoms (e.g., Ladouceur et al., 2000; Meeten, Dash, Scarlet, & Davey, 2012; Rosen & Knaüper, 2009). If IU is associated with elevated worry and anxiety, by

implication, reduction in negative beliefs about uncertainty should also play a role in symptom reduction during treatment. The results of Study 1 provided further evidence that an IU-focused CBT is associated with significant reductions in GAD symptoms and in IU by post-treatment. Moreover, reductions in negative beliefs about uncertainty were associated with reductions in GAD symptoms. These findings are consistent with recent clinical trials examining the effect of CBT on IU (van der Heiden et al., 2012) and with experimental studies demonstrating that changes in IU lead to subsequent and corresponding changes in GAD symptoms (e.g., Ladouceur et al., 2000). The results from Study 1 therefore provide further support (albeit indirect) for a causal role of IU in the maintenance of GAD symptoms. It should also be noted here that IU has recently been associated with other anxiety disorders (Carlton et al., 2012) and changes in IU are correlated with symptom reductions in the treatment of disorders other than GAD (e.g., Social Anxiety Disorder; McEvoy & Erceg-Hurn, 2016). However, the fact that IU may play a role in maintaining symptoms of other disorders need not detract from the important role it appears to play in the context of excessive worry and anxiety, and GAD diagnostic status. Nonetheless, continued research is needed to clarify the differences and similarities in the role of IU in etiological models across anxiety disorders as well as the relative importance, across disorders, of reductions in IU in symptom reduction during treatment.

The results of Study 1 also demonstrated that CBT was associated with reductions in negative interpretation bias. By post-treatment, participants who had completed CBT were less likely to report concern when confronted with situations involving ambiguous (but potentially negative) outcomes. Moreover, reductions in interpretation bias were associated with symptom reduction during treatment. Of note, although the effect of interpretation bias on GAD symptoms was partially mediated by reductions in negative beliefs about uncertainty, interpretation bias also appeared to play a direct role in symptom reduction. These results are consistent with information-processing accounts of GAD symptoms (e.g., Hayes & Hirsch, 2007; Mathews, 1990), in which the tendency to interpret ambiguous events as threatening is proposed to play a causal role in the onset and/or maintenance of excessive worry and anxiety and, by implication, in their reduction during treatment. Although the effect of CBT on interpretation bias has received relatively little attention in the research literature, particularly in the context of CBT for GAD, the results of Study 1 are nonetheless also consistent with several prior studies that have

demonstrated that CBT can be associated with reductions in interpretation bias among individuals with Social Anxiety Disorder, Panic Disorder or GAD (Eysenck et al., 1991; Franklin et al., 2005; McManus et al., 2000; McNally & Foa, 1987; Reineck et al., 2013).

While examining the effects of IU and interpretation bias on GAD symptoms, both Studies 1 and 2 also allowed for a closer examination of the relation between these cognitive phenomena. Historically, cognitive accounts of the maintenance of GAD symptoms have tended to focus on either the roles played by specific problematic beliefs (e.g., Koerner & Dugas, 2006; Wells, 1995) or by biases in information processing (e.g., Mathews, 1990). Although there have been recent attempts to develop more comprehensive and integrated etiological models of GAD (e.g., Hayes & Hirsch, 2007), these models have tended to downplay the roles played by problematic beliefs or to view these beliefs as epiphenomenal. In the broader anxiety disorders literature, however, more comprehensive etiological models have begun to incorporate both cognitive content (e.g., problematic beliefs) and cognitive process variables (e.g., biased information processing) more centrally into our understanding of the maintenance of anxiety symptoms (e.g., Clark & Beck, 2010). In the context of GAD, as mentioned in Chapter 1, prior research has supported the idea of a close association between negative beliefs about uncertainty and the tendency to interpret ambiguous information in a threatening manner (e.g., Bredemeier & Berenbaum, 2008; Dugas et al., 2005; Koerner & Dugas, 2008). However, much of this research has been correlational. The results from Study 2 provide more direct evidence of the IU-interpretation bias association among individuals with GAD. Specifically, the experimental manipulation of negative interpretation bias was associated with reductions in negative beliefs about uncertainty. Moreover, the results in Study 1 demonstrated that these two cognitive phenomena, both of which have been proposed to be causal variables in etiological models, do appear to work together to produce symptom change during an IU-focused CBT. Just as there have been recent calls for more comprehensive etiological models within the anxiety disorders literature (Clark & Beck, 2010), it is suggested here that there is a need for a more nuanced understanding of the processes of change during empirically supported treatments. The current program of research is a step in this direction, although further research is needed to better understand the impact of our treatments on both cognitive content and process variables and the roles played by these variables in symptom reduction. Omitting critical content and/or process

variables in our models of change processes may mean that we miss a valuable opportunity not only to better understand how our treatments work but also to identify variables that, if targeted more thoroughly during treatment, might lead to improvements in treatment outcomes.

Although both Studies 1 and 2 provided further evidence of an association between negative beliefs about uncertainty and negative interpretation bias, they differed in the impact of these cognitive phenomena on excessive worry and anxiety. In Study 1, both IU and negative interpretation bias played a role in symptom reduction during CBT. In Study 2, however, participants who had received CBM-I training did not differ in symptom severity at post-training from participants in an interpretation control condition, despite experiencing reductions in both interpretation bias and negative beliefs about uncertainty. Although unexpected, these findings are not inconsistent with a number of studies in the CBM-I literature in which training did not have the anticipated effect on anxiety symptoms (e.g., Mackintosh et al., 2006, Experiment 1; Salemink et al., 2009; Salemink, Kindt, Rienties, & van den Hout, 2014). Moreover, even when CBM-I training programs do have an effect on anxiety symptoms, this effect tends to be small (Hallion & Ruscio, 2011). Given these modest effects, recent research has examined ways of enhancing CBM-I efficacy. There is some evidence, for example, that providing imagery instructions during training, having participants generate their own interpretations of ambiguous scenarios, and providing more training sessions might enhance training effects (see Menne-Lothman et al., 2014, for a review). These findings suggest that making even minor modifications to existing CBM-I programs might be beneficial. With respect to the WSAP CBM-I training examined in Study 2, some of these modifications might be relatively simple to implement, such as asking participants to imagine that the situations described in the WSAP ambiguous sentences are occurring to them. Other modifications, such as adding training sessions, are more challenging in that few guidelines exist for identifying an "adequate" training dose. Indeed, there is little agreement on how to optimize learning in the context of CBM-I training, with some researchers arguing that training should be "intensive" (e.g., daily for multiple consecutive days; Salemink et al., 2009) and others arguing that training and testing should be spread out in order to allow for the consolidation of cognitive change and the resulting emotional impact (e.g., Mathews et al., 2009). Further research is therefore needed to identify the

optimal "dose" and spacing of CBM-I sessions, as well as the relative importance of other potential modifications to the design of CBM-I training protocols.

Although methodological explanations may be adequate to account for the variable and modest impact of CBM-I training on negative affect across studies, another possibility that must be considered is that etiological accounts in the information-processing literature may be inadequate, leading in turn to inadequate accounts of treatment processes. Information-processing theories (e.g., Hayes and Hirsch, 2007) tend to focus on the central role played by biased information processing in maintaining distress. However, it is worth considering whether there are important roles played by other cognitive phenomena, even in an intervention that targets interpretation bias. In Study 2, for instance, participants who completed CBM-I training experienced a large reduction in negative interpretation bias but only a moderate reduction in negative beliefs about uncertainty. In Study 1, participants who received CBT experienced large reductions in both IU and negative interpretation bias. Given the close association between IU and GAD symptoms, it may be the large reductions in IU are needed before symptom change occurs, regardless of the nature of the intervention. In other words, substantial reductions in IU may be a central part of the processes of change during efficacious treatments. Alternatively, there may be other explanatory variables that could be considered as potential mechanisms in treatment processes. Although both IU and negative interpretation bias are strongly associated with excessive worry and anxiety as well as GAD diagnostic status, individuals with GAD also report greater difficulties in a number of additional cognitive and affect-related domains. For instance, when compared to non-anxious controls, individuals with elevated worry and anxiety are more likely to report difficulties managing and tolerating negative emotions (MacDonald, Pawluk, Koerner, & Goodwill, 2015). Moreover, both distress regarding negative emotions and experiential avoidance are each uniquely associated with intolerance of uncertainty and with worry among individuals with GAD (Lee, Orsillo, Roemer, & Allen, 2010). It could therefore be proposed that individuals with GAD are highly intolerant of situations involving uncertainty and view them as threatening not because of the uncertainty itself, but rather because being in a state of uncertainty leads to an aversive emotional state that they find highly intolerable. In other words, distress intolerance and experiential avoidance may be more proximally associated with GAD symptoms than negative interpretation bias. If so, interventions would need to target

distress related to negative emotions and experiential avoidance in order to be effective. It could be argued that CBT protocols target variables such as distress intolerance and experiential avoidance through specific CBT components such as exposure-based exercises or psychoeducation about the nature of emotions, whereas the more focused CBM-I training may not. Further research is needed to determine whether other explanatory variables should be included in our theoretical accounts of change processes, even in interventions that primarily target interpretation bias.

Another possible explanation for the differential impact of changes in IU and interpretation bias on negative affect in Studies 1 and 2 may be found in the extent to which CBT and CBM-I training targeted the specific interpretations of ambiguous situations that were most closely associated with participants' distress. As in other CBM-I training programs, the approach used to target interpretation bias in Study 2 was standardized in the sense that all participants received CBM-I training targeting interpretation bias in each of 10 common worry domains (e.g., social relationships, health, safety) and also in the sense that participants in the CBM-I condition were presented with stimuli that were likely to encourage or discourage specific interpretations of the ambiguous sentences. As discussed in Chapter 4, this approach was effective in that participants who completed CBM-I training experienced a significant reduction in negative interpretation bias overall after four training sessions. However, not all individuals worry to the same degree about events or situations in all worry domains. Moreover, some participants may have had unique negative interpretations of the ambiguous sentences presented during training that were not targeted. As a result, CBM-I might not have targeted bias in worry domains that were most distressing for participants, potentially reducing the impact of training on emotional distress. In CBT, in contrast, treatment was delivered on an individual basis over 12 to 14 sessions, providing therapists ample time to tailor interventions to the negative or threatening interpretations within specific worry domains that were most associated with distress for each participant. Indeed, there is recent evidence that taking a more idiosyncratic approach to CBM-I training can be associated with both reductions in negative interpretation bias and in anxiety, at least among individuals from a community sample with elevated anxiety (Mackintosh et al., 2013). Further research is needed to determine whether a more individualized approach would be associated with improvements in anxiety among individuals with GAD.

Clinical Implications

The IU-focused CBT examined in Study 1 has received empirical support in several clinical trials thus far (Dugas et al., 2003; Dugas et al., 2010; Gosselin et al., 2006; Ladouceur et al., 2000; van der Heiden et al., 2012). As discussed previously, in addition to large and significant reductions in GAD and depressive symptoms by post-treatment, remission rates for this CBT have ranged from 60.0% (Ladouceur et al., 2000) to 80.0% (van der Heiden et al., 2012). Although the primary goal in Study 1 was to examine mechanisms of symptom change, the initial analyses from this single-sample clinical trial provided additional support for the efficacy of the IU-focused CBT protocol. With large and significant reductions in GAD and depressive symptoms and a post-treatment remission rate of 75.0%, the results from Study 1 are comparable to previous clinical trials (e.g., Dugas et al., 2010; van der Heiden et al., 2012) and compare favourably to remission rates reported in meta-analyses of CBT for GAD (Fisher, 2006; Hanrahan et al., 2013). Of note, although CBT has been an empirically-supported intervention for GAD for over three decades, there is some evidence that effect sizes for treatment outcomes are somewhat higher in more recent clinical trials, leading some researchers to suggest that it is our ongoing efforts to ensure that CBT protocols are targeting relevant mechanisms of change that may be contributing to better outcomes over time (Hanrahan et al., 2013).

As discussed previously, the results in Study 1 also indicated that CBT was associated with reductions in negative beliefs about uncertainty and negative interpretation bias. Little is known, however, about *how* CBT brings about these reductions and the relative impact of specific treatment components on IU and interpretation bias has not yet been identified empirically. Nonetheless, the overall goal in CBT is to alter the content of problematic schemata or mental representations that contain anxiety-relevant information and associations (Beck et al., 1985; Foa & Kozak, 1986). In the context of this CBT, the primary targets of treatment are negative beliefs about uncertainty and associated distress. These beliefs may be targeted indirectly by several interventions in this protocol, including psychoeducation about GAD symptoms and IU, problem-solving training, re-evaluation of the usefulness of worry and imaginal exposure. However, *in vivo* exposure, where participants engage in exercises in which they are systematically exposed to situations involving ambiguous outcomes, constitutes the most direct intervention for these beliefs and associated distress (Dugas & Robichaud, 2007). As

discussed in Chapter 2, learning during exposure may occur either through a process of habituation and/or through cognitive change that occurs when previously-ignored information is used to challenge problematic beliefs about the feared stimulus (Tryon, 2004). If these processes can help individuals alter general negative beliefs about uncertainty, they may also help individuals view specific ambiguous situations as less threatening. Further research is needed, however, to determine which treatment components are most effective in targeting IU and interpretation bias during CBT. Identifying the most effective components of a multi-module intervention may help to strengthen treatment outcomes not only by allowing us to remove components that are less effective but also by allowing us to allot more treatment time to particularly effective components.

Despite improvements in outcomes of CBT for GAD in the last decades, the need to maximize treatment efficacy persists. The results from Study 1 indicate that although CBT is efficacious, a substantial minority of individuals (25%) continue to meet diagnostic criteria for GAD following treatment. As discussed previously, one way to improve treatment outcomes is to maximize the impact of treatment on variables that have been identified as mechanisms of symptom reduction. Although component analyses are needed to compare the relative impact of specific CBT interventions on both symptom and mechanism variables, there is nonetheless considerable evidence that exposure-based interventions are effective in the reduction of worry and anxiety during CBT protocols (e.g., see Bennett-Levy, 2003 for a review). Moreover, there is some evidence that exercises that involve exposure but are framed as behavioural experiments, in which participants explicitly identify problematic beliefs or assumptions as hypotheses to be challenged during exposure to the feared stimulus, may be even more effective than exposure alone (e.g., Salkovskis, Hackmann, Wells, Gelder, & Clark, 2007). In view of this, and as discussed in Chapter 2, a new variant of an IU-focused CBT protocol has been developed (Hebert, Geninet, & Dugas, 2015) with an exclusive focus on behavioural experiments that directly target negative beliefs about uncertainty. Although the original IU-focused CBT involved *in vivo* exposure exercises to situations involving uncertain outcomes, this new IU-focused CBT will involve exposure exercises framed as behavioural experiments to challenge problematic beliefs about uncertainty. Thus far, preliminary evidence in a small-scale clinical trial suggests that this new IU-focused CBT protocol is efficacious, with 85.7% of participants (*n*

= 6/7) achieving high end state functioning at post-treatment and at 6 months following treatment (Hebert et al.). Larger clinical trials, including comparisons with existing CBT protocols for GAD, will be needed to determine whether this new CBT protocol is at least as efficacious as existing protocols in targeting both IU and GAD symptoms. Moreover, it remains to be seen whether this more "distilled" CBT protocol will also be effective in the reduction of other phenomena thought to play a causal role in the maintenance of GAD symptoms, such as negative interpretation bias.

Although the IU-focused CBT examined in Study 1 led to reductions in both IU and negative interpretation bias by post-treatment, CBM-I training programs have been proposed as relatively cost-effective and stand-alone alternative interventions to CBT for anxiety disorders (e.g., Amir & Taylor, 2012). The main goal in Study 2 was to evaluate the efficacy of a new CBM-I training program designed to target interpretation bias in the many worry domains associated with GAD. As expected, this CBM-I training was indeed associated with significant reductions in negative interpretation bias by post-training. This was the case despite the fact that training was administered over a relatively short period of time, involving only four 15 to 20-minute training sessions, twice per week over a 2-week period. However, this CBM-I intervention was not associated with the expected reductions in GAD symptoms following training and we cannot conclude that this CBM-I protocol can serve as an alternative intervention to CBT for GAD at present.

As discussed previously, although some studies show that CBM-I training can lead to improvements in both interpretation bias and anxiety symptoms (e.g., Amir & Taylor, 2012; Beard & Amir, 2008; Mathews et al., 2007; Murphy et al., 2007; Salemink et al., 2009), meta-analyses indicate that the effect of training on symptoms has tended to be small and variable across studies (Beard, 2011; Hallion & Ruscio, 2011). In fact, the extent of this variability, which also extends to CBM-A training programs or programs designed to target biases in attention for threat-related information (Hallion & Ruscio, 2011), has led some researchers to question the clinical relevance of existing cognitive bias modification programs (Cristea, Kok, & Cuijpers, 2015; Emmelkamp, 2012) or even the need for further investigations into ways of improving CBM-I training outcomes (Emmelkamp, 2012). Specific criticisms of the CBM-I/A literature include an over-reliance on small samples sizes with consequently underpowered analyses, lack

of randomization to experimental or comparison conditions, low publication rates for pilot studies or studies with null findings, and heterogeneity in design characteristics, making comparisons across studies difficult (Beard, 2011; Cristea et al., 2015; Emmelkamp, 2012; Fox et al., 2015). These are indeed significant problems that need to be addressed before we can fully evaluate the clinical utility of CBM-I training programs. It is also suggested here that there is a need to broaden the range of potential explanatory variables that are examined when conducting CBM-I efficacy trials to confirm that it is indeed improvements in interpretation bias, and not other potentially important variables (e.g., experiential avoidance, intolerance of uncertainty), that are responsible for any observed symptom changes. Despite these problems, it nonetheless seems premature to conclude that further investigations into CBM-I design or implementation issues are unwarranted. As Fox, Mackintosh and Holmes (2014) argue, research into the efficacy of CBM-I training is in an early stage of development and many questions remain about how we might refine these programs to maximize their impact on both interpretation bias and symptoms. Moreover, even if CBM-I training programs can be refined to the point that they consistently produce small but reliable improvements in interpretation bias and anxiety symptoms, this would provide clinicians with an additional low-cost intervention to add to existing interventions for excessive worry and anxiety. Thus, perhaps the recommendation at present should be to proceed with investigations of CBM-I training programs but to do so with caution, taking care not to overstate claims of efficacy and to ensure that study designs are adequate to fully assess the clinical utility of these programs as they continue to be refined.

Although the CBM-I training program examined in Study 2 cannot be recommended at present as a stand-alone clinical intervention, it is possible that it may still have significant clinical utility when used in another manner. Specifically, the effect of CBM-I on negative interpretation bias in Study 2 was relatively robust. One of the main goals in CBT is to help clients identify problematic interpretations of ambiguous situations and, ultimately, develop greater flexibility in their ability to consider fewer negative and more neutral or benign interpretations in anxiety-provoking situations (Dobson & Dobson, 2009). As discussed in Chapters 2 and 4, it therefore seems possible that adding CBM-I training as a brief and low-cost intervention to existing CBT protocols might help to increase treatment efficacy. If so, the enhancing effect of adding CBM-I training to CBT might occur in several ways. If CBM-I

training helps clients consider alternative explanations to situations they initially viewed as threatening, this training may help clients to be more receptive to the cognitive restructuring interventions that are often implemented in CBT protocols. Alternatively, CBM-I training appears to reduce the extent to which clients endorse negative beliefs about uncertainty. Given that IU has been shown to be a mechanism of symptom reduction during CBT (Bomyea et al., 2015), an intervention that provides additional opportunities to challenge problematic beliefs about uncertainty might also help to improve treatment efficacy. Finally, the repeated exposure to situations with uncertain (but potentially negative) outcomes during CBM-I training, particularly if clients are asked to imagine that these situations are occurring to them, might provide additional opportunities for exposure and facilitate greater experiential learning as a result. If CBT protocols can be refined with the addition of cost-effective and easy-to-implement interventions that enhance efficacy, this may help us to move closer to our goal of improved outcomes in the treatment of GAD.

References

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders*. (5th ed.). Arlington, VA: Author.

American Psychiatric Association. (1980). *Diagnostic and Statistical Manual of Mental Disorders*. (3rd ed.). Washington, DC: Author.

Amir, N., Bomyea, J., & Beard, C. (2010). The effect of single-session interpretation modification on attention bias in socially anxious individuals. *Journal of Anxiety Disorders, 24*, 178. doi: 10.1016/j.janxdis.2009.10.005

Amir, N., & Taylor, C. T. (2012). Interpretation training in individuals with Generalized Social Anxiety Disorder: A randomized controlled trial. *Journal of Consulting and Clinical Psychology, 80*, 497-511. doi: 10.1037/a0026928

Beard, C. (2011). Cognitive bias modification for anxiety: Current evidence and future directions. *Expert Review of Neurotherapeutics, 11*, 299-311. doi: 10.1586/ern.10.194

Beard, C., & Amir, N. (2008). A multi-session interpretation modification program: Changes in interpretation and social anxiety symptoms. *Behaviour Research and Therapy, 46,* 1135–1141. doi: 10.1016/j.brat.2008.05.012

Beard, C. & Amir, N. (2009). Interpretation in social anxiety: When meaning precedes ambiguity. *Cognitive Therapy and Research, 33,* 406-415. doi: 0.1007/s10608-009-9235

Beck, A. T., & Clark, D. A. (1997). An information processing model of anxiety: Automatic and strategic processes. *Behaviour Research and Therapy, 35*, 49-58. doi: 10.1016/S0005-7967(96)00069-1

Beck, A. T., Emery, G., & Greenberg, R. I. (1985). *Anxiety disorders and phobias: A cognitive perspective*. New York: Basic Books.

Beck, A. T., & Steer, R. A. (1990). *Beck Anxiety Inventory manual.* San Antonio, TX: Psychological Corporation.

Beck, A. T., Steer, R. A., & Brown, T. A. (1996). *Beck Depression Inventory manual* (2nd ed.). San Antonio, TX: Psychological Corporation.

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

Bennett-Levy, J., Butler, G., Fennell, M., Hackmann, A., Mueller, M., & Westbrook, D. (Eds.). (2004). *Oxford guide to behavioural experiments in cognitive therapy*. Oxford, UK: Oxford University Press.

Bomyea, J., Ramsawh, H., Ball, T. M., Taylor, C. T., Paulus, M. P., Lang, A. J., & Stein, M. B. (2015). Intolerance of uncertainty as a mediator of reductions in worry in a cognitive behavioral treatment program for generalized anxiety disorder. Journal of Anxiety Disorders, 33, 90-94. doi: 10.1016/j.janxdis.2015.05.004

Borkovec, T. D., Alcaine, O. M., & Behar, E. (2004). Avoidance theory of worry and generalized anxiety disorder. In R. G. Heimberg, C. L. Turk, and D. S. Mennin (Eds.). *Generalized anxiety disorder: Advances in research and practice.* (pp. 77-108). New York, NY: Guilford Press.

Borkovec, T. D., & Costello, E. (1993). Efficacy of applied relaxation and cognitive-Behavioural therapy in the treatment of generalized anxiety disorder. *Journal of Consulting and Clinical Psychology, 61*, 611-619. doi: 10.1037/0022-006X.61.4.611

Borkovec, T. D., Alcaine, O. M., & Behar, E. (2004). Avoidance theory of worry and generalized anxiety disorder. In R. Heimberg, C. Turk, & D. Mennin (Eds.), *Generalized anxiety disorder: advances in research and practice* (pp. 77–108). New York, NY: Guilford Press.

Bredemeier, K., & Berenbaum, H. (2008). Intolerance of uncertainty and perceived threat. *Behaviour Research and Therapy, 46*, 28-38. doi:10.1016/j.brat.2007.09.006

Broadbent, D. E., & Broadbent, M. (1998). Anxiety and attentional bias: State and trait. *Cognition and Emotion, 2*, 165-183. doi:10.1080/02699938808410922

Brosschot, J. F., Gerin, W., & Thayer, J. F. (2006). The perseverative cognition hypothesis: A review of worry, prolonged stress-related physiological activation, and health. *Journal of Psychosomatic Research*, *60*, 113–124. doi: 10.1016/j.jpsychores.2005.06.074

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*, 33-37. doi: 10.1016/0005-7967(92)90093-V

Brown, T. A., Di Nardo, P. A., Lehman, C. L., & Campbell, L. A. (2001). Reliability of DSM-IV anxiety and mood disorders: Implications for the classification of emotional disorders. *Journal of Abnormal Psychology, 110*, 49-58. doi: 10.1037/0021-843X.110.1.49

Butler, A. .C., Chapman, J. E., Forman, E. M., & Beck, A. T. (2006). The empirical status of cognitive-behavioral therapy: A review of meta-analyses. *Clinical Psychology Reviews,* 26, 17-31. doi: 10.1016/j.cpr.2005.07.003

Butler, G., & Mathews, A. (1983). Cognitive processes in anxiety. *Advances in Behaviour Research and Therapy, 5*, 51-62. doi:10.1016/0146-6402(83)90015-2

Carleton, R. N., Mulvogue, M. K., Thibodeau, M. A., McCabe, R. E., Antony, M. M., & Asmundson, G. J. G. (2012). Increasingly certain about uncertainty: Intolerance of uncertainty across anxiety and depression. *Journal of Anxiety Disorders, 26*, 468-479. doi: 10.1016/j.janxdis.2012.01.011

Cho, Y., & Telch, M. J. (2005). Testing the Cognitive Content-Specificity Hypothesis of Social Anxiety and Depression: An Application of Structural Equation Modeling. *Cognitive Therapy and Research*, *29*, 399-416. doi:10.1007/s10608-005-2081-9

Clark, D. A., & Beck, T. A. (2010). Cognitive theory and therapy of anxiety and depression: Convergence with neurobiological findings. *Trends in Cognitive Sciences, 14*, 418-424. doi: 10.1016/j.tics.2010.06.007

Clark, D. A., Beck, A. T., & Brown, G. (1989). Cognitive mediation in general psychiatric outpatients: A test of the content-specificity hypothesis. *Journal of Personality and Social Psychology, 56*, 958-964. doi: 10.1037/0022-3514.56.6.958

Craske, M. G., & Pontillo, D. C. (2001). Cognitive biases in anxiety disorders and their effect on cognitive-behavioral treatment. *Bulletin of the Menniger Clinic, 65*, 58-77. doi: 10.1521/bumc.65.1.58.18708

Cristea, I. A., Kok, R. N., & Cuijpers, P. (2015). Efficacy of cognitive bias modification interventions in anxiety and depression: Meta-analysis. *The British Journal of Psychiatry, 206*, 7-16. doi: 10.1192/bjp.bp.114.146761

Cuijpers, P., Sijbrandij, M., Koole, S., Huibers, M., Berking, M., & Andersson, G. (2014). Psychological treatment of generalized anxiety disorder: A meta-analysis. *Clinical Psychology Review, 34*, 130-140. doi: 10.1016/j.cpr.2014.01.002

Davey, G. C. L., Hampton, J., Farrell, J., & Davidson, S. (1992). Some characteristics of worrying: Evidence for worrying and anxiety states as separate constructs. *Personality and Individual Differences, 13*, 133-147. doi: 10.1016/0191-8869(92)90036-O

de Bruin, G. O, Rassin, E., van der Heiden, C., & Muris, P. (2006). Psychometric properties of a Dutch version of the Intolerance of Uncertainty Scale. *Netherlands Journal of Psychology, 62*, 87–92. doi: 10.1007/BF03061055

Di Nardo, P. A., Brown, T. A., & Barlow, D. H. (1994). *Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV)*. San Antonio, TX: Psychological Corporation.

Dobson, D., & Dobson, K. S. (2009). *Evidence-based practice of cognitive-behavioral therapy*. New York: Guilford Press.

Dugas, M. J., Brillon, P., Savard, P., Turcotte, J., Gaudet, A., Ladouceur, R., et al. (2010). A randomized clinical trial of cognitive-Behavioural therapy and applied relaxation for adults with generalized anxiety disorder. *Behaviour Therapy, 41*, 46-58. doi: 10.1016/j.beth.2008.12.004

Dugas, M. J., Freeston, M. H., & Ladouceur, R. (1997). Intolerance of uncertainty and problem orientation in worry. *Cognitive Therapy and Research, 21*, 593-606. doi: 10.1023/A:1021890322153

Dugas, M. J., Freeston, M. H., Doucet, C., Lachance, S., & Ladouceur, R. (1995). Structured versus free-recall measures: Effects on report of worry themes. *Personality and Individual Differences, 18,* 355–362. doi:10.1016/0191-8869(94)00151-H

Dugas, M. J., Freeston, M. H., Provencher, M. D., Lachance, S., Ladouceur, R., & Gosselin, P. (2001). Le Questionnaire sur l'Inquiétude et l'Anxiété. Validation dans des échantillons non cliniques et cliniques (The Worry and Anxiety Questionnaire: Validation in non-clinical and clinical samples). *Journal de Thérapie Comportementale et Cognitive, 11*, 31-36. Retrieved from http://cat.inist.fr/?aModele=afficheN&cpsidt=932219

Dugas, M. J., Gagnon, F., Ladouceur, R., & Freeston, M. H. (1998). Generalized anxiety disorder: A preliminary test of a conceptual model. *Behaviour Research and Therapy, 36*, 215-226. doi: 10.1016/S0005-7967(97)00070-3

Dugas, M.J., Gosselin, P., & Ladouceur, R. (2001). Intolerance of uncertainty and worry: Investigating narrow specificity in a nonclinical sample. *Cognitive Therapy and Research, 25*, 551-558. doi: 0147-5916/01/1000-0551$19.50/0

Dugas, M. J., Hedayati, M., Karavidas, A., Buhr, K., Francis, K., & Phillips, N. A. (2005). Intolerance of uncertainty and information processing: Evidence of biased recall and interpretations. *Cognitive Therapy and Research,* 29, 57-70. doi: 10.1007/s10608-005-1648-9

Dugas, M. J., & Ladouceur, R. (2000). Treatment of GAD: Targeting intolerance of uncertainty in two types of worry. *Behaviour Modification, 24*, 635-657. doi: 10.1177/0145445500245002

Dugas, M. J., Ladouceur, R., Leger, E., Freeston, M. H., Langlois, F., Provencher, M. D., & Boisvert, J-M. (2003). Group cognitive-behavioral therapy for generalized anxiety disorder: Treatment outcome and long-term follow-up. *Journal of Consulting and Clinical Psychology, 71*, 821-825. doi: 10.1037/0022-006X.71.4.821

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

Dugas, M. J. &, Robichaud, M. (2007). *Cognitive-Behavioural treatment for generalized anxiety disorder: From science to practice.* New York, NY: Routledge.

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*, 169-178. doi: 10.1016/j.beth.2006.07.002

Dugas, M.J., Savard, P., Turcotte, J., Gaudet, A., Brillon, P., Ladouceur, R., Leblanc, R., & Gervais, N.J. (2010). A randomized clinical trial of cognitive-behavioral therapy and applied relaxation for adults with generalized anxiety disorder. *Behavior Therapy, 41*, 46-58. doi: 10.1016/j.beth.2008.12.004

Dugas, M.J., Schwartz, A., & Francis, K. (2004). Intolerance of uncertainty, worry, and depression. *Cognitive Therapy and Research, 28*, 835-842. doi: 10.1007/s10608-004-0669-0

Durham, R. C., Chambers, J. A., MacDonald, R. R., Power, K. G., & Major, K. (2003). Does cognitive-behavioural therapy influence long-term outcome of generalized anxiety

disorder? An 8-14 year follow-up of two clinical trials. *Psychological Medicine, 33*, 499-509. doi: 10.1017/S003329170200707

Emmelkamp, P. M. G. (2012). Attention bias modification: The emperor's new suit? BMC Medicine, 63, 1-4. Retrieved from http://www.biomedcentral.com/1741-7015/10/63.

Eysenck, M. W., Mogg, K., May, J., Richards, A., & Mathews, A. (1991). Bias in interpretation of ambiguous sentences related to threat in anxiety. *Journal of Abnormal Psychology, 100*, 144-150. doi:10.1037/0021-843X.100.2.144

Fisher, P. L. (2006). The efficacy of psychological treatments for generalized anxiety disorder. In G. C. Davey and A. Wells (Eds.), *Worry and its psychological disorders: Theory, assessment and treatment* (pp. 359-377). Chichester, England: Wiley & Sons.

Fox, E., Mackintosh, B., & Holmes, E. A. (2014). Travellers' tales in cognitive bias modification research: A commentary on the Special Issue. *Cognitive Therapy and Research, 38*, 239-247. doi: 10.1007/s10608-014-9604-1

Fox, E., Russo, R., & Dutton, K. (2001). Attentional bias for threat: Evidence for delayed disengagement from emotional faces. *Cognition and Emotion, 16*, 355-379. doi: 10.1080/02699930143000527

Franklin, M. E., Huppert, J., Langner, R., Leiberg, S., & Foa, E. B. (2005). Interpretation bias: A comparison of treated social phobics, untreated social phobics, and controls. *Cognitive Therapy and Research, 29,* 289-300. doi:10.1007/s10608-005-2412-8

Freeston, M. H., Rhéaume, J., Letarte, H., Dugas, M.J., & Ladouceur, R. (1994b). Why do people worry? *Personality and Individual Differences, 17*, 791-802. doi: 10.1016/0191-8869(94)90048-5

Fuhrer, R., & Rouillon, F. (1989). The French version of the CES-D (Center for Epidemiologic Studies-Depression Scale): Description and translation of the self-report scale / La version française de l'échelle CES-D (Center for Epidemiologic Studies-Depression Scale). *European Psychiatry, 4*, 163-166. doi: 1992-87795-001

Gosselin, P., Dugas, M. J., Ladouceur, R., & Freeston, M. H. (2001). Évaluation des inquiétudes: Validation d'une traduction française du Penn State Worry Questionnaire. *L'Encéphale, 27,* 475-484. Retrieved from http://cat.inist.fr/?aModele=afficheN&c psidt=14068032

Gosselin, P., Ladouceur, R., Morin, C.M., Dugas, M.J., & Baillargeon, L. (2006). Benzodiazepine discontinuation among adults with GAD: A randomized trial of cognitive-behavioral therapy. *Journal of Consulting and Clinical Psychology, 74,* 908-919. doi: 10.1037/0022-006X.74.5.908

Gould, R. A., Otto, M. W., Pollack, M. H., & Yapp, L. (1997). Cognitive behavioral and pharmacological treatment of generalized anxiety disorder: A preliminary meta-analysis. Behavior Therapy, 28, 285-305. Doi: 10.1016/S0005-7894(97)80048-2

Gould, R. A., Safren, S. A., O'Neill Washington, D., & Otto, M. W. (2004). A meta-analytic review of cognitive-behavioral treatments. In R. G. Heimberg, C. L. Turk, and D. S. Mennin (Eds.),*Generalized anxiety disorder: Advances in research and practice.* New York: Guilford Press.

Hallion, L. S., & Ruscio, A. M. (2011). A meta-analysis of the effect of cognitive bias modification on anxiety and depression. *Psychological Bulletin, 137*, 940-958. doi: 10.1037/a0024355

Hanrahan, F., Field, A. P., Jones, F. W., & Davey, G. C. L. (2013). A meta-analysis of cognitive therapy for worry in generalized anxiety disorder. *Clinical Psychology Review, 33*, 120-132. doi: 10.1016/j.cpr.2012.10.008

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach.* New York, NY: Guilford Press.

Hayes, S., & Hirsch, C. R. (2007). Information processing biases in generalized anxiety disorder. *Psychiatry, 6*, 176-182. doi:10.1016/j.mppsy.2007.02.003

Hayes, S., Hirsch, C. R., Krebs, G., & Mathews, A. (2010). The effects of modifying interpretation bias on worry in generalized anxiety disorder. *Behaviour Research and Therapy, 48*, 171-178. doi: 10.1016/j.brat.2009.10.006

Hebert, E.A., Geninet, I., & Dugas, M.J. (2015, November). Challenging uncertainty: Behavioral experiments in the treatment of generalized anxiety disorder. Presented at the annual meeting of the Association of Behavioral and Therapy, Chicago, USA.

Hirsch, C., Hayes, S., & Mathews, A. (2009). Looking on the bright side: Accessing benign meanings reduces worry. *Journal of Abnormal Psychology, 118*, 44-54. doi: 10.1037/a0013473

Hirsch, C. R., & Mathews, A. (2012). A cognitive model of pathological worry. *Behaviour Research and Therapy, 50*, 636-646. doi: 10.1016/j.brat.2012.06.007

Hirsch, C., & Mathews, A. (1997). Interpretative inferences when reading about emotional events. *Behaviour Research and Therapy, 35,* 1123-1132. doi:10.1016/S0005-7967(97)00069-7

Hoffman, D. L., Dukes, E. M., & Wittchen, H. U. (2008). Human and economic burden of generalized anxiety disorder. *Depression and Anxiety, 25*, 72-90. doi: 10.1002/da.20257

Hofmann, S. G., & Smits, J. A. (2008). Cognitive-behavioral therapy for adult anxiety disorders: A meta-analysis of randomized placebo-controlled trials. *Journal of Clinical Psychiatry, 69*, 621-632. doi:10.4088/JCP.v69n0415

Hoppitt, L., Illingworth, J. L., MacLeod, C., Hampshire, A., Dunn, B. D., & Mackintosh, B. (2014). Modifying social anxiety related to a real-life stressor using online cognitive bias modification for interpretation. *Behaviour Research and Therapy, 52*, 45-52. doi: 10.1016/j.brat.2013.10.008

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey replication. *Archives of General Psychiatry, 62*, 593-602. doi: 10.1001/archpsyc.62.6.593.

Kessler, R. C., DuPont, R. L., Berglund, P., & Wittchen, H-U. (1999). Impairment in pure and comorbid generalized anxiety disorder and major depression at 12 months in two national surveys. *American Journal of Psychiatry, 156*, 1915-1923. doi:10.1176/ajp.156.12.1915

Kirschbaum, C., Pirke, K. M., & Hellhammer, D. H., (1993a). The 'Trier Social Stress Test'--a tool for investigating psychobiological stress responses in a laboratory setting. *Neuropsychobiology, 28*, 76-81. doi: 119004

Koerner, N., & Dugas, M. J. (2006). A cognitive-affective model of generalized anxiety disorder: The role of intolerance of uncertainty. In G. C. L. Davey and A. Wells (Eds.), *Worry & psychological disorders: Theory, assessment & treatment* (pp. 201-216). Chichester: John Wiley and Sons, Ltd.

Koerner, N., & Dugas, M. J. (2008). An investigation of interpretations in individuals vulnerable to excessive worry: The role of intolerance of uncertainty. *Cognitive Therapy and Research, 32,* 619-638. doi: 10.1007/s10608-007-9125-2

Ladouceur, R., Dugas, M. J., Freeston, M. H., Léger, E., Gagnon, F., & Thibodeau, N. (2000). Efficacy of a new cognitive-Behavioural treatment for generalized anxiety disorder: Evaluation in a controlled clinical trial. *Journal of Consulting and Clinical Psychology, 68*, 957-964. doi: 10.1037//0022-006X.68.6.957

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

Lee, J. K., Orsillo, S. M. Roemer, L., ,& Allen, L. B. (2010). Distress and avoidance in generalized anxiety disorder: Exploring the relationships with intolerance of uncertainty and worry. *Cognitive Behaviour Therapy, 39*, 126-136. doi: 10.1080/16506070902966918

MacDonald, E. M., Pawluk, E. J., Koerner, N., & Goodwill, A. M. (2015). An examination of distress intolerance in undergraduate students high in symptoms of generalized anxiety disorder. *Cognitive Behaviour Therapy, 44*, 74-84. doi: 10.1080/16506073.2014.964303

Mackintosh, G., Mathews, A., Eckstein, D., & Hoppitt, L. (2013). Specificity effects in the modification of interpretation bias and stress reactivity. Journal of Eperimental Psychopathology, 4, 133-147. doi:10.5127/jep.025711

Mackintosh, B., Mathews, A., Yiend, J., Ridgeway, V., & Cook, E. (2006). Induced biases in emotional interpretation influence stress vulnerability and endure despite changes in context. *Behavior Therapy, 37*, 209-222. doi:10.1016/j.beth.2006.03.001

MacLeod, C., Mathews, A., & Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology, 95*, 15-20. doi: 10.1037/0021-843X.95.1.15

Mathews, A. (1990). Why worry? The cognitive function of anxiety. *Behaviour Research and Therapy, 28*, 455-468. doi: 10.1016/0005-7967(90)90132-3

Mathews, A., & Mackintosh, B. (2000). Induced emotional interpretation bias and anxiety. *Journal of Abnormal Psychology, 109*, 602-615. doi: 10.1037/0021-843X.109.4.602

Mathews, A., Richards, A., & Eysenck, M. (1989). Interpretation of homophones related to threat in anxiety states. *Journal of Abnormal Psychology, 98*, 31-34. doi: 10.1037/0021-843X.98.1.31

Mathews, A., Ridgeway, V., Cook, E., & Yiend, J. (2007). Inducing a benign interpretational bias reduces trait anxiety. *Journal of Behavior Therapy and Experimental Psychiatry, 38*, 225-236. doi: 10.1016/j.jbtep.2006.10.011

Marcus, S. C., Olfson, M., Pincus, H. A., Shear, M. K., & Zarin, D. A. (1997). Self-reported anxiety, general medical conditions, and disability bed days. *American Journal of Psychiatry, 154*, 1766-1768. doi: 10.1176/ajp.154.12.1766

McEvoy, P. M., & Erceg0Hurn, D. M. (2016). The search for universal transdiagnostic and trans-therapy change processes: Evidence for intolerance of uncertainty. Journal of Anxiety Disorders, 41, 96-107. doi: 10.1016/j.janxdis.2016.02.002

McManus, F., Clark, D. M., & Hackmann, A. (2000). Specificity of cognitive biases in social phobia and their role in recovery. *Behavioural and Cognitive Psychotherapy*, *28,* 201-209. doi: 10.1017/S1352465800003015

McNally, R. J., & Foa, E. B. (1987). Cognition and agoraphobia: Bias in the interpretation of threat. *Cognitive Therapy and Research, 11*, 567-581. doi: 10.1007/BF01183859

Meeten, F., Dash, S. R., Scarlet, A. L., & Davey, G. C. L. (2012). Investigating the effect of intolerance of uncertainty on catastrophic worrying and mood. *Behaviour Research and Therapy, 50*, 690-698. doi: 10.1016/j.brat.2012.08.003

Menne-Lothman, C., Viechtbauer, W., Hohn, P., Kasanova, Z., Haller, S. P., Drukker, M., van Os, J., Wichers, M., & Lau, J. Y. F. (2014). How to boost positive interpretations? A meta-analysis of the effectiveness of cognitive bias modification for interpretation. *PLOS ONE, 9*, 1-26. doi: 10.1371/journal.pone.0100925

Metzger, R. L, Miller, M. L, Cohen, M., Sofka, M., & Borkovec, T. D. (1990). Worry changes decision making: The effect of negative thoughts on cognitive processing. *Journal of Clinical Psychology, 46,* 78-88. doi: 10.1002/1097-4679

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*, 487-495. doi: 10.1016/0005-7967(90)90135-6

Mineka, S., & Sutton, S. K. (1992). Cognitive biases and the emotional disorders. *Psychological Science, 3*, 65-69. doi: 10.1111/j.1467-9280.1992.tb00260.x

Mogg, K., Bradley, B. P., Miller, T., Potts, H., Glenwright, J., & Kentish, J. (1994). Interpretation of homophones related to threat: Anxiety or response bias effects? *Cognitive Therapy and Research, 18*, 461-477. doi: 10.1007/BF02357754

Molina, S., & Borkovec, T. D. (1994). The Penn State Worry Questionnaire: Psychometric properties and associated characteristics. In G. C. Davey & F. Tallis (Eds.), *Worrying: Perspectives on theory, assessment and treatment* (pp. 265-283). New York, NY: Wiley & Sons.

Montgomery, S. A., & Asberg, M. (1979). A new depression scale designed to be sensitive to change. *The British Journal of Psychiatry, 134*, 382-389. doi: 10.1192/bjp.134.4.382

Morin, A. J., Moullec, G., Maïano, C., Layet, L., Just, J. L., & Ninot, G. (2011). Psychometric properties of the Center for Epidemiologic Studies Depression Scale (CES-D) in French clinical and nonclinical adults. *Revue d'Épidémiologie et de Santé Publique, 59*, 327-340. doi: 10.1016/j.respe.2011.03.061

Murphy, R., Hirsch, C. R., Mathews, A., Smith, K., & Clark, D. M. (2007). Facilitating a benign interpretation bias in a high socially anxious population. *Behaviour Research and Therapy, 45*, 1517-1529. doi: 10.1016/j.brat.2007.01.007

Ogniewicz, A. S., Dugas, M. J., Langlois, F., Gosselin, P., & Koerner, N. (2014). An adapted work-sentence association paradigm for generalized anxiety disorder and worry: Assessing interpretation bias. *Journal of Experimental Psychopathology, 5*, 457-476. doi: 10.5127/jep.039013

Provencher, M.D., Freeston, M.H., Dugas, M.J., & Ladouceur, R. (2000). Catastrophizing assessment of worry and threat schemata among worriers. *Behavioural and Cognitive Psychotherapy, 28,* 211-224. doi: 10.1017/S1352465800003027

Radloff, L. (1977). The CES-D Scale: A Self Report Depression Scale for Research in the General Population. *Applied Psychological Measurement, 1*, 385-401. doi: 10.1177/014662167700100306

Radomsky, A. S., & Rachman, S. (1999). Memory bias in obsessive–compulsive disorder (OCD). *Behaviour Research and Therapy*, *37*(7), 605–618. doi: 10.1016/S0005-7967(98)00151-X

Reinecke, A., Rinck, M., Becker, E. S., & Hoyer, J. (2013). Cognitive-behavior therapy resolves implicit fear associations in generalized anxiety disorder. *Behaviour Research and Therapy, 51*, 15-23. doi: 10.1016/j.brat.2012.10.004

Richards, A., & French, C. C. (1991). Effects of encoding and anxiety on implicit and explicit memory performance. *Personality and Individual Differences, 12*, 131-139. Doi: 10.1016/0191-8869(91)90096-T

Richards, A., Reynolds, A., & French, C. C. (1993). Anxiety and the spelling and use in sentences of threat/neutral homophones. *Current Psychology: Research & Reviews, 12*, 18-25. doi: 10.1007/BF02737089

Rosen, N.O., & Knauper, B. (2009). A little uncertainty goes a long way: State and trait differences in uncertainty interact to increase information seeking but also increase worry. *Health Communications, 24(3),* 228-238. doi: 10.1080/10410230902804125.

Salemink, E., Kindt, M., Rienties, H., & van den Hout, M. (2014). Internet-based cognitive bias modification of interpretations in patients with anxiety disorders: A randomised controlled trial. *Journal of Behavior Therapy and Experimental Psychiatry, 45*, 186-195. doi: 10.1016/j.jbtep.2013.10.005

Salemink, E., van den Hout, M., & Kindt, M. (2009). Effects of positive interpretive bias modification in highly anxious individuals. *Journal of Anxiety Disorders, 23*, 676-683. doi: 10.1016/j.janxdis.2009.02.006

Salkovskis, P. M., Hackmann, A.,. Wells, A., Gelder, M. G., & Clark, D. M. (2007). Belief disconfirmation versus habituation approaches to situational exposure in panic disorder with agoraphobia: A pilot study. *Behaviour Research and Therapy, 45*, 877-885. doi: 10.1016/j.brat.2006.02.008

Sheehan, D. V., Lecrubier, Y., Janvas, J., Knapp, E., Weiller, E., Sheehan, M., et al. (1994). *Mini International Neuropsychiatric Interview Version 5.0 (MINI)*. Tampa/Paris: University of South Florida/Inserm U302-Hôpital de la Salpêtrière.

Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janvas, J., Weiller, E., et al. (1997). The Mini-International Neuropsychiatric Interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry, 59*, 22-33. doi: 10.1016/S0924-9338(97)83297-X

Shrout, P., & Bolger, N. (2002). Mediation in experimental and non-experimental studies: New procedures and recommendations. *Psychological Methods, 7*, 422-445. doi: 10.1037/1082-989X.7.4.422

Spielberger, C. D. (1977). *Manual for the State-Trait Anxiety Inventory Y Form*. Palo Alto, CA: Consulting Psychologists Press.

Spitzer, R. L., Williams, J. B. W., Gibbon, M., & First, M. B. (1990). *User's guide for the structured clinical interview for DSM-III-R: SCID.* Washington, D.C.: American Psychiatric Association.

Standage, H., Harris, J., & Fox, E. (2014). The influence of social comparison on cognitive bias modification and emotional vulnerability. *Emotion, 14*, 170-179. doi: 10.1037/a0034226

Tallis, F., Eysenck, M., & Mathews, A. (1991). Elevated evidence requirements and worry. *Personality and Individual Differences, 12,* 21-27. doi: 10.1016/0191-8869(91)90128-X

Tolin, D. F., Worhunsky, P., & Maltby, N. (2006). Are "obsessive" beliefs specific to OCD?: A comparison across anxiety disorders. *Behaviour Research and Therapy, 44*, 469-480. doi: 10.1016/j.brat.2005.03.007

Tryon, W. W. (2004). Possible mechanisms for why desensitization and exposure therapy work. *Clinical Psychology Review, 25*, 67-95. doi: 10.1016/j.cpr.2004.08.005

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

Vasey, M.W., & Borkovec, T.D. (1992). A catastrophizing assessment of worrisome thoughts. *Cognitive Therapy and Research, 16,* 505-520. doi: 10.1007/BF01175138

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

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

Wenzel, A. (2012). Modification of core beliefs in cognitive therapy. In I. R. de Oliveira (Ed.), *Standard and Innovative Strategies in Cognitive Behavior Therapy* (Chapter 2, pp. 17-19). Rijeka, Croatia: InTech (e-book). Retrieved from www.intechopen.com

Wilson, E. J., MacLeod, C., Mathews, A., & Rutherford, E. M. (2006). The causal role of interpretative bias in anxiety reactivity. *Journal of Abnormal Psychology, 115*, 103-111. doi: 10.1037/0021-843X.115.1.103

Wittchen, H-U., Zhao, S., Kessler, R. C., & Eaton, W. W. (1994). DSM-III-R Generalized Anxiety Disorder in the National Comorbidity Survey. *Archives of General Psychiatry, 51*, 355-364. doi: 10.1001/archpsyc.1994.03950050015002.

Woud, M. L., Holmes, E. A., Postma, P., Dalgleish, T., & Mackintosh, B. (2012). Ameliorating intrusive memories of distressing experiences using computerized reappraisal training. Emotion, 12, 778–784. doi:10.1037/a0024992.

Woud, M. L., Zhang, X. C., Becker, E. S., McNally, R. J., & Margra, F. J. (2014). Don't panic: interpretation bias is predictive of new onsets of panic disorder. *Journal of Anxiety Disorders, 28*, 83-87. doi: 10.1016/j.janxdis.2013.11.008

Yiend, J., Mackintosh, B., & Mathews, A. (2005). Enduring consequences of experimentally induced biases in interpretation. *Behaviour Research and Therapy, 43*, 779-797. Doi: 10.1016/j.brat.2004.06.007

Appendix A

Advertisement for Participant Recruitment (Study 1)

Êtes-vous une personne inquiète?

Le Laboratoire des troubles anxieux de l'Université Concordia en collaboration avec la Clinique des troubles anxieux de l'Hôpital du Sacré-Cœur de Montréal est à la recherche de personnes qui s'inquiètent de façon excessive ou exagérée pour participer à une étude évaluant un traitement psychologique ayant déjà fait preuve de son efficacité.

Si vous avez entre 18 et 65 ans et que vous êtes en bonne santé physique, vous pourriez être éligible pour participer à l'étude.

Pour plus d'information, veuillez téléphoner au : 514 848-2424, poste 5085

Laboratoire des troubles anxieux
Directeur : Michel Dugas, Ph.D., psychologue

UNIVERSITÉ Concordia UNIVERSITY

www.concordia.ca

Appendix B

Information and Consent for Participation (Study 1)

HÔPITAL DU SACRÉ-COEUR DE MONTRÉAL
HSCM

UNIVERSITÉ Concordia UNIVERSITY

Formulaire d'information et de consentement téléphonique

(1e partie : Évaluation de l'admissibilité)

Titre de l'étude : La thérapie cognitivo-comportementale pour le trouble d'anxiété généralisée : Impact du traitement de l'information sur l'efficacité thérapeutique à court et à long terme

Chercheur principal : Michel Dugas, Ph.D. Professeur titulaire, Université Concordia
Chercheur, Centre de recherche HSCM

INFORMATION

A. BUT DE L'ÉTUDE

Le but de cette étude est d'évaluer l'impact des biais de traitement de l'information sur l'efficacité à court et à long terme de la thérapie cognitivo-comportementale pour le trouble d'anxiété généralisée (TAG). La première partie de l'étude consiste à évaluer de façon préliminaire la nature et la sévérité de vos symptômes anxieux afin de déterminer si vous rencontrez les critères de sélection pour passer à la seconde étape d'évaluation et par la suite recevoir le traitement pour le trouble d'anxiété généralisée.

B. PROCÉDURES

Dans un premier temps, vous participerez à une entrevue d'évaluation téléphonique (durée 1h30) avec une psychologue de l'équipe.

S'il semble que vous rencontrez les critères de sélection de l'étude, vous serez référé(e) à la Clinique des troubles anxieux de l'Hôpital du Sacré-Cœur de Montréal, où vous serez évalué(e) à nouveau par un(e) psychiatre de notre équipe. Cette évaluation se déroule en personne et est d'une durée d'une heure trente environ. Après cette rencontre, les membres de l'équipe de recherche (psychologues, psychiatres et chercheur principal) se réunissent pour discuter et vérifier si vous rencontrez bien les critères requis pour l'étude. Nous vous ferons ensuite part de la décision de l'équipe.

Si vous rencontrez les critères pour être inclus(e) dans l'étude, vous aurez à signer un autre formulaire de consentement concernant la suite de l'étude.

C. RISQUES ET BÉNÉFICES

1. Risques, effets secondaires et désagréments

Il n'est pas impossible que certaines questions provoquent un léger malaise à court terme (possiblement en vous faisant réfléchir à vos difficultés). Par contre, cette entrevue a déjà été utilisée à plusieurs reprises auprès des personnes anxieuses et les malaises sont rares. Si cela vous arrive, nous vous prions d'en discuter avec nous.

2. Bénéfices et avantages

En participant à cette étude, vous bénéficierez d'une évaluation détaillée de votre état. Évidemment, si vous rencontrez les critères de sélection pour l'étude de traitement, vous recevrez une psychothérapie efficace pour le

traitement du TAG. Parallèlement, vous pourrez contribuer à l'avancement des connaissances en participant à cette étude.

D. CONDITIONS DE PARTICIPATION

1. Versement d'une indemnité

Vous ne recevrez aucune rémunération pour votre participation à ce volet d'évaluation.

2. Confidentialité

Tous les renseignements recueillis à votre sujet demeureront strictement confidentiels, dans les limites prévues par la loi, et vous ne serez identifié(e) que par un code.

3. Indemnisation en cas de préjudice

En acceptant de participer à cette étude, vous ne renoncez à aucun de vos droits et vous ne libérez pas les chercheurs, l'organisme subventionnaire (Instituts de recherche en santé du Canada) ou les établissements impliqués de leurs responsabilités légales et professionnelles.

4. Participation volontaire et retrait de l'étude

Votre participation à cette étude est volontaire. Vous êtes donc libre de refuser d'y participer. Vous pouvez également vous retirer de l'étude à n'importe quel moment, sans avoir à donner de raisons, en faisant connaître votre décision au chercheur ou à l'un des membres de l'équipe de recherche.

CONSENTEMENT

- Je comprends que je donne mon consentement verbal pour que l'équipe de recherche évalue si je rencontre les critères de sélection de l'étude.
- Je comprends que je peux retirer mon consentement et interrompre ma participation à tout moment, sans conséquences négatives.
- Je comprends que ma participation à cette étude est CONFIDENTIELLE (c.-à-d. les membres de l'équipe connaissent mon identité mais ne la révéleront pas).

J'AI ÉCOUTÉ ATTENTIVEMENT CE QUI M'A ÉTÉ LU ET JE COMPRENDS LA NATURE DE CETTE ÉTUDE: OUI_____ NON_____

JE CONSENS DONC VERBALEMENT, DE FAÇON LIBRE ET VOLONTAIRE À PARTICIPER À L'ÉVALUATION TÉLÉPHONIQUE ET S'IL Y A LIEU À LA RENCONTRE AVEC UN(E) PSYCHIATRE DE L'ÉQUIPE :

OUI_____ NON_____

NOM DU PARTICIPANT : _____ DATE : _____

NOM DU MEMBRE DE L'ÉQUIPE : _____ HEURE : _____

SIGNATURE _____ DATE _____

Si vous avez des questions à poser au sujet de cette étude, vous pouvez contacter en tout temps la direction générale de l'Hôpital du Sacré-Cœur de Montréal au (514) 338-2222, poste 3581.

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HSCM

UNIVERSITÉ Concordia UNIVERSITY

FORMULAIRE D'INFORMATION ET DE CONSENTEMENT

Titre de l'étude: La thérapie cognitivo-comportementale pour le trouble d'anxiété généralisée : Impact du traitement de l'information sur l'efficacité thérapeutique à court et à long terme

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Tél : 514-338-4201

Organisme de subvention : Instituts de recherche en santé du Canada
410 avenue Laurier ouest, 9ème étage, indice de l'adresse 4209A,
Ottawa, Ontario, K1A 0W9

INFORMATION

1. Nature et objectif de l'étude

Nous savons aujourd'hui que les personnes atteintes de troubles anxieux ont certains biais dans leur façon de traiter l'information provenant de leur environnement. Par exemple, les personnes anxieuses tendent à porter leur attention

plus rapidement à certains « signes de danger » et à interpréter certaines situations ambiguës de façon menaçante. Par contre, nous ne savons pas si l'ampleur de ces biais affecte la réponse à la psychothérapie. En d'autres mots, nous ne savons pas si les personnes anxieuses qui présentent des biais plus importants dans leur façon de traiter l'information répondent différemment aux interventions psychologiques.

Le but de cette étude est d'évaluer l'impact des biais de traitement de l'information sur l'efficacité à court et à long terme de la thérapie cognitivo-comportementale pour le trouble d'anxiété généralisée (TAG). Plus particulièrement, nous voulons : (1) évaluer l'impact des biais « pré-thérapie » sur la réponse à cette thérapie; et (2) évaluer l'impact des biais « post-thérapie » sur le maintien des gains thérapeutiques suite à la thérapie. Afin d'évaluer l'ampleur des biais de traitement de l'information, nous nous proposons d'utiliser trois tâches informatiques qui sont expliquées ci-dessous.

Cent dix (110) adultes avec un diagnostic principal de trouble d'anxiété généralisée participeront à cette étude. Les participants seront recrutés à la Clinique des troubles anxieux de l'Hôpital du Sacré-Cœur de Montréal ou par le biais d'annonces placées dans le quotidien *La Presse*.

2. Déroulement de l'étude et méthodes utilisées

Les grandes lignes pour la suite de l'étude sont les suivantes : (1) évaluation pré-thérapie en deux rencontres; (2) thérapie cognitivo-comportementale administrée en 14 rencontres hebdomadaires; (3) évaluation post-thérapie en huit rencontres sur une période de 18 mois.

Premier volet : Évaluation pré-thérapie

Suite à l'évaluation de vos symptômes d'anxiété – entrevues téléphoniques et entrevue psychiatrique à la Clinique des troubles anxieux – nous avons déterminé que vous rencontrez les critères d'inclusion de cette étude. Vous participerez maintenant à une rencontre d'environ deux heures avec une psychologue de notre équipe (Isabelle Geninet, Pascale Harvey ou Amélie Seidah) – le but de cette rencontre est d'évaluer vos traits de personnalité ou votre façon habituelle de réagir aux événements de tous les jours. Au cours de cette rencontre, vous aurez aussi à compléter des questionnaires portant sur vos symptômes d'anxiété. Par la suite, vous aurez à participer à une dernière rencontre d'évaluation pendant laquelle vous ferez trois tâches sur un ordinateur et répondrez à des questionnaires. En ce qui concerne les tâches informatiques, vous ferez une tâche évaluant votre façon de porter attention à certains mots et deux tâches évaluant votre façon de comprendre certaines situations. Chacune des trois tâches prend environ 20 minutes à compléter. Vous répondrez ensuite à des questionnaires qui ont pour but d'évaluer votre état général. Cela vous prendra environ 20 minutes pour répondre aux questionnaires. La durée totale de cette rencontre (directives, tâches informatiques, pause et questionnaires) sera d'environ une heure et demie.

Deuxième volet : Thérapie cognitivo-comportementale

En participant à cette étude, vous recevrez une psychothérapie efficace pour le traitement du TAG. Cette thérapie, de type cognitivo-comportementale, pourrait vous aider à comprendre et à changer les comportements et pensées qui contribuent à vos difficultés. La durée de cette thérapie est de quatre mois (14 rencontres hebdomadaires de 50 minutes) et elle vous sera administrée par une des psychologues de notre équipe. Entre les rencontres, vous aurez des lectures à faire et des exercices à pratiquer.

Troisième volet : Évaluation post-thérapie

Afin d'évaluer les effets de la psychothérapie à long terme, vous serez évalué(e) à sept reprises, sur une période de 18 mois, suite à votre thérapie. Immédiatement après la thérapie, vous participerez à deux rencontres d'évaluation (rencontre 1 : entrevue diagnostique et questionnaires; rencontre 2 : tâches à l'ordinateur et questionnaires). Par la suite, vous participerez à une rencontre d'évaluation (entrevue diagnostique et questionnaires) à six reprises, c'est-à-dire aux relances de 3, 6, 9, 12, 15 et 18 mois.

3. Risques, effets secondaires et désagréments

Évaluations

Il n'est pas impossible que certaines tâches ou certains questionnaires provoquent un léger malaise à court terme (possiblement en vous faisant réfléchir à vos difficultés). Par contre, ces tâches et questionnaires ont déjà été utilisés à plusieurs reprises auprès des personnes anxieuses et les malaises sont rares. Si cela vous arrive, nous vous prions d'en discuter avec la professionnelle de recherche ou avec votre thérapeute.

Psychothérapie

Il est possible que quelques uns des exercices prescrits par votre psychologue provoquent certains malaises à court terme. Ceux-ci sont temporaires et disparaissent habituellement avec la pratique répétée de ces exercices.

Si vous recevez un médicament de votre médecin ou de votre psychiatre au moment du début de l'étude, cela demeure la responsabilité de ce dernier pendant la durée du traitement. Cependant, nous vous demandons seulement de ne pas augmenter le dosage de votre médication ou de modifier le type de médicament sans en avertir préalablement votre thérapeute.

4. Bénéfices et avantages

Tel que mentionné précédemment, en participant à cette étude, vous recevrez une psychothérapie efficace pour le traitement du TAG. De plus, cette thérapie vous sera offerte par des psychologues qui sont des experts dans son application. Vous profiterez aussi d'une évaluation plus poussée de votre état, avec un suivi sur une période de 18 mois après la fin de la psychothérapie. Parallèlement, vous allez nous aider à mieux évaluer les facteurs qui influencent l'efficacité de cette thérapie et ainsi contribuer à l'avancement des connaissances en participant à cette étude.

5. Versement d'une indemnité

Vous ne recevrez aucune rémunération pour votre participation à la première partie de cette étude (évaluation pré-thérapie, psychothérapie et évaluation immédiatement après la thérapie). Par contre, vous recevrez une compensation de 30$ pour chacune des six rencontres de relance (3, 6, 9, 12, 15 et 18 mois après la fin de la psychothérapie). Donc, si vous vous présentez pour toutes les rencontres de relances, vous recevrez une indemnité de 180$.

6. Confidentialité

Tous les renseignements recueillis à votre sujet au cours de l'étude demeureront strictement confidentiels, dans les limites prévues par la loi, et vous ne serez identifié(e) que par un code. Les rencontres avec les psychologues seront enregistrées sur cassettes audio afin de nous permettre d'évaluer la qualité des interventions offertes par celles-ci (les cassettes seront aussi identifiées par un code). Immédiatement après l'étude, toutes les cassettes seront détruites. Aucune publication ou communication scientifique résultant de cette étude ne renfermera quoi que ce soit qui puisse permettre de vous identifier.

Cependant, à des fins de contrôle du projet de recherche, votre dossier pourra être consulté par une personne mandatée par le comité d'éthique de la recherche de l'Hôpital du Sacré-Cœur ainsi que par des représentants de l'organisme de subvention (Instituts de recherche en santé du Canada). Tous ces organismes adhèrent à une politique de stricte confidentialité.

7. Indemnisation en cas de préjudice

Si vous deviez subir quelque préjudice que ce soit résultant de votre participation à cette étude, vous recevrez tous les soins médicaux nécessaires, sans frais de votre part. Toutefois, ceci ne vous empêche nullement d'exercer un recours légal en cas de faute reprochée à toute personne impliquée dans l'étude.

En acceptant de participer à cette étude, vous ne renoncez à aucun de vos droits ni ne libérez les chercheurs, l'organisme subventionnaire (Instituts de recherche en santé du Canada) ou les établissements impliqués de leurs responsabilités légales et professionnelles.

8. Participation volontaire et retrait de l'étude

Votre participation à cette étude est volontaire. Vous êtes donc libre de refuser d'y participer. Vous pouvez également vous retirer de l'étude à n'importe quel moment, sans avoir à donner de raisons, en faisant connaître votre décision au chercheur ou à l'un des membres de l'équipe de recherche. Toute nouvelle connaissance acquise durant le déroulement de l'étude qui pourrait affecter votre décision de continuer d'y participer vous sera communiquée sans délai.

Votre décision de vous en retirer n'aura aucune conséquence sur les soins qui vous seront fournis par la suite ou sur vos relations avec votre médecin et les autres intervenants.

9. Personnes à contacter

Si vous avez des questions à poser au sujet de cette étude ou s'il survient un incident quelconque ou si vous désirez vous retirer de l'étude, vous pouvez contacter en tout temps le Dr Michel Dugas (le chercheur principal de l'étude) aux numéros de téléphone suivants :

Lundi, mardi, jeudi et vendredi : (514) 848-2424, poste 2215 (Département de psychologie, Université Concordia)

Mercredi : (514) 338-4201 (Clinique des troubles anxieux, Hôpital du Sacré-Cœur)

Si vous voulez poser des questions à un professionnel ou à un chercheur qui n'est pas impliqué dans cette étude, vous pouvez communiquer avec Dr. Normand Lussier, omnipraticien à la Clinique des troubles anxieux, au (514) 338-4201.

Si vous avez des questions à poser concernant vos droits en tant que participant à un projet de recherche, ou si vous avez des plaintes ou des commentaires à formuler, vous pouvez communiquer avec la direction générale de l'hôpital, au (514) 338-2222, poste 3581.

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CONSENTEMENT

La thérapie cognitivo-comportementale pour le trouble d'anxiété généralisée : Impact du traitement de l'information sur l'efficacité thérapeutique à court et à long terme

La nature de cette étude, les procédés à utiliser, les risques et les bénéfices que comporte ma participation à cette étude ainsi que le caractère confidentiel des informations qui seront recueillies au cours de l'étude m'ont été expliqués.

J'ai eu l'occasion de poser toutes mes questions concernant les différents aspects de cette étude et on y a répondu à ma satisfaction.

Je reconnais qu'on m'a laissé le temps voulu pour prendre ma décision.

J'accepte volontairement de participer à cette étude. Je demeure libre de m'en retirer en tout temps sans que cela ne nuise aux relations avec mon médecin ou les autres intervenants et sans préjudice d'aucune sorte.

Je recevrai une copie signée de ce formulaire d'information et de consentement.

_____	_____	_____
Nom du sujet (en lettres moulées)	Signature	Date
_____	_____	_____
Nom du chercheur ou de son représentant (en lettres moulées)	Signature	Date

Appendix C

Advertisement for Participation Recruitment (Study 2)

Étude sur l'inquiétude

Êtes-vous une personne qui s'inquiète beaucoup?

Est-ce que vos inquiétudes vous *semblent excessives et exagérées?*

Si OUI, si le français est votre langue maternelle et si vous avez au moins 18 ans, vous pourriez être éligible à participer à une étude évaluant un nouveau programme destiné à modifier les habitudes mentales des personnes qui s'inquiètent beaucoup.

L'étude a lieu au Laboratoire des troubles anxieux à l'Université Concordia. Le programme comprend 5 visites en laboratoire au cours de 3 semaines. Les individus qui complètent l'étude recevront 50$.

La première étape consiste à compléter un bref questionnaire en ligne d'une durée de 10 minutes. La confidentialité est assurée.

Intéressé? Contactez-nous à etude.pmi@gmail.com en indiquant votre nom et numéro de téléphone. Questions? (514) 848-2424 poste 2234.

Ce projet est approuvé par le Comité d'Éthique de la Recherche de l'Université

Concordia.

Appendix D

Information and Consent for Participation (Study 2)

Changer les habitudes mentales des personnes inquiètes

Formulaire de consentement pour l'étude PMI-TAG

Par la présente, je déclare consentir à participer à un programme de recherche mené par Mme Eleanor Donegan sous la supervision de Dr Michel Dugas au Département de Psychologie de l'Université Concordia. Mme Donegan peut être contactée par courriel anxiety@alcor.concordia.ca ou par téléphone au 514-848-2424 poste 2234.

A. BUT DE LA RECHERCHE

On m'a informé(e) que le but de cette étude est d'évaluer un nouveau programme de formation conçu pour modifier la façon dont les personnes inquiètes et anxieuses réagissent aux situations de leur vie quotidienne.

B. PROCÉDURES

Je comprends que ma participation implique cinq visites qui auront lieu au Laboratoire des Troubles Anxieux du Département de Psychologie de l'Université Concordia. Ces visites se dérouleront durant les **trois prochaines semaines** pour un total de **six heures** de participation. On me demandera de compléter des questionnaires mesurant mes pensées et mes émotions. Je ferai également des tâches à l'ordinateur conçues pour évaluer et potentiellement modifier certaines habitudes mentales (ou façons de penser) souvent associées à des niveaux élevés d'inquiétudes et d'anxiété.

Je comprends qu'il y a deux conditions dans cette étude : une condition conçue pour modifier ces habitudes mentales et une autre condition conçue pour être sans effet sur ces mêmes habitudes mentales. Je comprends également que je serai assigné(e), au hasard, à l'une ou l'autre de ces conditions.

Je comprends que l'information que je donne sera gardée sous clé dans un classeur ou dans un document informatique protégé par un mot de passe dans le Laboratoire des Troubles Anxieux. Seuls les membres de l'équipe de recherche directement impliqués dans cette étude auront accès à ces informations. S'il advient que je me sente en difficulté durant ma participation, je dois en aviser l'expérimentateur le plus tôt possible afin de discuter avec lui si je poursuis ou non ma participation. À la fin de ma participation, je recevrai comme compensation :

Étudiants en psychologie à l'Université Concordia : un total de **6 crédits** (1 crédit par heure de participation)

OU

Tous les autres participants : un total de **50$** (5$ après chacune des quatre premières sessions, et 30$ après la dernière session).

C. RISQUES ET BÉNÉFICES

Je comprends que, bien que les risques associés à ma participation à cette étude soient minimes, il est possible que je vive un certain inconfort ou une détresse lorsque j'accomplirai les différentes tâches en

lien avec mes inquiétudes et mon anxiété. Il est aussi possible que les informations que je divulguerai suggèrent que je souffre d'un problème psychologique dont je ne soupçonnais pas l'existence. Je comprends que si je me retrouve dans cette situation, je discuterai de mon malaise ou mes préoccupations avec l'expérimentateur afin que nous puissions déterminer si je poursuis ou non ma participation. Je comprends qu'une liste de ressources en santé mentale est disponible si je désire consulter quelqu'un pour mes difficultés.

En terme de bénéfices, je comprends que cette recherche a le potentiel de mettre en lumière un nouveau programme destiné à aider les individus qui sont très inquiets et anxieux en modifiant certaines habitudes mentales lorsqu'ils se retrouvent dans des situations stressantes.

D. CONDITIONS DE PARTICIPATION

- Je comprends que**,** pour être admissible à participer à cette étude**, le français** doit être ma première langue. ***(*Votre langue maternelle est celle que vous avez parlée à la maison entre 0 et 5 ans)**
- Je comprends que je suis libre de retirer mon consentement et cesser ma participation à tout moment sans conséquences négatives.
- **Je comprends que si je termine l'étude avant de d'avoir complété les six sessions, je n'aurai pas droit à me faire compenser pour les sessions manquantes (i.e., je vais recevoir 1 crédit par heure complétée ou 5$ pour chaque session complétée)**
- Je comprends que ma participation à cette étude est CONFIDENTIELLE (c.-à-d. le chercheur connait mon identité mais ne la révèlera pas).
- Je comprends que les données de cette étude puissent être publiées.
- Je comprends le but de la présente étude.

J'AI LU ATTENTIVEMENT CE QUI PRÉCÈDE ET JE COMPRENDS LA NATURE DE L'ENTENTE. JE CONSENS LIBREMENT ET VOLONTAIREMENT À PARTICIPER À CETTE ÉTUDE.

NOM (caractères d'imprimerie) _____

SIGNATURE _____

DATE : _____

Si vous avez des questions concernant le **fonctionnement** de l'étude, S.V.P contacter Eleanor Donegan, Département de Psychologie, par courriel à « anxiety@alcor.concordia.ca » ou par téléphone au (514) 848-2424 poste 2234.

Si vous avez des questions concernant vos **droits** en tant que participants à l'étude, S.V.P. contactez Kyla Wiscombe ou Adela Reid (conseillères en éthique de la recherche, Université Concordia), au 514-848-2424 poste 7481 ou par courriel au ethics@alcor.concordia.ca

Appendix E

Computerized CBM-I/ICC Instructions (Study 2)

POUR CETTE TÂCHE, VOUS VERREZ UN MOT APPARAÎTRE À L'ÉCRAN. IL APPARAÎTRA TRÈS BRIÈVEMENT; VOUS DEVREZ DONC ÊTRE TRÈS ATTENTIF(VE) POUR LE LIRE. LE MOT DISPARAÎTRA PUIS, UNE PHRASE APPARAÎTRA.

PAR LA SUITE, L'ORDINATEUR VOUS DEMANDERA SI LE MOT ET LA PHRASE SONT RELIÉS OU NON RELIÉS.

SI VOUS CROYEZ QUE LE MOT ET LA PHRASE SONT RELIÉS, APPUYEZ SUR LA TOUCHE « 1 » DU CLAVIER NUMÉRIQUE (1 = RELIÉS). SI VOUS CROYEZ QUE LE MOT ET LA PHRASE NE SONT PAS RELIÉS, APPUYEZ SUR LA TOUCHE « 3 » DU CLAVIER NUMÉRIQUE (3 = NON RELIÉS).

ON VOUS INDIQUERA ALORS SI VOTRE RÉPONSE EST BONNE OU MAUVAISE.

LORSQUE VOUS ÊTES PRÊT(E) À DÉBUTER LE PROCHAIN ESSAI, APPUYEZ SUR LA BARRE ESPACE.

LES MOTS APPARAISSENT TRÈS BRIÈVEMENT; SI VOUS EN MANQUEZ UN, TENTEZ TOUT DE MÊME UNE RÉPONSE ET PASSEZ AU SUIVANT. ESSAYEZ DE COMPLÉTER LA TÂCHE LE PLUS RAPIDEMENT ET AUSSI PRÉCISÉMENT QUE POSSIBLE.

VOUS AUREZ L'OCCASION DE PRENDRE PLUSIEURS COURTES PAUSES DURANT LA TÂCHE. L'ORDINATEUR VOUS AVERTIRA QUAND CE SERA LE TEMPS DE PRENDRE UNE PAUSE.

APPUYEZ SUR LA BARRE ESPACE POUR COMMENCER.

Appendix F

Sample WSAP CBM-I and ICC Word and Sentence Pairs (Study 2)

CMB-I

Domaine d'inquiétude	Mots	Phrases ambigues	Valence	Réponse correcte
1. Danger physique (soi)	Chien	J'entends un bruit dans la nuit	Bénin	Relié
	Voleur	J'entends un bruit dans la nuit	Négatif	Non relié
2. Danger physique (autres)	Occupée	J'appelle ma mere mais elle ne peut pas répondre au téléphone	Bénin	Relié
	Blessée	J'appelle ma mere mais elle ne peut pas répondre au telephone	Négatif	Non relié
3. Santé (soi)	Mieux	Ma santé a changé	Bénin	Relié
	Pire	Ma santé a changé	Négatif	Non relié
4. Santé (autres)	En forme	La condition de mon père est surprenante étant donné son âge	Bénin	Relié
	Malade	La condition de mon père est surprenante étant donné son âge	Négatif	Non relié
5. Relations amoureuses	Conversation	Mon conjoint (ma conjointe) veut me parler	Bénin	Relié
	Rupture	La condition de mon père est surprenante étant donné son âge	Négatif	Non relié
6. Relations sociales	Heureux(se)	Mon ami(e) réagit à mon cadeau	Bénin	Relié
	Déçu(e)	Mon ami(e) réagit à mon cadeau	Négatif	Non relié
7. Relations familiales	Vacances	Je n'ai pas vu ma mere depuis quelques semaines	Bénin	Relié
	Dispute	Je n'ai pas vu ma mere depuis quelques semaines	Négatif	Non relié
8. Finances	Augmentation	Il y a un changement au niveau de mon salaire	Bénin	Relié
	Diminution	Il y a un changement au niveau de mon salaire	Négatif	Non relié

9. Compétence au travail	Éloges	Mon patron veut me rencontrer	Bénin	Relié
	Critiques	Mon patron veut me rencontrer	Négatif	Non relié
10. Performance académique	Facile	Je remets mon examen une heure à l'avance	Bénin	Relié
	Abandon	Je remets mon examen une heure à l'avance	Négatif	Non relié

ICC

Domaine d'inquiétude	Mots	Phrases ambigues	Valence	Réponse correcte
1. Danger physique (soi)	Oreilles	J'entends un bruit dans la nuit	Bénin	Relié
	Bibliothèque	J'entends un bruit dans la nuit	Négatif	Non relié
2. Danger physique (autres)	Communication	J'appelle ma mere mais elle ne peut pas répondre au téléphone	Bénin	Relié
	Plastique	J'appelle ma mere mais elle ne peut pas répondre au telephone	Négatif	Non relié
3. Santé (soi)	Surveillance	Ma santé a changé	Bénin	Relié
	Tambour	Ma santé a changé	Négatif	Non relié
4. Santé (autres)	Paternel	La condition de mon père est surprenante étant donné son âge	Bénin	Relié
	Manteau	La condition de mon père est surprenante étant donné son âge	Négatif	Non relié
5. Relations amoureuses	Discussion	Mon conjoint (ma conjointe) veut me parler	Bénin	Relié
	Continent	Mon conjoint (ma conjointe) veut me parler	Négatif	Non relié
6. Relations sociales	Don	Mon ami(e) réagit à mon cadeau	Bénin	Relié
	Siècle	Mon ami(e) réagit à mon cadeau	Négatif	Non relié
7. Relations familiales	Parenté	Je n'ai pas vu ma mere depuis quelques semaines	Bénin	Relié
	Métro	Je n'ai pas vu ma mere depuis quelques semaines	Négatif	Non relié
8. Finances	Revenu	Il y a un changement au niveau de mon salaire	Bénin	Relié
	Eau	Il y a un changement au niveau de mon salaire	Négatif	Non relié
9. Compétence au travail	Rendez-vous	Mon patron veut me rencontrer	Bénin	Relié
	Feuille	Mon patron veut me rencontrer	Négatif	Non relié

10. Performance académique	Temps	Je remets mon examen une heure à l'avance	Bénin	Relié
	Champes	Je remets mon examen une heure à l'avance	Négatif	Non relié

Appendix G

Scrambled Sentence Task Instructions (Study 2)

Screen 1

Tâche de mémoire

Dans un instant, un nombre à 6 chiffres apparaitra à l'écran.
Veuillez prendre 10 secondes pour le mémoriser.
Vous devrez le garder en mémoire car nous vous demanderons de nous dire quel est ce nombre une fois que vous aurez complété la tâche suivante.

Appuyez sur la barre espace pour continuer.

Screen 2

710695

Screen 3

Test des Phrases en Désordre

Chacune des phrases en désordre qui vous sera présentée comprend 6 mots. Votre tâche consiste à utiliser **5 de ces 6 mots** et les réorganiser afin de former une phrase qui a du sens. Utilisez les touches numériques du clavier pour indiquer l'ordre dans lequel vous placez les mots pour former votre nouvelle phrase.

Par exemple si on vous présente ces 6 mots:

1	2	3	4	5	6
homme	lunettes	cet	des	porte	souliers

Vous pouvez choisir de réorganiser ces mots en formant une phrase de 5 mots en entrant la séquence suivante au clavier : 31546

qui représente la phrase suivante :

3	1	5	4	6
cet	homme	porte	des	souliers

Ou encore: 31542

qui représente la phrase suivante :

3 1 5 4 2
cet homme porte des lunettes

Bien que chaque ensemble de mots puisse former plus qu'une phrase, vous devez former une seule phrase à partir de chacune des phrases en désordre. Les phrases formées ne doivent pas être sous forme de question. Veuillez noter que les mots précédés d'un apostrophe (ex : l'homme, d'après) sont considérés comme étant un seul mot.

Vous allez maintenant commencer le test des phrases en désordre. Vous disposerez de **4 minutes** pour remettre en ordre le plus de phrases possible. **Travaillez aussi vite et bien que vous le pouvez**.

Appuyez sur la barre espace pour commencer.

…

Final Screen

Vous avez maintenant terminé le test des phrases en désordre.

Veuillez entrer le nombre à 6 chiffres que nous vous avons demandé de mémoriser avant le début de ce test. Pour ce faire, utilisez le clavier numérique. Une fois que vous l'aurez fait, appuyez sur la barre espace.

Appendix H

Sample Scrambled Sentence Task Items (Study 2)

Scrambled Sentence Task for GAD – Sample Stimuli

Domaine d'inquiétude	Phrases en désordres	Phrases après désambiguation
1. Danger physique (soi)	attaquer me probable improbable est faire	Me faire attaquer est probable / improbable
2. Danger physique (autres)	conjoint blessé sera jamais mon bientôt	Mon conjoint sera bientôt / jamais blessé
3. Health (soi)	être vont sévères mes légers symptômes	Mes symptômes vont être sévères / légers
4. Health (autres)	malade conjoint deviendra mon plus moins	Mon conjoint deviendra plus / moins malade
5. Relations amoureuses	mon déçu va ravi partenaire être	Mon partenaire va être déçu / ravi
6. Relations sociales	sociales inacceptables sont maladresses les acceptable	Les maladresses sociales sont acceptable /acceptables
7. Relations Familiales	les seront conflits réglés familiaux catastrophiques	Les conflits familiaux seront catastrophique / réglés
8.Finances	sont financiers avantageux risques les désavantageux	Les risques financiers sont avantageux / désavantageux

9. Compétence au travail	improbable faire est me congédier probable	Me faire congédier est probable / improbable
10. Performance académique	ma ira présentation orale mal bien	Ma présentation orale ira bien / mal