

Experimental Manipulation of Beliefs about Uncertainty: Effects on Interpretive
Processing and Access to Threat Schemata

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Abstract

Experimental Manipulation of Beliefs about Uncertainty: Effects on Interpretive
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Sonya Deschenes

This study investigated the influence of beliefs about uncertainty on interpretive biases and access to threat schemata. Individuals from the community and undergraduate students ($N = 74$) were randomly assigned to one of two experimental conditions: positive beliefs about uncertainty ($n = 37$) and negative beliefs about uncertainty ($n = 37$). To manipulate beliefs about uncertainty, participants watched a presentation on problem solving that contained information about either positive or negative effects of uncertainty on problem solving. To assess interpretive biases, participants completed a modified version of the Ambiguous/Unambiguous Situations Diary. Participants read potentially threatening passages and rated their level of worry. Passages were then disambiguated either positively or negatively and participants rated the likelihood and the value of these events. To assess access to threat schemata, the Catastrophizing Interview was administered, which is a structured worry task that assesses various aspects of the worry process, using the downward arrow technique. The results indicated that, relative to the positive beliefs about uncertainty group, participants in the negative beliefs about uncertainty group rated the positively disambiguated scenarios as less positive and the average likelihood of feared consequences to personal worries as more probable. This study provides support for the notion that beliefs about uncertainty may have an effect on interpretations of ambiguous situations as well as ease of access to threat schemata.

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Experimental Manipulation of Beliefs about Uncertainty: Effects on Interpretive Processing and Access to Threat Schemata

The cognitive theory of anxiety disorders proposed by Clark and Beck (2010) suggests that fundamental beliefs are instrumental to information processing and the expression of symptoms. According to the theory, anxious individuals possess sets of threat-related dysfunctional beliefs that predispose them to misinterpret their surroundings in a threatening manner, and in turn experience symptoms of anxiety. Cognitive theory can be applied to our understanding of generalized anxiety disorder (GAD), a disorder that is characterized by excessive and uncontrollable worry and anxiety (DSM-IV-TR; APA, 2000). In particular, this theory relates to a cognitive model of GAD that proposes that negative beliefs about uncertainty play a key role in the development and maintenance of worry and anxiety (Dugas, Gagnon, Ladouceur, & Freeston, 1998). This study aimed to examine whether manipulating beliefs about uncertainty would affect interpretive processing and the worry process, specifically in terms of access to threat schemata.

Negative Beliefs about Uncertainty

Intolerance of uncertainty (IU), a dispositional characteristic arising from a set of negative beliefs about uncertainty and its implications (Dugas & Robichaud, 2007), is proposed to be a cognitive vulnerability factor for excessive worry and anxiety (Dugas et al., 1998). Research examining the relationship between IU and worry in non-clinical samples has shown that IU and worry are strongly and specifically related (e.g., Buhr & Dugas, 2006; Dugas, Freeston, & Ladouceur, 1997; Dugas, Gosselin, & Ladouceur, 2001; Rassin & Muris, 2005), independently of shared associations with trait anxiety

(Khawaja & Chapman, 2007) and depression (Freeston, Rhéaume, Letarte, Dugas, & Ladouceur, 1994).

In addition, worry is more highly related to IU than to perfectionism or need for control in nonclinical samples (Buhr & Dugas, 2006). IU also seems to have a stronger association with worry than with obsessions/compulsions or panic sensations (Dugas et al., 2001). In clinical samples, individuals with GAD appear to have higher levels of IU than individuals with other anxiety disorders (Ladouceur et al., 1999). However, one study found that individuals who met diagnostic criteria for GAD or obsessive compulsive disorder (OCD) did not differ on level of IU (Holaway, Heimberg, & Coles, 2006).

Although the specificity of the relationship between IU and worry is fairly well established, the actual nature of this relationship remains unclear. That is, conclusions drawn from correlational designs are insufficient to clearly establish that IU is a cognitive vulnerability (or a causal risk factor) for excessive worry and GAD. Causal risk can be considered if it is shown that IU precedes the onset of excessive worry, and that changes in IU lead to corresponding changes in worry (see Kraemer et al., 1997, for a discussion of causal risk). Therefore, to clearly establish that IU is a cognitive vulnerability for excessive worry, research methodologies other than correlational designs must be considered.

Examining the sequence of change in IU and worry throughout the treatment of GAD provides means for assessing the causal impact of IU on worry. A cognitive-behavioural treatment for GAD that targets IU has been developed (see Dugas & Robichaud, 2007). Targeting IU throughout this treatment led to decreases in worry, and

for most participants, changes in IU preceded changes in worry (Dugas & Ladouceur, 2000), a finding that is consistent with causal risk.

Another method of assessing the possible causal impact of IU on worry is through the use of experimental manipulations. In fact, studies have shown that experimentally manipulating levels of IU does have an impact on worry. For example, one study experimentally increased or decreased IU by using a gambling procedure in a non-clinical sample (Ladouceur, Gosselin, & Dugas, 2000). The task involved playing a computerized roulette game. Participants were told that if they ended the game with a certain amount of money, a donation would be made to a (fictitious) charity. IU was increased in one group by having the experimenter inform the participants that their odds of winning were much smaller than in previous studies. In the decreased IU condition, participants were told that their odds of winning were much larger than in previous studies (the actual odds of winning were the same in both conditions). Following the manipulation, participants in the increased IU group reported more worry about the fictitious charity compared to participants in the decreased IU group. However, there were important limitations to this study. First, the authors did not assess the impact of the manipulation on mood state, which could have accounted for the differences in worry. In addition, the worry measure was directly related to the context of the manipulation, thereby limiting the generalizability of the results.

Another study examined the impact of experimentally manipulating IU on personally relevant worries (Grenier & Ladouceur, 2004). IU was manipulated with a visualization session, where participants were asked to imagine they had ingested a medication with unknown effects, and read aloud passages aimed at increasing IU (e.g.,

“uncertainty is negative”) or decreasing IU (e.g., “uncertainty is a normal part of everyday life”). The authors found that participants in the increased IU condition showed higher levels of worry compared to those in the decreased IU condition. This study, however, had a number of important limitations as well. For example, the authors did not control for baseline state anxiety, and the experimenter was aware of each participant’s group assignment.

IU was experimentally manipulated in two additional studies, however with dependent variables unrelated to GAD. In both studies, a linguistic manipulation paired with false feedback was used to induce high or low IU (Rosen & Knauper, 2009; Rosen, Knauper, & Sammut, 2007). Given that individuals are more likely to endorse statements as being “occasionally” instead of “almost always” true of themselves, the low IU group responded to questionnaire items assessing IU with the qualifier “almost always,” and the high IU group responded to questionnaire items assessing IU with the qualifier “occasionally.” To further distinguish the groups, false feedback on participants’ level of tolerance for uncertainty was provided, with participants in the high IU group receiving information about how they did not tolerate uncertainty well, and participants in the low IU group being informed that they were able to tolerate uncertainty. By modifying the qualifiers on the IU questionnaire and providing false feedback about individual IU level, it was expected that participants generated beliefs about uncertainty that were consistent with the manipulations. The results showed that experimentally increasing IU led to a greater intention to seek information (Rosen et al., 2007). This study was extended with the addition of a situational uncertainty (SU) manipulation. Participants with experimentally increased or decreased IU, following the same procedure described in

Rosen et al., 2007, where given information about a fictitious virus. SU was manipulated by the level of information provided about the contraction of the virus. The high SU group read an information sheet about the virus aimed at increasing feelings of uncertainty about having the virus, whereas the low SU group read an information sheet about the virus aimed at reducing feelings of uncertainty about having the virus. The results showed that participants in the high IU and SU groups demonstrated greater information seeking and greater levels of worry about having contracted the virus, compared to participants in the low IU and low SU groups (Rosen & Knauper, 2009).

Taken together, these findings suggest 1) that IU, and likely the underlying negative beliefs about uncertainty, can in fact be successfully manipulated experimentally, and 2) that IU can have a causal influence on worry.

Information Processing Biases

Interpretive processing and symptoms of GAD. Interpretation biases favouring threat have consistently been demonstrated in individuals high in anxiety or worry, or with GAD (e.g., Davey, Hampton, Farrell, & Davidson, 1992; Eysenck, MacLeod, & Mathews, 1987; Mogg, Baldwin, Brodrick, & Bradley, 2004). Various tasks have been used to assess interpretation biases, such as the spelling of ambiguous homophones and the interpretation of ambiguous sentences. In non-clinical samples, studies have shown that individuals high in trait anxiety are more likely to make negative interpretations of potentially threatening ambiguous homophones (e.g., die/dye, slay/sleigh, war/wore) compared to individuals low in trait anxiety. Specifically, when high trait anxious individuals are asked to listen to ambiguous homophones and write the first spelling of each word that comes to mind, they are more likely than non-anxious individuals to

endorse the threatening spelling of the homophones (Dalglish, 1994; Eysenck et al., 1987; Mogg, Bradley, Miller, & Potts, 1994). Biased interpretations of ambiguous homophones are also observed in clinical samples of individuals with GAD compared to non-anxious individuals (e.g., Mathews, Richards, & Eysenck, 1989; Mogg et al., 2004).

Higher levels of trait worry and trait anxiety have also been associated with a greater tendency to report ambiguous scenarios as concerning (e.g., “I phoned the doctor today and was surprised to hear the result of last week’s check-up”) (Davey et al., 1992). Biases have also been found in the interpretation of ambiguous sentences, with greater bias for threatening interpretations in high trait anxious individuals compared to low trait anxious individuals. For example, when participants high and low in trait anxiety are presented with potentially threatening sentences (e.g., “the strength of the punch took Alan by surprise”) followed by two sentences that differ by one word (e.g., “He had not expected the blow to have such an effect on him” versus “He had not expected the alcohol to have such an effect on him”), individuals high in trait anxiety tend to endorse the threatening interpretations of the ambiguous sentences more than do individuals low in trait anxiety (MacLeod & Cohen, 1993). This finding has been replicated in a clinical sample of individuals with GAD, compared to non-anxious individuals (Eysenck, Mogg, May, Richards, & Mathews, 1991). Taken together, these findings suggest that biases towards threatening interpretations of ambiguous stimuli are characteristic of individuals with GAD, high trait anxiety and high trait worry.

Interpretive processing and IU. Biased interpretations of ambiguous information also appear to be associated with IU. For example, individuals high in IU interpret ambiguous scenarios as more concerning than do individuals low in IU (Koerner &

Dugas, 2008). In fact, in line with Clark and Beck's (2010) cognitive theory of anxiety disorders, one of the ways in which IU is thought to lead to excessive worry is *via* biased interpretive processing (Koerner & Dugas, 2008). Given that previous findings show that biased interpretations of ambiguous situations partially mediate the relationship between IU and worry (Koerner & Dugas, 2008), it seems that interpretive biases are indeed a mechanism by which IU leads to excessive worry. However, the putative causal influence of negative beliefs about uncertainty on interpretation biases has yet to be directly examined.

Worry and Access to Threat Schemata

Worry has been characterized as a cognitive process that is made up of a chain of threat-related 'what if...?' questions (e.g., Kendall & Ingram, 1987; Vasey & Borkovec, 1992). Relatedly, threat schemata have been defined as cognitive representations that guide perceptions and judgments about the threat value of the world (Clark & Beck, 2010; Kendall & Ingram, 1987). A common method of assessing access to threat schemata is with the use of a structured worry interview (e.g., Catastrophizing Interview; Vasey & Borkovec, 1992). The interview assesses the degree to which the threat-related "what if" questioning style is accessible when discussing personally-relevant worries. Previous studies using the Catastrophizing Interview have demonstrated that individuals high in trait anxiety (e.g., Provencher, Freeston, Dugas, & Ladouceur, 2000; Vasey & Borkovec, 1992), individuals high in trait worry (Davey & Levy, 1998), and individuals who meet diagnostic criteria for GAD (Hazlett-Stevens & Craske, 2003) have more tightly structured and organized threat schemata as well as greater ease of access to threat schemata than low trait anxious individuals, low worriers, and non-clinically anxious

controls, respectively. Therefore, it appears that ease of access to threatening schemata is reliably related to non-clinical and clinical worry and anxiety.

Goals and Hypotheses

Consistent with the cognitive theory of anxiety disorders by Clark & Beck (2010), negative beliefs about uncertainty are likely to impact interpretive biases and access to worrisome threat schemata. However, the effect of directly manipulating beliefs about uncertainty on the processing of ambiguous information and the ease with which threat schemata are accessed is unknown. The first goal of this study was to examine the effects of manipulating beliefs about uncertainty on interpretations of ambiguous information. It was hypothesized that participants who received a manipulation aimed at increasing negative beliefs about uncertainty (hereafter referred to as the negative group) would demonstrate greater negative interpretations of ambiguous information compared to participants who received a manipulation aimed at increasing positive beliefs about uncertainty (hereafter referred to as the positive group). This would be evidenced by the negative group 1) reporting more worry concerning ambiguous scenarios, 2) estimating a greater probability of negative outcomes and a lower probability of positive outcomes for ambiguous scenarios, and 3) rating negative outcomes as more negative and positive outcomes as less positive.

The second goal of this study was to examine the effects of manipulating beliefs about uncertainty on the accessibility of threat schemata. It was hypothesized that participants in the negative group would demonstrate greater access to threat schemata, compared to participants in the positive group. This would be evidenced by the negative group 1) generating a more extensive chain of consequences when describing personally-

relevant worries, 2) estimating a greater likelihood of each possible consequence, and 3) producing a final consequence that is objectively more severe.

Method

Participants

Seventy-five ($N = 75$) English-speaking undergraduate students and individuals from the community were recruited for this study (50 females, 25 males). The mean age of participants was 28.69 years ($SD = 12.32$) and the range was 18 to 65 years. In addition, 46.67% ($n = 35$) of the sample had completed a university degree and 14.67% ($n = 11$) of the sample currently or had previously studied in the field of Psychology. Seventy-two percent ($n = 54$) of the sample were students at the time of the study, 18.67% ($n = 14$) were employed, and 9.33% ($n = 7$) were neither employed nor students at the time of the study. Eighty-eight percent of the sample reported being single, 5.33% ($n = 4$) reported civil union, 5.33% ($n = 4$) reported being married, and 1.33% ($n = 1$) of the sample reported being separated or divorced. Regarding ethnicity, 70.67% ($n = 53$) identified themselves as Caucasian, 9.33% ($n = 7$) as African-American or of Caribbean origin, 9.33% ($n = 7$) as Asian, 1.33% ($n = 1$) as Hispanic, 1.33% as Aboriginal, 5.33% ($n = 4$) as Multi-racial, and 2.67% ($n = 2$) as other ethnic origins. The demographic form used in the current study is presented in Appendix A.

Materials

Baseline measures. Visual Analogue Scales were used to assess state levels of anxiety, sadness, fatigue and irritability, with qualifiers at the ends of each 100-mm line (“*not at all anxious*” to “*extremely anxious*”, “*not at all sad*” to “*extremely sad*”, “*no*

fatigue” to “*extreme fatigue*” and “*not at all irritable*” to “*extremely irritable*”, respectively). The Visual Analogue Scales are presented in Appendix B.

The State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA; Ree, French, MacLeod, & Locke, 2008) is a 21-item self-report questionnaire that assesses both cognitive and somatic symptoms of anxiety, either pertaining to one’s mood at the moment (state version) or in general (trait version). For the purposes of the present study, the Trait version of the STICSA was used. This version of the STICSA asks respondents to assess how often each statement is true of them on a 4-point Likert scale ranging from 1 (*not at all*) to 4 (*very much so*). The STICSA has excellent internal consistency ($\alpha = .88$), and shows evidence of construct, convergent, and discriminant validity (Grös, Antony, Simms, & McCabe, 2007). In the current sample, internal consistency was $\alpha = .86$. The STICSA is presented in Appendix C.

The Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item questionnaire that assesses depressive symptoms over the past week. Each item includes four options, which are scored from 0-3. Higher scores indicate a greater degree of depressive symptomology. The BDI-II has excellent internal consistency ($\alpha = .92$) and test-retest reliability over a period of seven days ($r = .93$), and shows evidence of convergent and divergent validity (Beck et al., 1996). In the current sample, internal consistency was $\alpha = .86$. The BDI-II is presented in Appendix D.

Experimental Manipulation

The experimental manipulation consisted of a lecture on problem solving and uncertainty. The lecture was presented using PowerPoint® (Microsoft Corporation) software, with visual slides and audio recording, on a PC desktop computer. Throughout

the presentation, three main steps leading to effective problem solving were outlined, which are described in detail in D’Zurilla and Nezu (2007). The steps were problem identification, brainstorming possible solutions to the problem, and decision making. The experimental manipulation consisted of integrating information on the effects of uncertainty on problem solving.

Positive group. In the positive beliefs about uncertainty condition, uncertainty was presented as having a positive impact on each step of the problem-solving process. For example, participants learned that uncertainty facilitates the recognition that a problem exists (the problem can therefore be solved more quickly), that feeling uncertain helps with brainstorming multiple options, and that uncertainty leads to thoughtful and thorough decision making, with more critical thinking and attention going into each decision. The presentation concluded with the idea that individuals who accept and make use of their feelings of uncertainty in everyday situations will be effective at solving problems. The script for the positive manipulation presentation is presented in Appendix E.

Negative group. In the negative beliefs about uncertainty condition, uncertainty was presented as having a negative impact on each step of the problem-solving process. For example, participants learned that uncertainty causes individuals to misidentify problems as the negative emotion they feel towards the problem, as opposed to identifying the actual problem. They also learned that feeling uncertain interferes with attention, concentration and the ability to be creative, which are essential for effective brainstorming. Participants were also informed about two maladaptive decision making patterns that can result from uncertainty; specifically, failure to act and impulsive

decision making. The presentation concluded with the idea that individuals who reduce or eliminate the amount of uncertainty felt when faced with a problem will be effective at solving problems. The script for the negative manipulation presentation is presented in Appendix F.

Manipulation receipt and validity check. To assess comprehension of the manipulation (i.e., manipulation receipt), the PowerPoint presentation included four multiple choice questions about the information that was provided. To assess the validity of the manipulation, the degree to which participants would recommend the presentation to individuals with poor problem-solving skills was rated on a 4-point scale ranging from 1 (*I would not recommend this presentation to anyone with poor problem-solving skills*) to 4 (*I would definitely recommend this presentation to someone with poor problem-solving skills*). The validity check is presented in Appendix G.

Manipulation efficacy checks. In addition to the manipulation receipt and validity check described above, manipulation efficacy checks were also carried out. The first of these consisted of the Probabilistic Inference Task (Garety, Hemsley, & Wessely, 1991; Ladouceur, Talbot, & Dugas, 1997), where participants are presented with an opaque bag containing black and white marbles. They are informed that the bag either contains 85 black marbles and 15 white marbles, or the opposite, 85 white marbles and 15 black marbles. Participants draw marbles one by one, until they feel that the number of marbles they have drawn is sufficient to determine which bag they have; the one containing mostly black marbles or the one containing mostly white marbles. For this study, the task was repeated twice and for each trial, the contents of the bags differed. One trial consisted of mostly black marbles while the other trial consisted of mostly white marbles.

The order of the trials was counterbalanced. In a previous study using the same proportion of coloured marbles, a significant positive correlation was found between IU and the total number of marbles drawn, such that high levels of IU were associated with a larger number of marbles drawn (Ladouceur et al., 1997). It was therefore expected that relative to participants in the positive group, those in the negative group would draw more marbles before making a decision. In addition to this behavioural manipulation check, participants were also asked to rate how certain they felt that they had made the correct decision, using a 100-mm Visual Analogue Scale (“*not at all certain*” to “*extremely certain*”), after each trial. In a previous study (Talbot, Dugas, & Ladouceur, 1999), high levels of IU were associated with lower certainty regarding having made the correct decision. Therefore, it was expected that the negative group would have a lower average certainty level than the positive group. The Visual Analogue Scale for certainty is presented in Appendix H.

The final manipulation check consisted of items from the Intolerance of Uncertainty Scale (IUS; Freeston et al., 1994; English translation: Buhr & Dugas, 2002). Selected IUS items were embedded into a questionnaire containing “filler” items from the NEO Personality Inventory – Five Factor Inventory (NEO-FFI; Costa & McCrae, 1989). The IUS is a 27-item questionnaire that assesses individuals’ intolerance of uncertainty on a 5-point Likert scale, ranging from 1 (*not at all true of me*) to 5 (*very much true of me*). A two-factor structure for the IUS has been reported (Sexton & Dugas, 2009), with Factor 1 reflecting the belief that uncertainty has negative behavioural and self-referent implications (e.g., “When I am uncertain, I can’t go forward”), and Factor 2 reflecting the belief that uncertainty is unfair (e.g., “It’s unfair having no guaranties in life”) and spoils

everything (e.g., “A small unforeseen event can spoil everything even with the best planning”). The original IUS has been shown to have good internal consistency ($\alpha = .94$), test-retest reliability over a five-week period ($r = .74$), and has shown evidence of convergent and divergent validity (Buhr & Dugas, 2002). Two versions of the measure of intolerance of uncertainty were used in this study, with each version consisting of five IUS items embedded within 20 NEO-FFI items. The internal consistency for the five IUS items administered prior to the manipulation was $\alpha = .81$, and the internal consistency for the five IUS items administered following the manipulation was $\alpha = .73$.

The first of these measures was administered prior to the experimental manipulation so that initial group differences in beliefs about uncertainty could be examined. The second of these measures served as a manipulation check, and was administered following the manipulation. Each measure contained three Factor 1 items and two Factor 2 items (chosen for their high factor loadings and face validity), based on the factor analysis conducted by Sexton and Dugas (2009). The questionnaire containing the IUS and filler items administered at baseline is presented in Appendix I and the questionnaire containing the IUS and filler items administered as a manipulation check is presented in Appendix J.

Dependent Variables

The interpretation of ambiguous situations was assessed using the modified Ambiguous/Unambiguous Situations Diary (AUSD; Davey et al., 1992; Koerner & Dugas, 2008). The original version of the AUSD (Davey et al., 1992) contains positive, negative, and ambiguous scenarios. However, given that the purpose of this study was to examine the impact of beliefs about uncertainty on the interpretations of ambiguous

information, only the ambiguous scenarios from the AUSD were included (i.e., the positive and negative scenarios were omitted). The modified AUSD contains a series of 22 short scenarios, each written in the first person. Each passage describes ambiguous scenarios, where the outcome can be positive, neutral or negative (i.e., threatening). The AUSD covers 11 worry domains, with two scenarios addressing each of the following domains: work competence, academic performance, finances, personal health and the health of others, the future, self-concept, romantic relationships, friendships, relationship with parents, and danger/threat of physical harm. The AUSD task was programmed using E-Prime software (Psychology Software Tools Inc.) and was run on a PC desktop computer. For each ambiguous scenario, worry is rated on a scale from 1 (*not at all worried*) to 5 (*extremely worried*). The passages are then followed by either a neutral/positive disambiguation (hereafter referred to as positive disambiguation) or a negative disambiguation. In all, the task includes 11 positive and 11 negative disambiguations (see appendix K for examples of each type of disambiguation). The likelihood of each disambiguation is rated on a scale from 1 (*not at all probable*) to 5 (*extremely probable*), and the value of each disambiguation is rated on a scale from 1 (*not at all good or not at all bad*) to 5 (*extremely good or extremely bad*).

Access to threat schemata was assessed using the Catastrophizing Interview (Provencher et al., 2000; Vasey & Borkovec, 1992). The Catastrophizing Interview is a structured task that assesses various aspects of the fear structure, using the downward arrow technique for worry themes generated by the respondent. First, the respondent generates a list of personally-relevant worry themes. Next, a list of possible consequences for the two most severe worry themes is generated by the respondent, using the

downward arrow technique. For each theme, the examiner asks “what is it about (the worry theme) that worries you?” and this response is followed by the question “If (the worry theme) actually happened, what are you afraid would happen next?” This question is repeated until no more worry consequences can be generated by the respondent. The likelihood of each worry consequence is rated on a scale from 1 (*not at all likely*) to 100 (*extremely likely*), for both worry themes. In addition, the experimenter rates the severity of the final consequence of each worry theme using the Catastrophizing Consequence Grid (CCG; Provencher et al., 2000), which consists of an 8-point severity scale ranging from mild (e.g., interpersonal difficulties) to severe (e.g., harm to self or others). For this study, the severity of the final consequence of each worry theme was also assessed by a second rater who was blind to the condition of each participant. The CCG is presented in Appendix L.

Procedure

Participants were recruited through poster advertisements on campus (see Appendix M), web-based advertisements viewed by residents in the community and in another English-language university in the same city, and through the Participant Pool of the Department of Psychology at Concordia University. Interested participants were asked to contact the Anxiety Disorders Laboratory to assess eligibility and for scheduling. Participants were either financially compensated (\$15) for their time ($n = 73$) or received course credit through the Participant Pool ($n = 2$).

Participants were invited to take part in a testing session at the Anxiety Disorders Laboratory at Concordia University, lasting approximately 75 minutes. They were told that the aim of the study was to examine problem-solving skills and the processing of

information; they were not informed that the true nature of the study involved manipulating beliefs about uncertainty. Upon arrival to the lab, participants were asked to read and sign a consent form (see Appendix N) and complete a questionnaire package. The package included a demographic form, Visual Analogue Scales (VASs) for anxiety, sadness, fatigue and irritability, the BDI-II, the STICSA-Trait, and a questionnaire containing items from the IUS as well as filler items from the NEO-FFI. The BDI-II, the STICSA and the questionnaire containing the IUS items were administered in a counterbalanced order.

Following the completion of the questionnaires, participants watched a lecture on steps leading to effective problem solving, which contained information aimed at manipulating beliefs about uncertainty. A similar information-based paradigm was used in a previous study, and was successful at manipulating fear of anxiety in non-clinical individuals (Buhr & Dugas, 2009).

Participants were randomly assigned to one of two experimental conditions, either positive beliefs about uncertainty or negative beliefs about uncertainty. Thirty-seven (37) participants were randomly assigned to receive the positive beliefs about uncertainty manipulation and 38 participants were randomly assigned to receive the negative beliefs about uncertainty manipulation. Throughout the study, the experimenter remained blind to the condition of each participant. Specifically, the manipulation presentations were organized by participant ID number ahead of time by a research assistant on the desktop computer, on which participants viewed the presentations (the experimenter left the testing room before participants opened their file and viewed the lecture).

As mentioned above, the presentation included comprehension questions that served as the manipulation receipt check. One question was asked following each main section of the lecture (problem identification, brainstorming, and decision making), and one question was asked after the conclusion of the lecture. Participants responded to each question on an answer sheet. Following the final question of the manipulation receipt check, participants answered a manipulation validity check question, by rating the extent to which they would recommend the presentation to someone with poor problem-solving skills. Next, the three manipulation checks were administered. First, participants completed the Probabilistic Inference Task, and answered the certainty question after each trial of the task. Following this, participants completed a second set of visual analogue scales for anxiety, sadness, fatigue and irritability, to examine the impact of the manipulation on these variables. In addition, participants completed the second version of the questionnaire containing IUS items and NEO-FFI filler items.

Following the manipulation checks, participants completed the tasks assessing the study's dependent variables. To assess interpretations of ambiguous information, participants completed a modified version of the AUSD. Following the AUSD, the Catastrophizing Interview was administered to assess access to threat schemata (see descriptions of the AUSD and the Catastrophizing Interview above). Participants completed the AUSD prior to the Catastrophizing Interview to avoid any carry-over effects elicited by the discussion of personally-relevant worries.

Finally, participants were debriefed and informed of the true purpose of the study, which was to experimentally manipulate beliefs about uncertainty in order to examine its effects on the processing of ambiguous information and on the accessibility of worrisome

thoughts. Participants were asked to sign a second consent form describing the true nature of the study, and those in the negative group were given the opportunity to watch a presentation aimed at increasing positive beliefs about uncertainty. The debriefing form is presented in Appendix O. The post-study consent form for the positive group is presented in Appendix P and the post-study consent form for the negative group is presented in Appendix Q.

Results

Data Screening

Skewness and kurtosis were assessed to examine whether the data were normally distributed. All values of skew were below 3.0 and all values of kurtosis were below 10.00, suggesting the data were normally distributed (Kline, 2009). Three univariate outliers were identified; however, their presence did not affect the distribution and they were therefore included in the analyses.

Baseline Measures

To assess the equivalency of the groups at pre-manipulation, independent samples *t*-tests were performed on baseline measures of trait anxiety, depression, and intolerance of uncertainty. Means and standard deviations on the STICSA-Trait, BDI-II and intolerance of uncertainty items are presented in Table 1. No differences between the positive and the negative group were found on the STICSA-Trait, BDI-II and IUS items, suggesting that the groups were equivalent on these variables at pre-manipulation.

Next, independent samples *t*-tests were carried out to compare the groups on the variables measured by the visual analogue scales at pre- and post-manipulation. No significant between-group differences were observed prior to the manipulation or after

the manipulation on state anxiety, sadness, fatigue and irritability. Means and standard deviations are presented in Table 2.

To further examine the effect of the manipulation on state anxiety, sadness, fatigue and irritability, a 2 X 2 mixed model analysis of variance (ANOVA) for each of the four visual analogue scales was carried out, with experimental condition (positive or negative groups) as the between-subject variable and time (pre- to post-manipulation) as the within-subject variable. There were no significant group-by-time interactions for anxiety, sadness or fatigue. However, there was a significant group-by-time interaction for irritability [$F(1, 73) = 5.78, p = .019, \eta_p^2 = .073$], such that there was a greater decrease in irritability in the positive group than in the negative group. To control for this interaction, change in irritability (pre-manipulation score – post-manipulation score) was entered as a covariate for all further analyses. The assumption of homogeneity of regression slopes was not violated for any of the subsequent analyses given that the group by covariate interaction was non-significant ($F(1,70) = .049, p = \text{n.s.}$).

Manipulation Receipt and Validity Check

To examine comprehension of the manipulation presentation, the frequency of correct responses to the manipulation receipt check questions was calculated. Participants with fewer than three correct responses (less than 75% correct) were excluded from all further analyses. Only one participant had fewer than three correct responses, and was therefore removed from further analyses (in fact, this participant had no correct responses). The final sample consisted of 37 participants in the positive group and 37 participants in the negative group ($N = 74$). A Fisher's exact test revealed no significant differences between groups on the frequency of correct responses ($p = .479$), suggesting

that the type of manipulation (positive or negative) had no significant effect on the frequency of correct responses to the manipulation receipt check questions.

To control for the validity of the presentation, an independent samples t -test was carried out to examine group differences on the manipulation validity question (the degree to which participants would recommend the presentation to someone with poor problem-solving skills). As expected, there were no significant differences between groups on the degree to which participants would recommend the presentation they viewed, suggesting that the manipulation was equally valid in both conditions [$t(54) = 1.74, p = n.s.$].

Manipulation Efficacy Checks

Probabilistic Inference Task. An analysis of covariance (ANCOVA) was conducted to compare the average number of marbles drawn in each condition, with change in irritability entered as a covariate. It was expected that participants in the negative group would draw a greater number of marbles compared to participants in the positive group. Contrary to expectations, no significant between-group difference was found [$F(1, 71) < 1, p = n.s.$]. An ANCOVA was also conducted to compare the average level of certainty of having made the correct choice (rated by a 100-mm visual analogue scale) in both conditions, controlling for change in irritability. It was expected that the negative group would have a significantly lower mean certainty rating about having made the right decision, compared to the positive group; however, no significant difference between the two groups was found [$F(1, 71) < 1, p = n.s.$].

Intolerance of uncertainty. To examine the effects of the manipulation on the self-report of intolerance of uncertainty, an ANCOVA was conducted on IUS item post-

manipulation scores, controlling for change in irritability. As expected, the negative group reported a significantly higher level of intolerance of uncertainty compared to the positive group [$F(1, 71) = 4.05, p = .048, \eta_p^2 = .054$]. Means (controlling for change in irritability) and standard errors for all three manipulation checks are presented in Table 3.

Dependent Variables

Interpretations of ambiguous situations. To test the hypothesis that manipulating beliefs about uncertainty would lead to corresponding group differences in appraisals of ambiguous situations, five separate ANCOVAs, controlling for change in irritability, were carried out. The first analysis tested the hypothesis that participants in the negative group would interpret ambiguous scenarios more negatively, by reporting a significantly higher level of worry about the ambiguous passages, compared to the participants in the positive group. No significant differences between the two groups were found [$F(1, 71) < 1, p = \text{n.s.}$].

For the negatively disambiguated passages, it was expected that participants in the negative group would rate the scenarios as more likely to occur and as more negative (bad), compared to participants in the positive group. Contrary to expectations, no significant differences between experimental conditions were found for the likelihood of negative disambiguations [$F(1, 71) < 1, p = \text{n.s.}$] or the value (badness) of negative disambiguations [$F(1, 71) < 1, p = \text{n.s.}$].

For the positively disambiguated passages, it was expected that participants in the positive group would rate the scenarios as more likely to occur and more positively valenced (good), compared to participants in the negative group. Although there were no significant differences between conditions on the likelihood of positive disambiguations

[$F(1, 71) < 1, p = \text{n.s.}$], participants in the positive group rated the positive disambiguations as being more positively valenced (good) than participants in the negative group [$F(1, 71) = 5.34, p = .024, \eta_p^2 = .07$]. For each group, means (controlling for change in irritability) and standard errors for AUSD worry, likelihood of positive and negative disambiguations, and value of positive and negative disambiguations are presented in Table 4.

Access to threat schemata. To test the hypothesis that manipulating beliefs about uncertainty would lead to group differences in the access to threat schemata (greater accessibility in the negative group), three separate ANCOVAs, controlling for change in irritability, were carried out. These analyses tested the hypotheses that participants in the negative group would report a significantly greater number of catastrophizing steps, rate feared consequences as more likely to occur, and report a final feared outcome that is objectively more severe compared to the positive group. As mentioned previously, the severity of final consequences was also evaluated by a second rater, who was blind to the condition of each participant. The intraclass correlation (ICC) for the primary and secondary rating was $r = .78$. The primary rating was used in the subsequent analysis.

The ANCOVAs revealed no significant group differences on the number of catastrophizing steps [$F(1, 71) < 1, p = \text{n.s.}$] or on the severity of final steps [$F(1, 71) < 1, p = \text{n.s.}$]. However, as predicted, there was a group difference on the average likelihood of each catastrophizing step, such that the negative group rated the steps as significantly more likely than the positive group [$F(1, 71) = 5.92, p = .017, \eta_p^2 = .077$]. For each group, means (controlling for change in irritability) and standard errors for the number of

catastrophizing steps, the average likelihood of catastrophizing steps, and the average severity of final steps are presented in Table 5.

Discussion

The goal of the present study was to examine the effects of manipulating beliefs about uncertainty on interpretations of ambiguous situations and access to threat schemata. The findings provide partial support for the hypotheses. The results indicate that participants in the negative group assigned a lower positive value to the positive outcomes of ambiguous scenarios (i.e., interpretive bias) and rated the catastrophizing steps as more likely to occur (i.e., access to threat schemata), compared to participants in the positive group.

Specifically, the first hypothesis was that manipulating beliefs about uncertainty would affect interpretations of ambiguous scenarios, such that participants in the negative group would demonstrate greater negative interpretations of ambiguous information compared to participants in the positive group. We hypothesized that relative to the positive group, the negative group would 1) report more worry about ambiguous scenarios, 2) estimate a greater probability of negative disambiguations and a lower probability of positive disambiguations, and 3) rate negative disambiguations as more negative and positive disambiguations as less positive. Partial support for the first hypothesis was found. The positive and the negative groups did not differ significantly on level of worry concerning ambiguous scenarios, or on probability estimates of the positive and negative disambiguations. However, participants in the negative group assigned a lower positive value to the positive disambiguations compared to participants in the positive group. In line with Clark and Beck's (2010) cognitive theory, which

proposes that dysfunctional beliefs influence information processing, this finding suggests that beliefs about uncertainty influence the response to positive outcomes of ambiguous situations, such that individuals with negative beliefs about uncertainty interpret positive outcomes in a manner that is less positive than individuals with positive beliefs about uncertainty.

A possible explanation for this finding is that threat-related cognitive systems become activated in the presence of ambiguous situations, yet the activation is prolonged in individuals with negative beliefs about uncertainty compared to individuals with positive beliefs about uncertainty. As a result, when ambiguous situations become disambiguated, the prolonged activation of threat-related cognitive systems may guide individuals with negative beliefs about uncertainty to interpret positive outcomes in a less favourable light. This explanation is consistent with research examining interpretive processing in socially anxious individuals. When socially anxious individuals are presented with positive social scenarios, they tend to interpret these as less positive than do nonanxious individuals (Alden, Taylor, Mellings, & Laposa, 2008; Campbell et al., 2009; Lapossa, Cassin, & Rector, 2010). This increased caution likely results from the belief that positive situations can lead to negative outcomes such as increased social demands and future disappointments, thus leading socially anxious individuals to remain alert in all social situations regardless of valence (Alden et al., 2008). Similarly, individuals who believe uncertainty is negative may interpret positive outcomes to ambiguous situations with more caution than do individuals who believe uncertainty is a normal part of everyday life (e.g., "If I think the situation is no longer threatening, I am

letting my guard down”). Possible motives underlying differences in the processing of positive outcomes, however, require further exploration.

The second hypothesis of this study was that manipulating beliefs about uncertainty would have an effect on access to threat schemata, such that the negative group would 1) generate a greater number of catastrophizing steps, 2) estimate a greater average likelihood of each step, and 3) report a final step that is more objectively severe compared to the positive group. Partial support for this hypothesis was also received. Although there were no significant group differences on the number of catastrophizing steps or on the severity of the final step, there was a significant difference between conditions on the average likelihood of catastrophizing steps. Specifically, we found increased average probability estimates of catastrophizing steps in the negative group compared to the positive group. This suggests that threat schemata were more easily accessible in the negative group. This interpretation is in accordance with the availability heuristic (Tversky & Kahneman, 1974), which proposes that individuals assess the probability of an event occurring by the ease with which occurrences can be retrieved in memory. That is, events are judged as more frequent or probable when examples of the event are easier to recall or imagine. In addition, individuals who find it easier to think of reasons why an event would happen, relative to why it would not happen, judge the event as more probable (McLeod, Williams, & Bekerian, 1991). Therefore, it is possible that individuals in the negative group were able to think about potential negative consequences of their original worries with greater ease than the positive group, and this was expressed in the greater perceived likelihood of the worry consequences.

In hindsight, it is not entirely surprising that a between-group effect was not observed on the number of catastrophizing steps and objective severity ratings. Although all three variables assessed by the Catastrophizing Interview are related to threat schemata, it can be argued that likelihood ratings represent cognitive processing, whereas the number of catastrophizing steps and the severity of the final step represent the cognitive structure/organization of schemata. Given that the dependent variables were assessed shortly after the experimental manipulation, it is unlikely that new schemata structures were formed or reorganized. Although the *structure* of worry-related threat schemata is thought to be engrained in long-term memory (e.g., Butler & Mathews, 1987; Eysenck, 1984), and therefore not subject to acute changes, the *accessibility* to stored threat schemata, such as likelihood ratings of worry consequences, can arguably be increased or decreased following a manipulation.

In addition, although previous studies using the Catastrophizing Interview reported group differences in the number of catastrophizing steps (i.e., cognitive structure; Davey et al., 1992; Vasey & Borkovec, 1992) and in the objective severity of final catastrophizing step (Provencher et al., 2000), these studies compared high and low trait worriers. Group differences in schemata structure can be expected when a trait variable is examined because the difference in trait worry may inherently reflect a difference on threat schemata structure and/or process. In the present case, however, it is not surprising that between-group differences were not found on the variables reflecting cognitive structure (given the experimental nature of the study).

Manipulation checks

The conclusions drawn from this study are all the more compelling given that significant group differences were not attributable to initial differences in beliefs about uncertainty, depression, or trait anxiety, as participants did not significantly differ on any of these variables prior to the manipulation. The experimental manipulation of beliefs about uncertainty also had no effect on state anxiety, sadness or fatigue. Therefore, it is unlikely that the results were due to changes in these variables following the experimental manipulation. Finally, we can conclude that the group differences found on the perceived value of positive disambiguations and likelihood estimates of catastrophizing steps are due to differences in beliefs about uncertainty, given that participants in the negative group endorsed the belief that uncertainty is negative (assessed by the IUS items) to a significantly greater extent than did participants in the positive group.

The null findings with the probabilistic inference task are not entirely surprising given the inconsistent research findings on this task. Although a relationship was found between IU and the number of marbles drawn on the Probabilistic Inference Task in a previous study (Ladouceur et al., 1997), this finding was not replicated in another study (Talbot, Dugas, & Ladouceur, 1999). On the other hand, although a relationship between IU and level of certainty about having made the correct decision on the probabilistic inference task was found in one study (Talbot et al, 1999), this again was not found in another study (Ladouceur et al., 1997). Therefore, given the discrepant findings, it is not entirely surprising that no significant differences emerged on the Probabilistic Inference Task following the manipulation. Therefore, despite the negative findings with the Probabilistic Inference Task, it can be concluded that the manipulation was successful,

given that participants in the negative group endorsed the belief that uncertainty is negative (assessed by the IUS items) to a significantly greater extent than participants in the positive group.

Strengths and Limitations

Although encouraging findings emerged from this study, there are a number of limitations to be considered. First, there was no control for the influence of the manipulation on positive mood. If this study were to be replicated, a “well-being” visual analogue scale should be included before and after the experimental manipulation. Second, given that the study design did not include a control condition, it is not possible to know whether significant between-group differences were due to the manipulation of positive beliefs, the manipulation of negative beliefs, or both. Future studies should include a control condition, in which participants would receive information regarding the steps leading to effective problem solving, but without any information about the role of uncertainty. Third, alpha-level corrections were not applied to any of the analyses involving the dependent variables. In the end, we concluded that these corrections would have been too stringent and important information would have been lost, given the small effect sizes produced by the experimental manipulation (as well as others reported in the literature).

On the other hand, a strength of this study was the development of an experimental manipulation procedure that was (for the most part) conceptually independent from the manipulation checks and outcome variables. It bears mentioning that the conceptual independence of the manipulation also helped participants to remain unaware of the true purpose of the study while completing all of the tasks. In addition, the

IUS items used for the manipulation check were embedded in a questionnaire containing personality inventory items, making the questionnaire resemble a measure of personality. This study also addressed some of the limitations of previous studies that attempted to experimentally manipulate level of IU. For example, in the current study, the experimenter remained blind to the condition of each participant (see Grenier & Ladouceur, 2004). Moreover, the present study did not use a measure of worry that was directly related to the manipulation (see Ladouceur et al., 2000).

Conclusions

The findings from this study lend support to the notion that beliefs about uncertainty have a causal effect on interpretations of ambiguous information and access to threat schemata. This is in line with cognitive theory, which proposes that maladaptive beliefs influence both interpretive processing and the expression of symptoms. Specifically, the results of this study provide preliminary evidence that beliefs about uncertainty have a causal effect on 1) the perceived value of positive outcomes to ambiguous scenarios and 2) the perceived likelihood that catastrophic outcomes will ensue from personally-relevant worries. This study also provides evidence that beliefs about uncertainty can be altered, which has implications for the cognitive-behavioural treatment of GAD, given the extant evidence that IU and GAD symptoms are highly related (see, e.g., Dugas et al., 1998). Finally, the current study also provides support for the cognitive model proposed by Dugas and colleagues (1998), which suggests that negative beliefs about uncertainty play a causal role in the etiology of excessive and uncontrollable worry, the primary diagnostic feature of GAD.

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Table 1

Means and Standard Deviations for Baseline Measures

| Measure | Positive Beliefs about Uncertainty | | Negative Beliefs about Uncertainty | |
|--------------|------------------------------------|-----------|------------------------------------|-----------|
| | Mean | <i>SD</i> | Mean | <i>SD</i> |
| BDI-II | 5.95 | 5.54 | 8.03 | 6.53 |
| STICSA-Trait | 34.35 | 7.10 | 35.26 | 7.37 |
| IUS Items | 11.16 | 3.83 | 12.30 | 4.12 |

Note. BDI-II = Beck Depression Inventory II; STICSA-Trait = State-Trait Inventory of Cognitive and Somatic Anxiety (Trait version); IUS Items = Items from the Intolerance of Uncertainty Scale.

Table 2

Means and Standard Deviations for State Anxiety, Sadness, Fatigue, and Irritability, as Assessed by the Visual Analogue

Scales

| Mood | Positive Beliefs about Uncertainty | | Negative Beliefs about Uncertainty | |
|--------------|------------------------------------|--------------|------------------------------------|--------------|
| | Pre Mean | Post Mean | Pre Mean | Post Mean |
| Anxiety | 20.38 | 15.62 | 20.84 | 18.42 |
| Sadness | 13.73 | 7.08 | 18.63 | 10.92 |
| Fatigue | 28.43 | 21.08 | 31.21 | 23.21 |
| Irritability | 17.73 | 8.76 | 13.00 | 11.47 |

Note. Pre = measured prior to the manipulation; post = measured after the manipulation; Anxiety = state anxiety level, measured by a 100-mm Visual Analogue Scale; Sadness = state sadness level, measured by a 100-mm Visual Analogue Scale; Fatigue = state fatigue level, measured by a 100-mm Visual Analogue Scale; Irritability = state irritability level, measured by a 100-mm Visual Analogue Scale.

Table 3

Means^a and Standard Errors for Manipulation Checks

| Manipulation check | Positive Beliefs about Uncertainty | | Negative Beliefs about Uncertainty | |
|--------------------|------------------------------------|------|------------------------------------|------|
| | Mean | SE | Mean | SE |
| Marbles Drawn | 7.59 | 0.75 | 7.69 | 0.75 |
| Certainty VAS | 78.17 | 2.55 | 79.90 | 2.55 |
| IUS Items-Post | 11.41 | 0.57 | 13.05 | 0.57 |

Note. Marbles Drawn = Average number of marbles drawn over two trials, assessed by the Probabilistic Inference Task; VAS

= Visual Analogue Scale; IUS Items-Post = Items from the Intolerance of Uncertainty Scale, measured after the manipulation.

^a Adjusted for change in irritability before and after the manipulation.

Table 4

Means^a and Standard Errors for AUSD Variables

| Dependent Variable | Positive Beliefs about Uncertainty | | Negative Beliefs about Uncertainty | |
|--------------------------|------------------------------------|------|------------------------------------|------|
| | Mean | SE | Mean | SE |
| Worry | 2.43 | 0.10 | 2.42 | 0.10 |
| Positive Disambiguations | | | | |
| Likelihood | 3.13 | 0.07 | 3.19 | 0.07 |
| Value | 4.36 | 0.08 | 4.10 | 0.08 |
| Negative Disambiguations | | | | |
| Likelihood | 2.35 | 0.80 | 2.43 | 0.80 |
| Value | 3.58 | 0.12 | 3.58 | 0.12 |

Note. AUSD = Ambiguous/Unambiguous Situations Diary, ambiguous scenarios only.

^a Adjusted for change in irritability before and after the manipulation.

Table 5

Means^a and Standard Errors for the Catastrophizing Interview Variables

| Dependent Variable | Positive Beliefs about Uncertainty | | Negative Beliefs about Uncertainty | |
|------------------------|------------------------------------|------|------------------------------------|------|
| | Mean | SE | Mean | SE |
| Number of Steps | 4.61 | 0.28 | 4.54 | 0.28 |
| Perceived Likelihood | 52.34 | 2.45 | 60.91 | 2.45 |
| Severity of Final Step | 3.83 | 0.31 | 3.90 | 0.31 |

Note. Number of Steps = Average number of catastrophizing steps; Perceived Likelihood = Average perceived likelihood of catastrophizing steps, percentage; Severity of Final Step = Average severity of final catastrophizing steps, rated from 1-8.

^a Adjusted for change in irritability before and after the manipulation.

Appendix A
Demographic Form

ID **General Information****Age:** _____**Sex:** Male _____ Female _____**Education:***Highest Level Completed*

Primary school _____ CEGEP _____ Bachelor's degree _____
 Secondary school _____ Certificate _____ Master's/Doctorate _____

Field of study: Psychology _____ Other (Please specify) _____*Status:* full-time _____ part-time _____**Work:***Status:* full-time _____ part-time _____ not working _____**First Language:**

English _____ French _____ Other (please specify) _____

Race / Ethnicity: (check one)

African-American / Black / Caribbean Origin _____
 Asian-American / Asian Origin / Pacific Islander _____
 Latino-a / Hispanic _____
 American Indian / Alaska Native / Aboriginal Canadian _____
 European Origin / White _____
 Bi-racial / Multi-racial _____
 Middle Eastern _____
 Other (Please Specify) _____

Civil Status: (check one)

Single _____
 Civil Union _____
 Married _____
 Separated/Divorced _____
 Widow/Widower _____

Appendix B
Visual Analogue Scales

0  100
No fatigue Extreme fatigue

Please rate your *current* level of irritability on the scale below by marking a line between 0 (Not at all irritable) and 100 (Extremely irritable)

0  100
Not at all irritable Extremely irritable

Appendix C

State-Trait Inventory for Cognitive and Somatic Anxiety

STICSA-T

STICSA-T

Below is a list of statements which can be used to describe how people feel. Beside each statement are four numbers which indicate how often each statement is true of you (e.g. 1 = almost never, 4 = almost always). Please read each statement carefully and circle the number which best indicates how often, in general, the statement is true of you.

| <i>In general...</i> | Almost never | Occasionally | Often | Almost always |
|--|--------------|--------------|--------|---------------|
| 1. My heart beats fast | 1..... | 2..... | 3..... | 4..... |
| 2. My muscles are tense | 1..... | 2..... | 3..... | 4..... |
| 3. I feel agonised over my problems | 1..... | 2..... | 3..... | 4..... |
| 4. I think that others won't approve of me | 1..... | 2..... | 3..... | 4..... |
| 5. I feel like I'm missing out on things because I can't make up my mind soon enough | 1..... | 2..... | 3..... | 4..... |
| 6. I feel dizzy | 1..... | 2..... | 3..... | 4..... |
| 7. My muscles are weak | 1..... | 2..... | 3..... | 4..... |
| 8. I feel trembly and shaky | 1..... | 2..... | 3..... | 4..... |
| 9. I picture some future misfortune | 1..... | 2..... | 3..... | 4..... |
| 10. I can't get some thoughts out of my mind | 1..... | 2..... | 3..... | 4..... |
| 11. I have trouble remembering things | 1..... | 2..... | 3..... | 4..... |
| 12. My face feels hot | 1..... | 2..... | 3..... | 4..... |
| 13. I think the worst will happen | 1..... | 2..... | 3..... | 4..... |
| 14. My arms and legs feel stiff | 1..... | 2..... | 3..... | 4..... |
| 15. My throat feels dry | 1..... | 2..... | 3..... | 4..... |
| 16. I keep busy to avoid uncomfortable thoughts | 1..... | 2..... | 3..... | 4..... |
| 17. I can't concentrate without irrelevant thoughts intruding | 1..... | 2..... | 3..... | 4..... |
| 18. My breathing is fast and shallow | 1..... | 2..... | 3..... | 4..... |

STICSA-T

Page 2 of 2

| | Almost never | Occasionally | Often | Almost always |
|--|--------------|--------------|--------|---------------|
| 19. I worry that I cannot control my thoughts as well as I would like to | 1..... | 2..... | 3..... | 4..... |
| 20. I have butterflies in my stomach | 1..... | 2..... | 3..... | 4..... |
| 21. My palms feel clammy | 1..... | 2..... | 3..... | 4..... |

Ree, M. J., French, D., MacLeod, C., & Locke, V. (2008). Distinguishing cognitive and somatic dimensions of state and trait anxiety: Development and validation of the State-Trait Inventory for Cognitive and Somatic Anxiety. *Behavioural and Cognitive Psychotherapy*

Appendix D

Beck Depression Inventory, Second Edition

BDI-II

BDI-II

This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the one statement in each group that best describes the way you have been feeling **during the past two weeks, including today**. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for each group, including Item 16 (Changes in Sleeping Pattern) or Item 18 (Changes in Appetite).

1) Sadness

- 0 I do not feel sad.
- 1 I feel sad much of the time.
- 2 I am sad all the time.
- 3 I am so sad or unhappy that I can't stand it.

2) Pessimism

- 0 I am not discouraged about my future.
- 1 I feel more discouraged about my future than I used to be.
- 2 I do not expect things to work out for me.
- 3 I feel my future is hopeless and will only get worse.

3) Past Failure

- 0 I do not feel like a failure.
- 1 I have failed more than I should have.
- 2 As I look back, I see a lot of failures.
- 3 I feel I am a total failure as a person.

4) Loss of Pleasure

- 0 I get as much pleasure as I ever did from the things I enjoy.
- 1 I don't enjoy things as much as I used to.
- 2 I get very little pleasure from the things I used to enjoy.
- 3 I can't get any pleasure from the things I used to enjoy.

5) Guilty Feelings

- 0 I don't feel particularly guilty.
- 1 I feel guilty over many things I have done or should have done.
- 2 I feel quite guilty most of the time.
- 3 I feel guilty all of the time.

6) Punishment Feelings

- 0 I don't feel I am being punished.
- 1 I feel I may be punished.
- 2 I expect to be punished.
- 3 I feel I am being punished.

7) Self-Dislike

- 0 I feel the same about myself as ever.
- 1 I have lost confidence in myself.
- 2 I am disappointed in myself.
- 3 I dislike myself.

8) Self-Criticalness

- 0 I don't criticize or blame myself more than usual.
- 1 I am more critical of myself than I used to be.
- 2 I criticize myself for all my faults.
- 3 I blame myself for everything bad that happens.

9) Suicidal Thoughts or Wishes

- 0 I don't have any thoughts of killing myself.
- 1 I have thoughts of killing myself, but I would not carry them out.
- 2 I would like to kill myself.
- 3 I would kill myself if I had the chance.

10) Crying

- 0 I don't cry any more than I used to.
- 1 I cry more now than I used to.
- 2 I cry over every little thing.
- 3 I feel like crying but I can't.

11) Agitation

- 0 I am no more restless or wound up than usual.
- 1 I feel more restless or wound up than usual.
- 2 I am so restless or agitated that it's hard to stay still.
- 3 I am so restless or agitated that I have to keep moving or doing something.

12) Loss of Interest

- 0 I have not lost interest in people or activities.
- 1 I am less interested in other people or things than before.
- 2 I have lost most of my interest in other people or things.
- 3 It's hard to get interested in anything.

13) Indecisiveness

- 0 I make decisions about as well as ever.
- 1 I find it more difficult to make decisions than usual.
- 2 I have much greater difficulty in making decisions than I used to.
- 3 I have trouble making any decision.

14) Worthlessness

- 0 I do not feel I am worthless.
- 1 I don't consider myself as worthwhile and useful as I used to.
- 2 I feel more worthless as compared to other people.
- 3 I feel utterly worthless.

15) Loss of Energy

- 0 I have as much energy as ever.
- 1 I have less energy than I used to have.
- 2 I don't have enough energy to do very much.
- 3 I don't have enough energy to do anything.

16) Changes in Sleeping Pattern

- 0 I have not experienced any changes in my sleeping pattern.
- 1a I sleep somewhat more than usual.
- 1b I sleep somewhat less than usual.
- 2a I sleep a lot more than usual.
- 2b I sleep a lot less than usual.
- 3a I sleep most of the day.
- 3b I wake up 1-2 hours early and can't get back to sleep.

17) Irritability

- 0 I am no more irritable than usual.
- 1 I am more irritable than usual.
- 2 I am much more irritable than usual.
- 3 I am irritable all the time.

18) Changes in Appetite

- 0 I have not experienced any changes in my appetite.
- 1a My appetite is somewhat less than usual.
- 1b My appetite is somewhat greater than usual.
- 2a My appetite is much less than before.
- 2b My appetite is much greater than usual.
- 3a I have no appetite at all.
- 3b I crave food all the time.

19) Concentration Difficulty

- 0 I can concentrate as well as usual.
- 1 I can't concentrate as well as usual.
- 2 It's hard to keep my mind on anything for very long.
- 3 I find I can't concentrate on anything.

20) Tiredness or Fatigue

- 0 I am no more tired or fatigued than usual.
- 1 I get more tired or fatigued more easily than usual.
- 2 I am too tired or fatigued to do a lot of the things I used to do.
- 3 I am too tired or fatigued to do most of the things I used to do.

21) Loss of Interest in Sex

- 0 I have not noticed any recent change in my interest in sex.
- 1 I am less interested in sex than I used to be.
- 2 I am much less interested in sex now.
- 3 I have lost interest in sex completely.

Appendix E
Positive manipulation script

Problem solving is a process by which a person attempts to identify and select effective solutions for problems encountered in everyday living. Problem solving is a normal part of everyday life. Some problems are more easily solved, whereas others are more difficult to solve. Problems are often difficult to solve when there is no clear solution. An example of a problem that is relatively easy to solve is being unhappy with the colour of your walls, and needing to choose a new colour of paint. On the other hand, a more difficult problem to solve would be that you are unhappy with your job, and you need to consider a career change. What makes some problems more difficult than others is the degree of ambiguity, novelty or unpredictability that is associated with them.

A few steps can be taken to ensure effective problem solving: 1) identifying the problem, 2) brainstorming different possible solutions, and 3) deciding on a solution. Uncertainty seems to have an effect on problem solving. Uncertainty is characterized as a feeling of being unsure. This feeling is often triggered by ambiguous, novel or unpredictable situations. The role of uncertainty in problem solving will be discussed in this presentation since problem situations are often ambiguous, novel or unpredictable. Although many people think that uncertainty can interfere with problem solving, there is clear evidence that feeling uncertain is actually beneficial for each step of the problem-solving process, as you will see shortly.

The first step to problem solving is to recognize that there is a problem. A well-defined problem is one step closer to being solved. A problem occurs when there is a difference between *what is*, which is the present condition, and *what should be*, which is the desired condition. To properly identify a problem, it's important to gather relevant, factual information about the problem situation. Questions that can help to identify the

problem are: Who is involved? What happened or did not happen that bothers you? And where and when did it happen? This helps with gathering relevant information about the problem as well as understanding the nature of the problem. When a problem is well-defined, it is usually not as threatening as it first appeared when it was still undefined.

A common mistake in this step of problem solving is for people to confuse the emotions they feel when faced a problem as the problem itself.

For example, if your boss has assigned more work than you can handle, you might feel frustrated and angry. When identifying the problem, you might define it as “I’m angry with my boss”. In fact, the problem is actually that you’ve been assigned more work than you handle, and you’re not sure how to reduce your workload. Although this feeling of frustration is the likely result of the problem situation, it is not the actual problem. It is important to differentiate the actual problem from the emotional reaction to the problem for effective problem solving. As was mentioned in the introduction, uncertainty can actually help us improve our problem solving abilities. In this case, when you recognize that a problem exists, you’ll probably be in a state of uncertainty. Therefore, you can use your feelings of uncertainty to help you identify the problem situation more quickly. The faster you identify the problem the faster you can solve it!

The second step of problem solving is brainstorming possible solutions to the problem. In this step, a person needs to consider as many solutions to the problem as possible. Many people only come up with one solution and then apply it without considering other possibilities. However, it’s important to generate many possible solutions because this maximizes the likelihood that the best solution will be among them.

There are three basic principles when brainstorming possible solutions: 1) the quantity principle, 2) the deferment of judgment principle, and 3) the variety principle.

The quantity principle states that generating many possible solutions will make it more likely that the best solutions will be among them. More alternative possibilities generated will lead to more ideas of good-quality solutions. When a greater number of possible solutions are generated, it is also more likely that novel solutions will be considered, rather than relying simply on conventional and habitual solutions, or solutions which might have worked well in the past. Uncertainty is helpful in the brainstorming stage because it helps you to consider multiple options and actually come up with a greater quantity of potential solutions.

The deferment-of-judgment principle states that more good-quality solutions will be generated as a result of not judging or evaluating the solutions too early in the problem solving process. Delaying the judgment and evaluation of the possible solutions until later will improve problem solving. This is because a potential solution that might seem ridiculous at first can often be toned down into an effective one. If this ridiculous solution had been evaluated right away, it would have been dismissed immediately and the more effective solution would not have been discovered. For example, if the problem is one of time-management, hiring a personal assistant might at first seem ridiculous, because one might not have the money to do so. However, this could be toned down to the more reasonable idea of hiring kids from the neighbourhood to mow the lawn or shovel snow, or help with housekeeping, which could save a lot of time.

The variety principle indicates that the greater the range or variety of solutions generated, the more good quality ideas will be made available. Often, individuals will

produce a very narrow “set” of ideas that reflect only one strategy or general approach to the problem. For example, for a “weight” problem, solutions such as taking up jogging, swimming, or hiking are all solutions that fall within the same set: they all involve physical activity. If the potential solutions all fall within one set, there is little actual variety to choose from. At this stage of problem solving, having a broad range of solution strategies is more helpful. Varied solutions for a weight problem might include taking up jogging, changing one’s diet, and spending a weekend at a health spa. Although all these solutions address the problem, they do not reflect the same set of problem-solving options. Since there is no clear set of solutions when you feel uncertainty towards a problem, you automatically generate a greater range of possible solutions, which improves your problem-solving abilities

The third step of problem solving is making a decision. In this step, a solution is chosen. It is at this point that each possible solution is carefully evaluated, and the best one is selected. It is important to note that the decision is made by finding the *best* possible solution for the particular situation, rather than by trying to find the *perfect* solution. Aiming to be certain about every decision is unrealistic because all decisions involve some degree of uncertainty; therefore, it is much more helpful to accept and “roll with” feelings of uncertainty in the decision making stage of problem solving. An effective solution is successful in achieving the problem-solving goal, while also maximizing benefits and minimizing negative consequences. Effective decision making is therefore achieved by predicting the possible consequences to each potential solution.

There are two major things to think about when predicting consequences: 1) what is the likelihood that you will actually be able to carry out each solution? What is the

likelihood that each solution will actually help you to solve your problem? And 2) what is the value of each solution? In other words, what are the expected positive and negative consequences for each possible solution? This is done in both the short and long-term, and the consequences can be social or personal. Another thing to keep in mind is that once the thorough evaluations have been made, it's always better to move forward and attempt to solve the problem. Putting off decision making can create new problems as a result of not addressing the first one. For example, if you feel that you are given too much work and you don't talk to your boss about it, then either 1) your boss will not realize this and might give you more work because he thinks you can handle it, or 2) the workload will stay the same, and this will start affecting different parts of your life. For example, too much time spent working might damage a relationship.

Uncertainty has been mentioned in this lecture as having a positive effect on problem solving. As we have previously seen, uncertainty can be described as the feeling of being unsure about what to do when one is confronted with a novel, unpredictable or ambiguous situation. For example, if you see a friend walking down the street and you wave but your friend doesn't wave back, you may be in a state of uncertainty because the situation is ambiguous -- you don't know if your friend ignored you or just didn't see you). In the decision making stage of problem solving, uncertainty can be useful.

Research shows that uncertainty actually *improves* decision making, which is the most crucial stage of problem solving. This is because uncertainty leads to more thoughtful and thorough decision making. A common problem in the decision making stage of problem solving is that people tend to choose solutions based on habit and convention, instead of thinking critically about each option carefully. That is, they tend

to do the same things they have done in similar situations in the past to solve a problem without putting much thought into it, which may not be that effective since the problem has returned. However, in novel, unpredictable or ambiguous situations (when you're not sure what option to decide on), you'll spend more time weighing the pros and cons of each option, so more critical thinking will usually go into your decision. This means that when you feel uncertain, the best solution is more likely to be chosen for solving the problem. Therefore with uncertainty, the solution chosen is often not just based on habitual and conventional solutions, but involves a more detailed thought process that often results in the selection of more effective solutions.

Not surprisingly given what we have seen so far, research has shown that uncertainty in a problem situation actually increases problem-solving performance. This is because as uncertainty increases, your attention becomes much more focused, which results in improved performance. It allows you to pay attention to the important information and the relevant facts of each option, such as recognizing the important consequences of each, which will help in choosing the best solution. Uncertainty can also help in estimating the values and the likelihood of each alternative solution, which we have seen is an important aspect of efficient decision making.

What we have seen so far is that feelings of uncertainty when faced with a problem help to improve problem-solving skills, especially at the decision making stage. Not only does effective problem solving have immediate positive implications, for example the problem is solved, but it can also contribute to various positive health outcomes in the long term. For example, research shows that people who are effective at solving their everyday problems tend to have lower levels of chronic stress and a lower

incidence of cardiovascular disease. As you can see in the figure, poor problem-solving skills are associated with higher levels of both cardiovascular disease and chronic stress. On the other hand, strong problem-solving skills are associated with much lower levels of those health problems, compared to both poor and moderate problem-solving skills. Therefore, for many reasons, it's important to accept and "roll with" feelings of uncertainty, and to understand how these feelings can be beneficial when it comes to solving everyday problems.

To conclude, effective problem solving can be achieved by: 1) recognizing when a situation is problematic and needs to be solved, 2) generating a list of various alternative solutions, and 3) choosing the most effective solution. Individuals who are able to accept and make use of their feelings of uncertainty when faced with a problem tend to be better at identifying the problem, at generating many possible solutions, and at choosing the most promising solution. In a word, individuals who accept and roll with uncertainty are better problem solvers.

Appendix F

Negative manipulation script

Problem solving is a process by which a person attempts to identify and select effective solutions for problems encountered in everyday living. Problem solving is a normal part of everyday life. Some problems are more easily solved, whereas others are more difficult to solve. Problems are often difficult to solve when there is no clear solution. An example of a problem that is relatively easy to solve is being unhappy with the colour of your walls, and needing to choose a new colour of paint. On the other hand, a more difficult problem to solve would be that you are unhappy with your job, and you need to consider a career change. What makes some problems more difficult than others is the degree of ambiguity, novelty or unpredictability that is associated with them. Part of this presentation will focus on the effects of uncertainty on problem solving.

Uncertainty is characterized as a feeling of being unsure. This feeling is often triggered by ambiguous, novel or unpredictable situations. Problem solving is a process that involves a few steps, and as you will see shortly, uncertainty can interfere with each step. The steps to effective problem solving are 1) identifying the problem, 2) brainstorming possible solutions, and 3) deciding on a solution.

The first step to problem solving is to recognize that there is a problem. A well-defined problem is one step closer to being solved. A problem occurs when there is a difference between *what is*, which is the present condition, and *what should be*, which is the desired condition. To properly identify a problem, it's important to gather relevant, factual information about the problem situation. Questions that can help to identify the problem are: Who is involved? What happened or did not happen that bothers you? And where and when did it happen? This helps with gathering relevant information about the

problem as well as understanding the nature of the problem. When a problem is well-defined, it is usually not as threatening as it first appeared when it was still undefined.

A common mistake in this step of problem solving is for people to confuse the emotions they feel when faced a problem as the problem itself. For example, if your boss has assigned more work than you can handle, you might feel frustrated and angry. When identifying the problem, you might define it as "I'm angry with my boss". In fact, the problem is actually that you've been assigned more work than you handle, and you're not sure how to reduce your workload. Although this feeling of frustration is the likely result of the problem situation, it is not the actual problem. It is important to differentiate the actual problem from the emotional reaction to the problem for effective problem solving.

As mentioned in the introduction of this presentation, uncertainty can have a negative effect at each problem solving step, including problem identification. We've talked about the common mistake people make when they define the problem; however this mistake is even more likely to be made when the problem involves uncertainty. Research has shown that people who experience uncertainty when faced with a problem are even more likely to define the problem in terms of their emotional reactions instead of the actual problem situation. Therefore, it is important to try to eliminate uncertainty when confronted with a problem.

The second step of problem solving is brainstorming possible solutions to the problem. In this step, a person needs to consider as many solutions to the problem as possible. Many people only come up with one solution and then apply it without considering other possibilities. However, it's important to generate many possible solutions because this maximizes the likelihood that the best solution will be among

them. There are three basic principles when brainstorming possible solutions 1) the quantity principle, 2) the deferment-of-judgment principle, and 3) the variety principle.

The quantity principle states that generating many possible solutions will make it more likely that the best solutions will be among them more alternative possibilities generated will lead to more ideas of good-quality solutions. When a greater number of possible solutions are generated, it is also more likely that novel solutions will be considered, rather than relying simply on conventional and habitual solutions, or solutions which might have worked well in the past.

The deferment-of-judgment principle states that more good-quality solutions will be generated as a result of not judging or evaluating the solutions too early in the problem solving process. Delaying the judgment and evaluation of the possible solutions until later will improve problem solving. This is because a potential solution that might seem ridiculous at first can often be toned down into an effective one. If this ridiculous solution had been evaluated right away, it would have been dismissed immediately and the more effective solution would not have been discovered. For example, if the problem is one of time-management, hiring a personal assistant might at first seem ridiculous, because one might not have the money to do so. However, this could be toned down to the more reasonable idea of hiring kids from the neighbourhood to mow the lawn or shovel snow, or help with housekeeping, which could save a lot of time.

The variety principle indicates that the greater the range or variety of solutions generated, the more good quality ideas will be made available. Often, individuals will produce a very narrow “set” of ideas that reflect only one strategy or general approach to the problem. For example, for a “weight” problem, solutions such as taking up jogging,

swimming, or hiking are all solutions that fall within the same set: they all involve physical activity. If the potential solutions all fall within one set, there is little actual variety to choose from. At this stage of problem solving, having a broad range of solution strategies is more helpful. Varied solutions for a weight problem might include taking up jogging, changing one's diet, and spending a weekend at a health spa. Although all these solutions address the problem, they do not reflect the same set of problem-solving options. Just like in the problem identification stage, it is also important to eliminate uncertainty in the brainstorming stage. Many studies have shown that feeling uncertain will often interfere with attention, concentration, and general ability to be creative, which are all crucial to brainstorming. The more uncertain you feel, the more difficulty you will have concentrating on the information needed to make a decision. This restriction in attention is likely to reduce your brainstorming capabilities. As a result, you may only generate the most obvious solutions, which will significantly limit your choice. This is an important problem because, as we have seen, a broad range of solutions is necessary for good problem solving.

The third step in problem solving is making a decision. In this step, a solution is chosen. It is at this point that each possible solution is carefully evaluated, and the best one is selected. It is important to note that the decision is made by finding the *best* possible solution for the particular situation, rather than by trying to find the *perfect* solution. If any uncertainty remains about which solution is best, it is important to continue evaluating each potential solution until you feel certain that you know which one is best. Research has shown that people make better decisions when they are certain about having found the best possible solution. As will be discussed further, although it is

important to move forward and attempt to solve problems, this does not mean that you should move forward before you are certain about which is the best possible solution. An effective solution is successful in achieving the problem-solving goal, while also maximizing benefits and minimizing negative consequences. Effective decision making is therefore achieved by predicting the possible consequences to each potential solution.

There are two major things to think about when predicting consequences: 1) what is the likelihood that you will actually be able to carry out each solution? What is the likelihood that each solution will actually help you to solve your problem? And 2) what is the value of each solution? In other words, what are the expected positive and negative consequences for each possible solution? This is done in both the short and long-term, and the consequences can be social or personal. Another thing to keep in mind is that once the thorough evaluations have been made, it's always better to move forward and attempt to solve the problem. Putting off decision making can create new problems as a result of not addressing the first one. For example, if you feel that you are given too much work and you don't talk to your boss about it, then either 1) your boss will not realize this and might give you more work because he thinks you can handle it, or 2) the workload will stay the same, and this will start affecting different parts of your life. For example, too much time spent working might damage a relationship.

Uncertainty has been mentioned in this lecture as having a negative effect on problem-solving. As we have previously seen, uncertainty can be described as the feeling of being unsure about what to do when one is confronted with a novel, unpredictable or ambiguous situation. For example, if you see a friend walking down the street and you wave but your friend doesn't wave back, you may be in a state of uncertainty because the

situation is ambiguous -- you don't know if your friend ignored you or just didn't see you. In the decision making stage of problem solving, uncertainty can have its most negative effects. Research shows that uncertainty impairs decision making: There are two common maladaptive patterns in decision making that can result from uncertainty, and these are 1) failure to act or 2) impulsivity. This means that either you won't make a decision at all when one is needed, or you'll be too impulsive in your choice of solution. Failure to act can occur by either defensive avoidance or by overanalyzing every possible solution, whereas impulsivity happens with the superficial evaluation of possible solutions, such as making a choice based on habit and convention. These maladaptive patterns are discussed next.

Some people respond to uncertainty by avoiding making a decision altogether. They may procrastinate, attempt to shift decision-making responsibility to someone else, or put off making a decision altogether. For example, if you are unhappy with your current job, it might be helpful to try to find a new job that makes you happier. However, if you feel uncertain, you may just stay at the job that makes you unhappy so you can avoid making a difficult decision. Unfortunately, as we have seen, putting off decision making often makes the current problem worse, or even creates new problems.

Another response to uncertainty is wasting time considering every possibility in too much detail, which results in failure to act. Uncertainty prevents individuals from organizing their own thoughts quickly and consistently, because they tend to overanalyze every single possible solution. This causes decision making problems because having too much information can interfere with focusing on the most important issues, which is akin to not seeing the forest for the trees. This tends to make people hesitant to choose a

solution. For example, imagine that because you were unhappy at your job, you applied to different companies and ended up interviewing for three positions. After the interviews, you receive two interesting job offers. However, when you begin to analyze the positive and negative aspects of each potential job, you get so caught up in the details that you are unable to tease the two positions apart and actually make a decision. In the worst case scenario, you may take so long to reach a decision that both companies retract their job offer, having mistakenly concluded that you were not really interested. This would leave you with no job offers, and you have to stay at your current job where you are unhappy, or you would have to start the job search process all over again.

On the other hand, research has shown that when people are forced to make a decision when feeling uncertain, they often respond by searching frantically for a solution, and impulsively choosing a solution that seems to promise instant relief. This relief comes from the immediate reduction in uncertainty, regardless of the outcome (positive or negative) of the decision. Because the possible solutions are evaluated very superficially, less time is spent thinking critically about each option, which is the opposite of overanalyzing. This means that the option selected may not have been the best one. This superficial evaluation is the common response when a decision is needed, and can't be avoided. Studies show that when people make a decision based on superficial evaluation, they often choose the solution based on habit and convention instead of actually thinking about each option. Habits can be good when solutions learned in past situations can be applied successfully to similar problems. However, if the problem is novel or ambiguous, people still tend to respond automatically with previously learned solutions without questioning their appropriateness or applicability to the new

problem situation. In order to maximize effectiveness in problem solving, it is important not to rely entirely on old habits and conventions; different approaches must be considered. Unfortunately, when problem situations lead to feelings of uncertainty, most people resort to habitual and conventional solutions. Returning to the example of job interviews, you may evaluate your options superficially, by placing a higher value on the first offer you received. In other words, rather than carefully comparing both offers, you may simply say yes to the first one to decrease your feelings of uncertainty. You would do this because of the immediate relief that the solution brings (reduction in uncertainty), however you didn't carefully consider the options that would make you the happiest.

Here is a summary of what we've seen so far about the effects of uncertainty in decision making. What we have seen so far is that uncertainty impairs the use of problem-solving skills, especially at the decision making stage. In uncertainty-inducing situations, you may end up not making a decision at all, or on the contrary, responding impulsively. Either way, uncertainty has a negative impact on decision making and problem solving. For the reasons mentioned above, the best way to solve a problem is often to try to reduce or eliminate your feelings of uncertainty right from the start.

To conclude, effective problem solving can be achieved by: 1) recognizing when a situation is problematic and needs to be solved, 2) generating a list of various alternative solutions, and 3) choosing the most effective solution. People become better problem-solvers by reducing the amount of uncertainty felt when faced with a problem.

Appendix G
Manipulation Validity Check

How strongly would you recommend this presentation to people in general with poor problem-solving skills?

- a) I don't think this lecture was helpful, and I would not recommend it to anyone with poor problem-solving skills
- b) I don't think this lecture would be helpful to some people with poor problem-solving skills
- c) I think this presentation was helpful, and it might be helpful to some people with poor problem-solving skills
- d) I think this presentation was helpful, and I would definitely recommend it to someone with poor problem-solving skills

Appendix H

Visual Analogue Scale for certainty

Please rate your level of certainty about having made the correct decision on the scale below by marking a line between 0 (Not at all certain) and 100 (Extremely certain)



Appendix I

Items from the Intolerance of Uncertainty Scale and the NEO Personality Inventory –

Five

Factor Inventory, baseline measure

NEO-FFI_1

Please answer the following questions about yourself. For each of the statements, indicate the extent of your agreement by writing the appropriate number (1 to 5) next to each statement. Try not to let your response to one question influence your response to other questions.

- | 1 | 2 | 3 | 4 | 5 |
|--------------------------|-----|---|---|-------------------------|
| Not at all true of me | | True of me to some extent | | Very Much true of me |
| ___ | 1. | I'm pretty good about pacing myself so as to get things done on time. | | |
| ___ | 2. | I am not a very methodical person. | | |
| ___ | 3. | I have a clear set of goals and work toward them in an orderly fashion. | | |
| ___ | 4. | When I am uncertain, I can't go forward. | | |
| ___ | 5. | Too often, when things go wrong, I get discouraged and feel like giving up. | | |
| ___ | 6. | I would rather go my own way than be a leader of others. | | |
| ___ | 7. | I am hard-headed and tough-minded in my attitudes. | | |
| ___ | 8. | I seldom notice the moods or feelings that different environments produce. | | |
| ___ | 9. | My mind can't be relaxed if I don't know what will happen tomorrow. | | |
| ___ | 10. | I often get angry at the way people treat me. | | |
| ___ | 11. | The smallest doubt can stop me from acting. | | |
| ___ | 12. | I like to be where the action is. | | |
| ___ | 13. | I usually prefer to do things alone. | | |
| ___ | 14. | I am a productive person who always gets the job done. | | |
| ___ | 15. | I have a lot of intellectual curiosity. | | |
| ___ | 16. | Being uncertain means that I lack confidence. | | |
| ___ | 17. | If necessary, I am willing to manipulate people to get what I want. | | |
| ___ | 18. | I believe that most people will take advantage of you if you let them. | | |

- ___ 19. Unforeseen events upset me greatly.
- ___ 20. I strive for excellence in everything I do.

Appendix J

Items from the Intolerance of Uncertainty Scale and the NEO Personality Inventory –

Five

Factor Inventory, manipulation check

NEO-FFI_2

Please answer the following questions about yourself. For each of the statements, indicate the extent of your agreement by writing the appropriate number (1 to 5) next to each statement. Try not to let your response to one question influence your response to other questions.

- | 1 | 2 | 3 | 4 | 5 |
|--------------------------|-----|---|---|-------------------------|
| Not at all true of me | | True of me to some extent | | Very Much true of me |
| ___ | 1. | Once I find the right way to do something, I stick to it. | | |
| ___ | 2. | I keep my belongings clean and neat. | | |
| ___ | 3. | I try to perform all the tasks assigned to me conscientiously. | | |
| ___ | 4. | When it's time to act, uncertainty paralyzes me. | | |
| ___ | 5. | I work hard to accomplish my goals. | | |
| ___ | 6. | When I make a commitment, I can always be counted on to follow through. | | |
| ___ | 7. | I generally try to be thoughtful and considerate. | | |
| ___ | 8. | I often feel helpless and want someone else to solve my problems. | | |
| ___ | 9. | I always want to know what the future has in store for me. | | |
| ___ | 10. | I never seem to be able to get organized. | | |
| ___ | 11. | Uncertainty makes me vulnerable, unhappy, or sad. | | |
| ___ | 12. | I often enjoy playing with theories or abstract ideas. | | |
| ___ | 13. | Sometimes I'm not as dependable or reliable as I should be. | | |
| ___ | 14. | My life is fast-paced. | | |
| ___ | 15. | I waste a lot of time before settling down to work. | | |
| ___ | 16. | When I am uncertain, I can't function very well. | | |
| ___ | 17. | I don't like having to waste my time daydreaming. | | |

- ___ 18. When I'm under a great deal of stress, sometimes I feel like I'm going to pieces.
- ___ 19. I can't stand being taken by surprise.
- ___ 20. I often feel tense and jittery.

Appendix K

Example Ambiguous/Unambiguous Situations Diary items with positive and negative
disambiguations

Modified AUSD

Example of ambiguous scenario with negative disambiguation

Today, I saw my friend walking down the street with a group of peers; I waved at her, but she walked without stopping.

Please indicate the degree to which you are worried or not worried.

| Not at all worried | A little worried | Moderately worried | Very worried | Extremely worried |
|-----------------------|---------------------|-----------------------|-----------------|----------------------|
| ...1..... | 2..... | 3..... | 4..... | 5... |

How probable is it that your friend ignored you?

| Not at all probable | A little probable | Moderately probable | Very probable | Extremely probable |
|------------------------|----------------------|------------------------|------------------|-----------------------|
| ...1..... | 2..... | 3..... | 4..... | 5... |

How bad would it be for you if your friend ignored you?

| Not at all bad | A little bad | Moderately bad | Very bad | Extremely bad |
|-------------------|-----------------|-------------------|-------------|------------------|
| ...1..... | 2..... | 3..... | 4..... | 5... |

Modified AUSD

Example AUSD ambiguous scenario with positive disambiguation

I got a term paper back from my professor today and was surprised at the mark it received.

Please indicate the degree to which you are worried or not worried.

| Not at all worried | A little worried | Moderately worried | Very worried | Extremely worried |
|-----------------------|---------------------|-----------------------|-----------------|----------------------|
| ...1..... | 2..... | 3..... | 4..... | 5... |

How probable is it that the mark was better than what you expected?

| Not at all probable | A little probable | Moderately probable | Very probable | Extremely probable |
|------------------------|----------------------|------------------------|------------------|-----------------------|
| ...1..... | 2..... | 3..... | 4..... | 5... |

How good would it be for you if the mark was better what you expected?

| Not at all good | A little good | Moderately good | Very good | Extremely good |
|--------------------|------------------|--------------------|--------------|-------------------|
| ...1..... | 2..... | 3..... | 4..... | 5... |

Appendix L

Catastrophizing Consequence Severity Grid

Consequence Severity Grid

1) Symptoms or difficulties do not affect individual's functioning

a) *Emotional*: absence of positive emotion (inattention, bored, uneasiness, etc.)

b) *Interpersonal*: disagreement with someone

c) *Behavioural/Occupational*: take a little more time

d) *Others*:

e) *Society*:

2) Mild symptoms or difficulties affect some of the individual's functioning

a) *Emotional*: negative emotion (stressed, depressed, ashamed, guilty, discouraged, lonely, etc.), difficulty concentrating, anxious symptoms (palpitations, shaking, insomnia, etc.)

b) *Interpersonal*: arguments with family

c) *Behavioural/Occupational*: finish work late, unsatisfied at work, etc.

d) *Others*: my parents are unhappy

e) *Society*:

3) Moderate symptoms or difficulties affect individual's functioning with increasing intensity or frequency, but non-chronic

a) *Emotional*: panic attacks, feeling like you're nothing, wanting to be alone

b) *Interpersonal*: arguments with significant other, problems with boss or colleagues, few friends, not speaking to family, loss of friends, etc.

c) *Behavioural/Occupational*: fails a class, becomes sick

d) *Others*: hurt others, loved one falls ill

e) *Society*:

4) Serious symptoms or difficulties cause observable and persistent interference in the individual

- a) *Emotional*: Mood disorder (depression, anxiety, etc.)
- b) *Interpersonal*: separation from wife/husband, no friends
- c) *Behavioural/Occupational*: incapable of holding a job, financial difficulties, academic failure
- d) *Others*: serious illness of loved one
- e) *Society*

5) Chronic symptoms or difficulties cause marked interference in multiple aspects of individual's life

- a) *Emotional*: Suicidal ideation, non-fatal accident with severe consequences (handicap, paralysis, disfiguration)
- b) *Interpersonal*: divorce
- c) *Behavioural/Occupational*: incapable of working, no work, on welfare, serious financial problems (in debt for rest of life)
- d) *Others*: death of husband/wife
- e) *Society*

6) Extreme symptoms or difficulties cause marked interference in nearly all aspects of individual's life

- a) *Emotional*: Psychosis (become insane, etc), being a failure
- b) *Interpersonal*: no significant relationship
- c) *Behavioural/Occupational*: live in poverty, no home, become a beggar or homeless
- d) *Others*: death of child, suicide of husband/wife

e) *Society*: concentration camps

7) Catastrophic symptoms or difficulties cause harm to the individual's life without causing death

a) *Emotional*: suicidal attempt, fatal disease (AIDS, cancer, etc)

b) *Interpersonal*: none

c) *Behavioural/Occupational*: none

d) *Others*: none

e) *Society*: natural disaster, epidemic, war, etc

8) Fatal symptoms or difficulties cause immediate death of the individual or result in post-mortem consequences

a) *Emotional*: suicide, burn in hell, does not rest in peace

b) *Interpersonal*: none

c) *Behavioural/Occupational*: none

d) *Others*: none

e) *Society*: destruction of planet, nuclear war

Appendix M

Information included in posters/advertisements

Problem-solving study

Would you like to participate in a psychology study?

We are currently looking for individuals aged 18 to 65 who are fluent in English.

If you are interested and would like to participate in this research study being conducted at Concordia University, please call: 514-848-2424, ext. 2229

Participation includes a 1 ½ hour session with computer tasks, questionnaires and an interview (compensation of 15\$).

This study is funded by the Canadian Institutes of Health Research (MOP-69066).

Appendix N

Pre-study consent form

CONSENT FORM TO PARTICIPATE IN RESEARCH

This is to state that I agree to participate in a program of research being conducted by Dr. Michel Dugas of the Department of Psychology at Concordia University.

PURPOSE

I have been informed that the purpose of this research is to examine problem-solving skills and the processing of information.

PROCEDURES

You will first be asked to view a PowerPoint presentation on problem-solving, and asked to answer a few questions about the information presented. Following this, you will be asked to participate in a problem-solving task, two computer tasks, and a brief structured interview.

RISKS, SECONDARY EFFECTS AND DISADVANTAGES

It may be possible that certain measures or tasks temporarily cause slight uneasiness (possibly, by causing you to reflect on your difficulties). However, these measures and tasks have been used in previous research and discomfort is rare. If, for some reason, you should experience uneasiness or discomfort during testing, please discuss it with the experimenter.

COMPENSATION

You will receive a compensation of \$15 for your participation in this study, or two participant pool credits.

CONFIDENTIALITY

All information collected from you throughout the course of this study will remain confidential, within the limits defined by law, and you will be identified solely by a numeric code. No publication or presentation resulting from this study will contain any identifying information. However, to ensure quality control, your information may be reviewed by an individual assigned by the University Research Ethics Committee of Concordia University, as well as a representative of the funding organization (Canadian Institutes of Health Research). These organizations adhere to a very strict confidentiality policy.

RIGHTS AS A PARTICIPANT

If you accept to participate in this study, you are not giving up any of your rights or liberties to the researchers, funding organizations (Canadian Institutes of Health Research), nor are those involved released of their legal and professional responsibilities.

VOLUNTARY PARTICIPATION AND WITHDRAWAL FROM THE STUDY

Your participation in this study is voluntary. Therefore you are free to refuse to participate. You can also withdraw from the study at any moment without negative consequences (i.e. you will still be compensated for your time).

CONDITIONS OF PARTICIPATION

- I understand that I am free to withdraw my consent and discontinue my participation at anytime without negative consequences.
- I understand that my participation in this study is confidential.
- I understand that the data from this study may be published.

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY

NAME (please print) _____

SIGNATURE _____

WITNESS SIGNATURE _____

Date _____

If at any time you have questions about your rights as a research participant, please contact Adela Reid, Research Ethics and Compliance Officer, Concordia University at 514.848.2424, x. 7481 or by e-mail at Adela.Reid@Concordia.ca

Appendix O
Debriefing form

Beliefs about Uncertainty, Information Processing and Worry

The purpose of this study was to look at whether the experimental manipulation of beliefs about uncertainty would lead to differences in implicit attitudes about uncertainty, appraisals of ambiguous stimuli, and level of state worry. Group membership was randomly determined. Beliefs about uncertainty were experimentally manipulated by using the information provided in the PowerPoint presentation at the beginning of the study. The “positive beliefs about uncertainty” group received information about the positive effects uncertainty can have in problem-solving. For example, participants in this group learned that uncertainty can facilitate the proper evaluation of choices, the use of past information, and creativity. On the other hand, participants in the “negative beliefs about uncertainty” group received information about the negative effects that uncertainty can have on problem-solving. For example, participants in this group learned that uncertainty can create cognitive biases that impair the problem-solving process and lead to poor outcomes. The questions asked throughout the presentation were used to ensure that participants were attentive to the information they were given. Afterwards, the marble task was used to ensure that the manipulation was successful. This task consisted of a probabilistic inference task, which requires participants to draw marbles out of a bag until they think they know which bag they were given (either a bag with 85 black marbles and 15 white marbles, or one with 85 white marbles and 15 black marbles). Measures assessing interpretations and attitudes about ambiguous information and measures assessing worry levels were also completed. Implicit attitudes were assessed using a computer categorization task that looked at the strength of associations between certain / unknown and pleasant / unpleasant words. Interpretations were assessed using a computer task with 22 passages describing potentially threatening ambiguous situations. The passages were then disambiguated either positively or negatively, and the likelihood and cost of each scenario was rated. This task also allowed us to measure levels of worry by asking participants to rate their level of worry for each ambiguous passage. Finally, state worry was again measured by an interview. This is a structured worry task used to examine various aspects of the worry process. Current worry themes were generated, and the participants were asked “what is it about (the worry theme) that worries you?”. This was repeated until no more worry themes could be generated. After completing the study, participants whose negative beliefs about uncertainty were increased will receive information aimed to *decrease* negative beliefs about uncertainty in order to eliminate any potential negative effects. This study will expand our current knowledge and understanding of the role of explicit beliefs about uncertainty in implicit attitudes, appraisal biases, and worry.

This research is being conducted by Sonya Deschenes, under the supervision of Dr. Michel Dugas, Associate Professor in the Department of Psychology of Concordia University. If you have any questions or concerns, we can be reached at:

The Anxiety Disorders Laboratory
 Concordia University
 Department of Psychology
 L-SP-319.00

Phone: (514) 848-2424 extension 2246

E-mail: anxiety@alcor.concordia.ca

Website : <http://www-psychology.concordia.ca/fac/dugas/>

If you have any concerns/questions regarding the way in which this study was conducted or regarding the ethics of this research, please contact Adela Reid, (Adela.Reid@concordia.ca), Research Ethics and Compliance Officer at Concordia University. If you have further interest in this subject, we have provided the following references. All are available from Concordia University’s E-journals.

- Koerner, N., & Dugas, M. J. (2008). An investigation of appraisals in individuals vulnerable to excessive worry: The role of intolerance of uncertainty. *Cognitive Therapy and Research*, 32, 619-638.
- Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The Implicit Association Test. *Journal of Personality and Social Psychology*, 74, 1464-1480.

Appendix P

Post-study consent form for the positive group

CONSENT FORM TO PARTICIPATE IN RESEARCH
STUDY 1- Increase Positive beliefs About Uncertainty Condition

This is to state that I have been made aware of the true nature of this study, and that I agree to have my data included in the final sample of the study (conducted by Sonya Deschenes and Dr. Michel Dugas of the Department of Psychology at Concordia University).

A. PURPOSE

I have been informed that the true purpose of this study is to examine the impact of the manipulation of beliefs about uncertainty on interpretations of ambiguous situations and worry level.

I have been informed that the material presented to me concerning problem-solving was intended to increase my positive beliefs about uncertainty. This information is based on research in the nonclinical problem-solving and applied psychology literatures, which focuses on typical cognitive, emotional and behavioural reactions that characterize problem-solving under uncertainty. Finally, I have been told that the researchers increased my positive beliefs about uncertainty in order to determine whether intolerance of uncertainty affects interpretations of ambiguous situations and levels of worry. It was important to conceal the true purpose of the study (by claiming that the goal of the study was related to decision making) to ensure the success of the manipulation.

I have been informed that should I wish that my data not be retained for this study, I may indicate so by informing the experimenter.

C. RISKS, SECONDARY EFFECTS AND DISADVANTAGES

It may be possible that certain measures cause slight uneasiness temporarily (possibly, by causing you to reflect on your difficulties). However, these measures have been used previously many times and discomfort is rare. If you should, for some reason, experience uneasiness or discomfort during or following the study, please discuss it with the evaluator/experimenter.

D. COMPENSATION

You will receive a compensation of \$15 for your visit to the Anxiety Disorders Laboratory, or two participant pool credits.

E. CONFIDENTIALITY

All information collected from you throughout the course of this study will remain confidential, within the limits defined by law, and you will be identified solely by a numeric code. No publication or presentation resulting from this study will contain any

identifying information. However, to ensure quality control, your information may be reviewed by an individual assigned by the University Research Ethics Committee of Concordia University, as well as a representative of the funding organization (Canadian Institutes of Health Research). These organizations adhere to a very strict confidentiality policy.

F. RIGHTS AS A PARTICIPANT

If you accept to participate in this study, you are not giving up any of your rights or liberties to the researchers, funding organizations (Canadian Institutes of Health Research), nor are those involved released of their legal and professional responsibilities.

G. VOLUNTARY PARTICIPATION AND WITHDRAWAL FROM THE STUDY

Your participating in this study is voluntary. Therefore you are free to refuse to participate. You can also withdraw from the study at any moment, without having to give an explanation when you make your decision known to the evaluator/experimenter.

H. CONDITIONS OF PARTICIPATION

- I understand that I am free to withdraw my consent and discontinue my participation at anytime without negative consequences.
- I understand that my participation in this study is confidential.
- I understand that the data from this study may be published.

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY.

NAME (please print)

SIGNATURE

WITNESS SIGNATURE

Date

-

If at any time you have questions about your rights as a research participant, please contact Adela Reid, Research Ethics and Compliance Officer, Concordia University at 514.848.2424, x. 7481 or by e-mail at Adela.Reid@Concordia.ca

Appendix Q

Post-study consent form for the negative group

CONSENT FORM TO PARTICIPATE IN RESEARCH
STUDY 1- Increase negative beliefs About Uncertainty Condition

This is to state that I have been made aware of the true nature of this study, and that I agree to have my data included in the final sample of the study (conducted by Sonya Deschenes and Dr. Michel Dugas of the Department of Psychology at Concordia University).

A. PURPOSE

I have been informed that the true purpose of this study is to examine the impact of the manipulation of beliefs about uncertainty on interpretations of ambiguous situations and worry level.

I have been informed that the material presented to me concerning problem-solving was intended to increase my negative beliefs about uncertainty. This information is based on our own research on such beliefs that are endorsed by high worriers and individuals with generalized anxiety disorder. Finally, I have been told that the researchers increased my negative beliefs about uncertainty in order to determine whether intolerance of uncertainty affects interpretations of ambiguous situations and levels of worry. It was important to conceal the true purpose of the study (by claiming that the goal of the study was related to decision making) to ensure the success of the manipulation.

I have been informed that I will view a second lecture on problem-solving intended to decrease negative beliefs about uncertainty so that any negative effects resulting from the original lecture are eliminated.

I have been informed that should I wish that my data not be retained for this study, I may indicate so by informing the experimenter.

C. RISKS, SECONDARY EFFECTS AND DISADVANTAGES

It may be possible that certain measures cause slight uneasiness temporarily (possibly, by causing you to reflect on your difficulties). However, these measures have been used previously many times and discomfort is rare. If you should, for some reason, experience uneasiness or discomfort during or following the study, please discuss it with the evaluator/experimenter.

D. COMPENSATION

You will receive a compensation of \$15 for your visit to the Anxiety Disorders Laboratory, or two participant pool credits.

E. CONFIDENTIALITY

All information collected from you throughout the course of this study will remain confidential, within the limits defined by law, and you will be identified solely by a numeric code. No publication or presentation resulting from this study will contain any identifying information. However, to ensure quality control, your information may be reviewed by an individual assigned by the University Research Ethics Committee of Concordia University, as well as a representative of the funding organization (Canadian Institutes of Health Research). These organizations adhere to a very strict confidentiality policy.

F. RIGHTS AS A PARTICIPANT

If you accept to participate in this study, you are not giving up any of your rights or liberties to the researchers, funding organizations (Canadian Institutes of Health Research), nor are those involved released of their legal and professional responsibilities.

G. VOLUNTARY PARTICIPATION AND WITHDRAWAL FROM THE STUDY

Your participating in this study is voluntary. Therefore you are free to refuse to participate. You can also withdraw from the study at any moment, without having to give an explanation when you make your decision known to the evaluator/experimenter.

H. CONDITIONS OF PARTICIPATION

- I understand that I am free to withdraw my consent and discontinue my participation at anytime without negative consequences.
- I understand that my participation in this study is confidential.
- I understand that the data from this study may be published.

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. I FREELY CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY.

NAME (please print)

SIGNATURE

WITNESS SIGNATURE

Date

If at any time you have questions about your rights as a research participant, please contact Adela Reid, Research Ethics and Compliance Officer, Concordia University at 514.848.2424, x. 7481 or by e-mail at Adela.Reid@Concordia.ca