Avoidable Uncertainty: Understanding the Relationship between Anxiety and Anger

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ABSTRACT

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Heightened levels of anxiety are associated with elevated levels of anger (Moscovitch et al., 2008). Given that the relationship between anxiety and anger is not well understood, the general goal of this dissertation is to better understand this relationship. More specifically, the goal of this dissertation is to propose and test a general theory to account for the co-occurrence of these two negative emotional states. Specifically, it is proposed that heighted expectations for certainty, when violated, explain the co-occurrence of anxiety and anger. That is, when one's state of uncertainty is perceived as unavoidable, anxiety is experienced, however; when one's state of uncertainty is perceived as avoidable, anxiety and anger result. In study 1, the Violated Expectations for Certainty Diary (VEC-D) was developed to assess expectations for certainty. The VEC-D contains 18 scenarios where uncertainty is present but could be perceived as avoidable. For each scenario, participants ($N = 389$) rated the extent to which they expected to attain certainty, along with other emotional reactions. The VEC-D demonstrated good psychometric properties with excellent test-retest reliability over a 2-week period, good internal consistency, and evidence of convergent and divergent validity. Exploratory factor analysis revealed that the scenarios included in the VEC-D loaded onto two distinct but related factors: scenarios where the potential negative outcome is non-social and scenarios where the potential negative outcome is social. The goal of study 2 was to experimentally induce a state of uncertainty and then to manipulate whether that state is avoidable. To do this, all participants experienced the uncertainty induction and then were randomly assigned to the avoidable

uncertainty condition (experimental group $n = 40$) or the unavoidable uncertainty condition

(control group $n = 45$). Results showed that the uncertainty induction was successful such that

participants reported higher levels of anxiety relative to baseline. Consistent with the hypothesis,

those in the experimental group reported increases in anger following the manipulation whereas

those in the control group reported decreases in anger. Taken together these findings suggest that

when heightened expectations for certainty are violated, anger is experienced in the context of

anxiety.

on every undergraduate exam, only to discover one week later that I did quite well. His patience

throughout my undergraduate and graduate degrees is truly appreciated.

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CHAPTER 1:

INTRODUCTION

Anxiety and anger are universally experienced negative emotions that serve a functional

purpose in that they motivate behaviours that contribute to social bonding and physical survival

(Keltner, Haidt, & Shiota, 2006; Reeve, 2005). Specifically, emotions can be adaptive when they

motivate behaviours that facilitate social relationships and self-preservation. For example, anger

can motivate behaviours to repair a relationship that might be fragile as a result of some

transgression, and anxiety increases vigilance in dangerous situations where rapid adaptive

responses (i.e., fight, flight, freeze, or faint) are necessary (Bracha, 2004; Clark & Beck, 2010).

On the other hand, emotions can be maladaptive, leading to behaviours that can harm social

relationships or be self-destructive. Emotions are maladaptive when one's ability to regulate

emotional experiences is diminished. More specifically, emotions are problematic when they are

experienced in situations that do not warrant such a response, when the intensity of the emotion

exceeds what is appropriate for the situation, when the experience of the negative emotion is

prolonged and fails to diminish within an appropriate amount of time, or when the emotional

experience interferes with one's ability to respond to environmental demands (Gerin et al., 2006;

Gross & Muñoz 1995). When experienced in this maladaptive way, anger is associated with a

number of negative consequences. For example, maladaptive anger is associated with increased

risk for cardiovascular disease (Brosschot & Thayer, 1998), non-compliance with medical advice

(Dodds & Dowd, 1997), dangerous driving (Deffenbacher, 2000), and aggressive behaviour

(Anderson & Bushman, 2002). In the context of maladaptive anxiety, negative consequences

include adverse health outcomes (Tully, Cosh, & Baune, 2012), interpersonal difficulties

(Lemay, Overall, & Clark, 2012), employment problems (Harris, 1997), and an overall reduced

quality of life (Mendlowicz & Stein, 2000). Interestingly, anxiety and anger are associated such

that those who are relatively more anxious also report higher levels of anger (Hawkins & Cougle, 2011). The general goal of this dissertation is to explore the nature of the relationship between anxiety and anger, and to propose a cognitive theory that can account in part for the co-occurrence of these two emotional states.

What is Anger?

Anger is a frequently experienced emotion with self-reported estimates of anger experiences ranging from several times per week to several times per day (Averill, 1982). Considering this, most individuals have an intuitive sense of the meaning of anger. It is therefore surprising that in the scientific literature, there lacks a general consensus about how to define anger (DiGuiseppe & Tafrate, 2007; Wranik & Scherer, 2012). Although anger definitions vary among researchers, most agree on what anger is not: aggression. Specifically, anger is a subjectively unpleasant feeling, whereas aggression is an overt behaviour committed with the intent to inflict harm (DiGuiseppe & Tafrate). Aggressive actions are often, but not always, committed following angry feelings, but feelings of anger are often not associated with aggressive behaviour (Averill, 1983). Although the distinction between anger and aggression is mostly clear, the exact nature of anger is not. Spielberger (1988) defines anger as "an emotional state that comprises feelings that vary in intensity from mild annoyance and aggravation to fury and rage, and that is accompanied by arousal of the autonomic nervous system" (p. 6). The emphasis that anger can vary in intensity is an advantage of this definition; however, the use of anger synonyms (e.g., rage) in the definition is problematic. Further, this definition omits cognitive and motoric responses associated with anger. Therefore, Berkowitz (2012) defined anger as "a fairly specific syndrome (or network) of motoric, somatovisceral, and cognitive reactions produced by particular circumstances that are usually associated with an urge to hurt a

target" (p. 322). This definition includes most aspects associated with anger, but does not specify that anger varies in intensity. Importantly, both definitions fail to mention that anger is a subjectively negative feeling. Therefore, anger might be best conceptualized as a subjectively negative emotion that varies in intensity, and is accompanied by action tendencies as well as somatovisceral and cognitive reactions.

Also debated is the necessity of differentiating anger from annoyance, frustration, rage and other constructs. Some argue for separate definitions among these terms (see DiGuiseppe & Tafrate, 2007), suggesting that they should be seen as distinct but related constructs. Others (e.g., Spielberger, 1988) understand these terms to represent different intensity levels of anger, which suggests that distinct definitions are not useful or practical. To date, there is speculation about how these various constructs might lead to different outcomes (e.g., annoyance leads to withdrawal whereas anger leads to approach; Averill, 1983), but little empirical support that these constructs represent qualitatively different entities (Berkowitz & Harmon-Jones, 2004). Considering the current state of the literature, these constructs might be best understood as representing degrees of anger as outlined by Spielberger.

Determinants of Anger

Properties of the situation, type of appraisal, and perceptions of coping ability contribute to the onset and maintenance of anger episodes (Berkowitz & Harmon-Jones, 2004). Only situations that include personally relevant outcomes (e.g., threats to self-esteem) can lead to anger (Kuppens, van Mechelen, Smits, de Boeck, & Ceulemans, 2007; Lazarus, 1991; Ben-Zur & Breznitz, 1991), whereas situations that lack personal relevance generally do not produce an emotional response (Lazarus).

Properties of the situation. Situations where a personally relevant goal is obstructed or blocked can lead to anger (Berkowitz & Harmon-Jones, 2004; Ellsworth & Smith, 1988). Some theorists label goal-blocking as an appraisal associated with anger which implies that the occurrence of goal-blocking is subject to interpretation (e.g., Kuppens et al., 2007). It may be instead that it is not the occurrence of goal blocking that is subjected to interpretation, but rather the reasons for the goal-blocking. For example, if the necessary road to travel to work is closed for construction, one's goal of getting to work is blocked, which could elicit feelings of anger (Ellsworth & Smith). In this example, it is difficult to argue that the occurrence of the road closure (i.e., goal-blocking) is subject to interpretation. It would seem that the road closure is an event that occurred, and is therefore a property of the situation. Of course, in this situation, type and degree of affective response will differ among individuals, which can be explained by the reasons attributed to the occurrence of goal-blocking. For example, if the situation is appraised as unnecessary or avoidable (i.e., "The road does not require construction"), anger is likely to be elevated relative to appraisals that the event was necessary or unavoidable ("The road does need repair"; Averill, 1982; Pastore 1952). Therefore, the legitimacy and necessity of goal-blocking is an appraisal made following the occurrence of goal-blocking (Cohen, 1955; Pastore).

Legitimate vs. illegitimate goal blocking. Although the perceived legitimacy of a goal-blocking occurrence is subject to interpretation and therefore differs among individuals, experimental research has demonstrated that the occurrence of goal blocking can be manipulated to be either legitimate or illegitimate and that both produce increases in hostile behaviour. However, the magnitude of the increase in hostile behaviour is greater for illegitimate goal-blocking relative to legitimate goal-blocking (Berkowitz, 1988; Dill & Anderson, 1995). In support of this, Dill and Anderson induced anger in participants by blocking their goal of

completing a task. Specifically, the experimenter provided instructions of how to complete a

complex task at a pace that was too fast for the participant to follow. When a confederate asked

the experimenter to slow down, the experimenter explained 1) she could not because her

supervisor pressured her to finish the testing session (goal-blocking with justification), or 2) she

could not because she wanted to leave to meet her boyfriend (goal-blocking without

justification). A third condition served as a control group where the experimenter agreed to slow

down her pace. Results were that hostility ratings were highest in the unjustified condition, and

that hostility ratings in the justified condition were higher than in the control condition.

Therefore, all occurrences of goal-blocking produce anger; however anger is experienced to a

greater extent when the reason for the goal-blocking situation is perceived as unjustified. In a

similar study, Burnstein and Worchel (1962) showed that the expression of anger differs

depending on the nature of the goal-blocking situation. In this study, participants' goal of

completing a task in a group was blocked either with or without justification. Importantly, all

members of the group were instructed to contribute to the completion of the task. In the justified

condition, a confederate repeatedly interrupted the group by asking for clarification. In this

condition, the interruptions were due to the confederate's inability to hear which was made

apparent with a hearing aid. In the unjustified condition, the confederate's repeated interruptions

were not related to hearing difficulties. At the end of the experiment, participants were given the

chance to vote the confederate out of the group. In the unjustified condition, all participants

voted to exclude the confederate whereas in the justified condition, half of the participants voted

to exclude the confederate. It is unsurprising that when the confederates behaviour was uncalled

for in the unjustified condition, all participants elected to exclude, however even when the

confederate's repeated interruptions were justified and unavoidable, half of participants elected to exclude this individual from the group.

In both studies, hostile behaviour (hostility ratings and exclusion rates) were used as proxies of felt anger. Although hostile behaviour is often associated with anger, not all instances of anger result in hostile behaviour (Averill, 1982). Due to the nature of these studies, measures of state anger were not assessed following the manipulations; however, it seems likely that individuals in the unjustified conditions experienced higher levels of anger compared to those in the justified conditions. On the other hand, it is possible that both conditions resulted in similar levels of anger. To address this possibility, Krieglemeyer, Wittstadt, and Strack (2009) provided mitigating information after the occurrence of goal-blocking and found decreases in aggressive behaviour but no change in anger. That is, although participants aggressed less when a reasonable explanation for a goal-blocking event was offered, their level of anger remained unchanged. Importantly, it is possible that mitigating information provided before the onset of goal-blocking would reduce subsequent anger. Nonetheless, one important difference between justified and non-justified goal blocking in experimental studies is the willingness to let one's experience of anger known via hostile or aggressive behaviour.

It is interesting that results from the abovementioned studies emerged despite a relatively unimportant goal. That is, the goal of completing a short laboratory-based task likely lacks personal significance for participants. Conceivably, anger levels for justified goal-blocking in situations that are personally relevant would produce even higher levels of anger. In support of this, when asked about what causes their anger, individuals do cite justified/unavoidable events. In a survey about the causes of anger, 14% of anger eliciting events were categorized as justified or unavoidable (Averill, 1982). Unsurprisingly, the overwhelming majority (87%) of anger

eliciting events were categorized as unjustified or avoidable. Thus, the anger eliciting episodes that are most frequently recalled are ones where an external agent acted in an unjustified way to thwart a desired outcome. However, a noticeable minority of anger eliciting episodes are those where an external agent acted in a justified way. Although it is possible that recall of anger eliciting episodes is facilitated when it is associated with unjustified goal-blocking, it also possible that instances of unjustified goal-blocking elicit the strongest experiences of anger, and it is this heightened emotional experience that facilitates recall of the situation associated with it.

Thus far, studies manipulating the legitimacy of the goal-blocking situations have done so using a confederate. That is, a confederate obstructed a goal in a justified or unjustified way and so in call cases, an identifiable person was responsible for the negative event. It would seem that there are situations where one's obstructed goal could be perceived as being unjustified but not readily attributable to an identifiable person. For example, if one's satellite signal is lost prior to the start of a favourite television program, then one's goal of watching that television program is blocked. In the absence of any extenuating circumstances (e.g., thunderstorm) that would account for the lost satellite signal, this instance of goal blocking might be perceived as unjustified. In this case, no person is readily responsible for the negative event. It remains to be seen if similar behavioural and affective responses would emerge following goal-blocking events in the absence of an identifiable responsible individual.

Type of appraisal. In addition to the occurrence of goal-blocking and the appraisal of legitimacy, appraisals of unfairness and blame also lead to anger (Kuppens, et al., 2007; Scherer, 1997; Srivastava, Espinoza, & Fedorikhin, 1999). For example, Srivastava et al. used an ultimatum bargaining paradigm to demonstrate the relationship between unfairness and anger. Participants were paired with confederates and were informed that their 'partner' would

distribute $10 between them. The participant then chose to either accept or reject the offer. If accepted, both parties received the allotted amount, whereas neither party received any funds if the offer was rejected. In the relatively fair condition, the confederate offered the participant $4 (and kept $6) whereas in the relatively unfair condition, the confederate offered $2 (and kept $8). Results were that anger levels (and rejection rates) were higher in the unfair condition relative to the fair condition. It is noteworthy that all accepted offers resulted in the participant receiving funds regardless of the fairness of the offer, and so these results suggest that participants would rather receive no money than receive money that is unfairly distributed. Presumably, anger levels produced by the unfair offer lead to spiteful behaviour whereby the participant's desire to punish their partner was relatively more important than their desire to receive money (Pillutla & Murninghan, 1996).

Appraisals of blame or other accountability contend that an external agent is responsible for the anger inducing event (Ellis & Smith, 1988; Kuppens et al., 2007). Appraisals of blame are similar to unjustified goal blocking situations in that both contain the theme that the negative event should have been avoided. I propose that the difference between the two is that appraisals of blame necessitate that an identifiable individual is responsible, whereas for unjustified goal blocking occurrences, an identifiable person is not necessary. That is, a goal-blocking situation could be appraised as unjustified in the absence of a responsible individual as previously discussed. Nonetheless, appraisals of other accountability are important for the experience of anger considering that that when asked about causes of anger, individuals overwhelmingly cite another individual (Averill, 1982).

In addition to the appraisal that someone is to blame for the anger inducing event, attributions of hostile intent magnify the anger response such that when a provocation is

appraised as purposeful or unnecessary rather than accidental or necessary, anger levels are higher. Although as previously discussed, reductions in self-reported anger following justified goal-blocking might be better attributed to socially desirable responding rather than actual reductions in anger (Krieglmeyer et al., 2009). Importantly, the nature of the justified and unjustified goal blocking events observed in experimental research studies do not always reflect real-world goal blocking events. That is, when experimentally manipulated, goal-blocking events tend to be unambiguously justified or unjustified whereas much of the real-world situations are ambiguous. The ambiguity of whether or not the goal-blocking situation is justified allows for individual differences in interpretation. For example, another driver cutting in front of you on the road could be appraised as hostile (e.g., he cut in front of me on purpose) or benign (e.g., he cut in front of me because he did not see me). In support of this, there are individual differences in the tendency to attribute hostile intent, which contributes to pathological anger (Hazebroek, Howells, & Day 2001; Wenzel & Lystad, 2005). That is, the tendency to consistently appraise ambiguous behaviour in a hostile manner contributes to sustained anger and is a risk factor for aggressive behaviour (Dodge, 1980).

Coping ability. In the context of anger, perceptions of ability to cope include the perceived ability to address and eliminate the source of the threat (Lazarus, 1991). That is, anger is generally associated with the belief that the anger-inducing event can be overcome (DiGuiseppe & Tafrate, 2007). In support of this, anger motivates approach behaviours which can be directed towards the source of the threat (for a review, see Harmon-Jones, 2004). Further, research has shown that following provocation, participants report feeling alert, determined, and strong, all of which are associated with the inclination to approach (Harmon-Jones, Vaugh-Scott, Mohr, Sigelman, & Harmon-Jones, 2004). In addition, brain imaging studies show that when

made to feel angry, relative left hemispheric activation, an indicator of approach motivation, is observed (Harmon-Jones). This motivation to approach might be most pronounced when the necessary action to eliminate the source of the threat is made salient. In support of this, Harmon-Jones, Sigelman, Bohlig, and Harmon-Jones (2003) induced anger in participants and then manipulated whether action to address the source of anger was possible or not. Specifically, to induce anger, undergraduate participants listened to a broadcast about increases in tuition. In the action possible condition, participants were informed that the decision about whether or not tuition would increase was not finalized, and that student opposition could prevent the increase. In the action impossible condition, participants were informed that the decision to increase tuition was final, and that student protest could not prevent the increase. Both conditions lead to increases in self-report anger, however, only the action possible condition lead to increased left hemispheric activation. Although it is tempting to conclude that anger does not always motivate approach, it is plausible that anger motivates a search for approach-related behaviour(s) and that relative left hemispheric activation is only observed when an approach-related option becomes available. Finally, individuals who believe they possess effective coping skills respond with anger more readily than do individuals who perceive their coping skills as less effective (Wranik & Scherer, 2010). In sum, anger is associated with the perceived ability to cope with the source of the threat given that the motivation to approach and address the threat is often present (Harmon-Jones et al.)

Are Appraisals Necessary for Anger?

Appraisal accounts of emotion propose that appraisals are *necessary* for the experience of any given emotion (Frijda, Kuipers, & Schure, 1989; Wranik & Scherer, 2010). For example, an encounter with a perceived threat results in anger (rather than fear) as a consequence of the belief

that the threat can be overcome (DiGuiseppe & Tafrate, 2007; Lazarus, 1991). Leonard

Berkowitz has argued extensively in his cognitive-neoassociation theory that conscious

appraisals are not necessary for the experience of anger, but rather frustration is the necessary

ingredient (Berkowitz, 1989, 1990, 2012). Put simply, any event that generates physical or

psychological discomfort can lead to anger. In support of this, unpleasantly hot or cold

temperatures lead to angry feelings (Anderson & Anderson, 1998; Anderson, Deuser, & DeNeve,

1995). Further, the presence of second hand smoke during a testing session leads to more hostile

evaluations compared to evaluations made in the absence of second hand smoke (Zillman,

Baron, & Tamborini, 1981). Moreover, instructions to adopt specific postures that are associated

with anger (e.g., clenching fists) results in increased self-reported anger compared to instructions

to adopt specific postures associated with fear or sadness (Duclos et al., 1989; Niedenthal, 2007).

Emotions induced via posture manipulations emerge despite no mention of the exact emotion.

That is, participants are unaware that the purpose of adopting specific postures is to affect their

emotional states. In these studies, angry feelings were elicited by non-social causes in the

absence of cognitive appraisals of unfairness or hostile intent. Although Averill (1982) identified

that an external agent was causally related in most experiences of anger, approximately 8% of

anger episodes were attributed to non-social causes (e.g., inanimate objects). Thus, an

exclusively social account of anger is incomplete (Berkowitz, 2012). Further, Averill's study

relied solely on self-report to identify anger eliciting stimuli, and so the determinants of anger

identified by Averill are only those that participants are consciously aware of and are willing to

report. An abundance of evidence supports the notion that individuals are not always aware of

what causes their emotional state (Nisbett, & Wilson, 1977). For example, following

provocation, individuals who consumed a pill they believed produced arousal were less likely to

be aggressive than individuals who consumed a pill they believed produced relaxation. A likely explanation for this finding is that for those who consumed the arousal pill, any arousal experienced following provocation by an experimenter could be misattributed to the pill, whereas for those who consumed the relaxation pill, arousal could only be attributed to the provocation. If one believes that their arousal is caused by a pill rather than a person, then aggressive behaviour towards that person would be less likely. Of course, the pill was identical in both conditions (as was the provocation). Therefore, it appears that individuals are not always able to accurately identify the source of the arousal (Younger & Doob, 1978); consequently, self-reports of the elicitors of anger will necessarily be incomplete. Taken together, it appears that conscious appraisals of wrongdoing are sufficient but not necessary for the onset of anger. Rather, conscious appraisals likely contribute to the experience of anger by increasing the intensity of anger (Berkowitz & Harmon-Jones, 2004).

Although conscious appraisals are not necessary for the experience of everyday anger, they appear to be characteristic of pathological anger (Owen, 2011; Wenzel & Lystad, 2005), and are targeted in treatments for anger-related problems. For example, Hawkins and Cougle (2013) showed that individuals can be trained to interpret ambiguous behaviour in a less hostile way, which leads to reductions in self-reported anger following a provocation. Further, cognitive-behavioural treatments are effective at reducing feelings of anger, particularly when attributional training is present and cognitive distortions are addressed (Sukhodolsky, Kassinove, & Gorman, 2004). Therefore, an appraisal based account of emotions is valuable in the context of pathological anger.

Violated Expectations

Taken together, the various elicitors of anger (goal blocking, conscious appraisals (unfairness, blame), and frustration) can all be described as violated expectations. Specifically, the occurrence of goal-blocking can be re-formulated as an expectation of goal attainment which has been violated. Appraisals of unfairness or blame can be described as violations of expectations for fairness. Frustration can be re-worded as violated expectations for physical or psychological comfort (Berkowitz, 2012). Expectations extend to other themes not explicitly mentioned. For example, angry feelings emerge when asked to read short descriptions about a rapist released on parole, which violates one's expectations for justice (Barrazone & Davey, 2009). Therefore, understanding anger as being the result of violated expectations can potentially provide a useful account of the experience of anger.

What is Anxiety?

Similar to anger, anxiety is a frequently experienced emotion (Barlow, 2002). Symptoms of anxiety are particularly elevated in the general population following a traumatic event such as the terrorist attacks on September 11th 2001 (Rasinski, Berktold, Smith, & Albertson, 2002). Further, as a group, anxiety disorders are the most prevalent class of mental health disorders (Kessler et al., 2005). Anxiety is composed of cognitive (e.g., inability to concentrate) and somatic (e.g., accelerated heart beat) characteristics (Ree, French, Macleod & Locke, 2008) and can be defined as a future-oriented negative affective state centered on the possibility of a negative outcome with accompanying physiological activation (Barlow).

Determinants of Anxiety: Uncertainty

Situations with an uncertain, potentially negative outcome evoke an anxious response (Clark & Beck, 2010). Unsurprisingly, ambiguous situations lead to anxious feelings only when the situation is personally relevant or important, and consequently, ambiguous situations lacking

personal relevance will result in minimal to no emotional response (Clark & Beck; Lazarus, 1991). Experimental studies provide support for the association between uncertainty and anxiety given that most anxiety induction paradigms contain an element of uncertainty. For example, requiring participants to deliver a speech evokes a state of anxiety which can be amplified by the presence of an audience (Mauss, Wilhelm, & Gross, 2004). Importantly, the increase in self-reported anxiety is observed prior to the speech suggesting that it is the possibility that the event will be negative (i.e., that one will be negatively evaluated) that accounts for this effect. In other words, anxiety is observed in individuals who feel uncertain about an upcoming personally relevant event that contains the possibility of threat (Clark & Beck). Of course, the intensity of the anxious response and the degree of uncertainty necessary to produce an anxious response varies among individuals.

      Intolerance of Uncertainty. Most individuals experience anxiety when the potential for threat is considerably elevated; however, a minority of individuals experience anxiety even when the potential for threat is negligible, and consequently feel anxious most of the time (Dugas & Robichaud, 2007). One reason why some individuals feel anxious, even when the potential for threat is negligible, is that they have difficulty tolerating a state of uncertainty; in other words, they are intolerant of uncertainty (IU). IU has been defined as "a dispositional characteristic resulting from negative beliefs about uncertainty and its implications" (Dugas & Robichaud, p. 24) and has received empirical support as a construct that characterizes individuals with elevated levels of trait anxiety and generalized anxiety disorder (GAD) in particular (e.g., Boswell, Thompson-Hollands, Farchione, & Barlow, 2013; Dugas, Marchand, & Ladouceur, 2005). For those with high levels of IU, even a small potential for threat is unbearable. For these individuals, a state of absolute certainty seems to be necessary to avoid feelings of anxiety. Of

course, absolute certainty is usually not possible, and so learning to tolerate feelings of uncertainty is necessary to alleviate anxiety (Dugas & Robichaud). In support of this, Dugas et al. developed a cognitive behavioural treatment for GAD which specifically aims to reduce one's negative beliefs about uncertainty and to increase tolerance for uncertainty. Multiple randomized controlled trials show that this treatment is effective such that approximately 70% of individuals no longer meet diagnostic criteria for GAD by posttreatment (Dugas et al., 2003; Dugas et al., 2010; Gosselin, Ladouceur, Morin, Dugas, & Baillargeron, 2006; Ladouceur et al., 2000). Given its explicit focus on increasing tolerance of uncertainty, it is not surprising that the treatment leads to a significant improvement in IU levels from pre to posttreatment (Dugas et al., 2003).

IU is typically assessed with the either the 27-item or 12-item Intolerance of Uncertainty Scale (IUS; Buhr & Dugas, 2002; Carleton, Norton, & Asmundson, 2007), which is comprised of two distinct yet related factors. Sexton and Dugas (2009) argue that the first factor represents the belief that uncertainty has negative self-referent and behavioural implications (IUS-NI) with items such as "When it's time to act, uncertainty paralyses me", and that the second factor represents the belief that uncertainty is unfair and spoils everything (IUS-US) with items such as "One should always look ahead so as to avoid surprises". Birrell, Meares, Wilkinson, and Freeston (2011) describe the two factors as representing the typical responses when in an uncertain state, with the first response style representing approach related responses, and the second factor representing avoidant related responses. Although more research is required to pinpoint the exact nature of these two factors, the descriptions put forth by Sexton and Dugas are more consistent with the definition of IU as a characteristic that results from a set of negative beliefs (not responses), and therefore will be used throughout this dissertation.

These two distinct negative beliefs about uncertainty are relevant given their divergent associations with anger-related constructs. For example, the belief that uncertainty is unfair partially explains the association between symptoms of GAD and hostility (Fracalanza, Koerner, Deschênes, & Dugas, 2014). In addition, induced state anger results in increases in the belief that uncertainty is unfair, but not in the belief that uncertainty has negative implications (Deschênes, Dugas, Anderson, & Gouin, 2014). Given these findings, it is important to examine distinct negative beliefs about uncertainty as they relate to anger constructs.

Negative Affect

The ease with which anxiety, anger, sadness and other negative emotions are experienced can be described as one's propensity for negative affect (Watson & Clark, 1992; Watson, Clark, & Tellegen, 1988). That is, individuals with higher levels of trait negative affect are vulnerable to experience specific negative emotions at a higher frequency and intensity (Watson et al.). In support of this, there is considerable overlap among anger, anxiety, and sadness suggesting that they are indeed lower order constructs of negative affect. For example, Watson and Clark found that correlations among anger, depression, and anxiety measures were all significant and moderate in strength. Further, negative mood induction experiments, while successful at increasing the target emotion; can also affect other negative emotions (Lobbestael, Arntz, & Weirs, 2008) suggesting that it is difficult to affect one negative emotion in isolation. For example, Engebretson, Sirota, Niaura, Edwards, and Brown (1999) noted that in addition to large increases in self-reported anger, their anger induction procedure produced small but significant increases in anxiety and sadness. Further, major depressive disorder is the most frequent comorbid condition for individuals suffering from an anxiety disorder (McEvoy, Grove, & Slade,

2011; Mineka, Watson, & Clark, 1998), which can be explained, in part, by a general propensity for negative affect.

Despite the overlap and similarities among specific negative emotions, there is an abundance of evidence to suggest that they are indeed distinct and there is utility in understanding their differences. For example, depression and anxiety can be distinguished by their associations with positive affect and arousal. Unlike anxiety, depression is characterized by low levels of positive affect, whereas compared to depression; anxiety is characterized by heightened arousal (Watson et al., 1995; Watson, Clark, & Staski, 2011). Motivational tendencies also differ among the negative emotions. Although most negative emotions are associated with the motivation to withdraw, anger is associated with the motivation to approach (Carver & Harmon-Jones, 2009; Harmon-Jones, 2004). Compared to the relative left hemispheric activation observed during episodes of anger, induced sadness results in relative right hemispheric activation, an indicator of withdrawal motivation (Harmon-Jones). Interestingly, anger motivates approach behaviours to the extent that such behaviours are aggressive or dominant in nature. When manipulated so that the dominant /aggressive response is avoidant rather than approach-related, an association between anger and avoidance is observed (Bossuyt, Moors, & De Houwer, 2014). Physiological activity differs depending on the emotional state such that compared to a state of sadness, a state of anger is associated with increased sympathetic activity (Marci, Glick, Loh, & Dougherty, 2007). Finally, behavioural outcomes differ as a function of the emotional state such that when sad, high risk/high reward options are favoured whereas low risk/low reward options are favoured when angry (Raghunathan & Pham, 1999). The above-mentioned findings are merely a sample of the large body of literature demonstrating

appreciable differences among the negative emotions. Therefore, it remains critical to investigate distinct emotional states while acknowledging their shared associations with negative affect.

Anxiety and Other Emotions

Despite a relative lack of research into the nature of the association between anxiety and anger, some studies have examined the associations among anxiety and emotions more broadly. For example, the comorbidity between depressive and anxious affect has received much research attention (e.g., McEvoy et al., 2011). In addition to demonstrating the existence of an association between anxiety and depression, a number of studies have examined the nature of this association. One explanation as to why these two negative emotional states co-occur relates to the perseverative negative thinking that characterizes both emotional states (Fresco, Frankel, Mennin, Turk, & Heimberg, 2002). In the case of anxiety, worry (a chain of 'what if" questions about a possible negative future outcome) is the central cognition, whereas for depression, rumination (a focus on depressive symptoms and their implications) is the central cognition. Worry and rumination are similar in that they are both examples of repetitive negative thinking that can be difficult to control (Brosschot, Gerin, & Thayer, 2006). One of the main differences between worry and rumination is that the content of worry is future-oriented whereas the content of rumination is past-oriented (Watkins, Moulds, & Mackintosh, 2005). Therefore, similar repetitive negative thinking styles might partly account for the association between depressive and anxious affect (Fresco et al.). Possibly, the debilitating and exhausting nature of continuous anxious affect leads to depressive affect. In support of this, anxiety tends to precede depression suggesting that anxiety may play a causal role in some forms of depression (Cole, Peeke, Martin, Truglio, & Seroczynski, 1998; Wetherell, Gatz, & Pedersen, 2001). Further, interventions for anxiety in youth have been shown to prevent the onset of depressive symptoms (Sutton, 2007).

Mennin et al. argue that the high comorbidity rates among the anxiety and depressive disorders is at least in part due to deficits in emotion regulation abilities, and that these deficits would also explain higher levels of other negative emotions such as anger (Mennin, Holaway, Fresco, Moore, & Heimberg, 2007). In support of this, anxiety is associated with heightened intensity of emotions, poor understanding of emotions, negative reactivity to emotions, and maladaptive management of emotions (Mennin et al.).

Although the association between anger and anxiety might be in part due to deficits in emotion regulation abilities, and shared association with negative affect, other factors might also contribute to the observed association. For example, Deschênes et al. (2014) found that induced state anger led to increases in cognitions associated with anxiety. Therefore, it is possible that shared cognitive processes, in addition to emotion regulation deficits and negative affect, explain the association between anxiety and anger. Following this logic, it stands to reason that other cognitions, notably appraisals or expectations about the emotion-eliciting situation, might also help to explain the association. This possibility has yet to be explored.

Explaining the Co-occurrence of Anxiety and Anger

Specific violated expectations might help to explain for the co-occurrence of anger and anxiety. That is, individuals may have expectations for certainty that, when violated, lead to both anger and anxiety. Although some states of uncertainty are **un**avoidable, it seems that other states of uncertainty are avoidable. That is, one might believe that information is available that would alleviate ones' state of uncertainty which would reduce or eliminate anxious feelings. For example, having tests done at the doctor's office can induce a state of uncertainty (the test results *could* be negative). Waiting to receive those test results prolongs the state of uncertainty, which if intolerable, is accompanied by anxiety. In this scenario, a receptionist would eventually call to

announce that the test results are available. If (positive) test results are disclosed immediately, anxiety would likely dissipate as the individual is no longer in a state of uncertainty about the nature of the results. However, if the test results are known but are not disclosed, anger and anxiety might result due to an unnecessary continued state of uncertainty. The notion that individuals might expect certainty in situations where certainty is perceived as attainable is novel and to our knowledge, not yet explored as a mechanism that might account for the co-occurrence of anger and anxiety.

The model depicting the proposed sequence of events is shown in Figure 1. The model is divided into two parts. The first part includes the solid boxes and solid connecting lines. This first part has received considerable research support which is described in more detail below. The novel part of the model includes the dotted boxes and connecting lines and depicts the proposed associations among expectations for certainty, appraisals of avoidability, anger, and anxiety.

In the top right, the sequence of events starts with an ambiguous situation[1], which would induce a state of uncertainty (e.g., Davey, Hampton, Farrell, & Davidson,1992). That uncertain state is then interpreted in a benign or negative way. If the interpretation is benign, then emotional responding is unlikely. For example, if one's state of uncertainty is appraised as negligible, or if the state of uncertainty is related to an event that lacks personal relevance (e.g., not knowing the status of an injured hockey player for a non-hockey fan), then any emotional response is likely to be minimal. In contrast, a negative interpretation of uncertainty leads to anxiety (e.g., Mathews & Mackintosh, 2000). Specifically, if the state of uncertainty is related to an event that is personally relevant (e.g., not knowing the results of a loved one's MRI scan), or

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[1] It is acknowledged that in addition to ambiguous situations, unpredictable and/or novel situations could also start the sequence of events.

if the state of uncertainty is perceived as unmanageable, then emotional responding (i.e., anxiety) is expected.

In the event that the state of uncertainty is interpreted negatively and anxiety is experienced, it is proposed that another interpretation is made. Specifically, the extent to which the state of uncertainty is avoidable is evaluated, such that one's state of uncertainty can be appraised along a continuum from completely avoidable to completely unavoidable. In other words, individuals might evaluate whether their state of uncertainty could have been prevented or resolved. If the state of uncertainty is perceived as unavoidable, then emotional responding is not expected to change and anxiety will persist; however, if the state of uncertainty is perceived as avoidable, then anger along with anxiety are proposed to result. In other words, if an individual perceives that their state of uncertainty is unnecessary such that certainty is possible, then anger will be experienced[2]. One reason to expect that appraisals of avoidability might occur when in an uncertain state relates to findings that a state of uncertainty increases the need for fairness (van den Boss, 2001). In a series of experiments, participants were either made to feel uncertain or experienced a control condition, and then either received or did not receive an opportunity to express their opinion about an upcoming decision (individuals perceive situations as being fairer when given the opportunity to express their opinion). Results showed that negative affect was highest when participants were made to feel uncertain and did not receive the opportunity to express their opinion. That is, the effect of procedural unfairness on negative affect is pronounced when participants are made to feel uncertain (van den Bos), and so individuals' need for fairness is elevated when in an uncertain state (Diekmann, Barsness, &

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[2] For now, it is proposed that this appraisal occurs following the onset of anxiety. However, it is possible that this appraisal precedes the onset of anxiety. Future research is needed to address this issue.

Sondak, 2004). If avoidable uncertainty is perceived as unfair, then appraisals about the avoidability of the uncertain state might also be primed.

Also depicted in Figure 1 is the relation between high IU and negative interpretations of uncertainty. Individuals who are relatively intolerant of uncertainty are more likely to appraise all aspects of the uncertain situation negatively. That is, a negative appraisal of the situation is likely (e.g., the test result will be bad) and increased difficulty tolerating the state of uncertainty is common (Koerner & Dugas, 2008; Sexton & Dugas, 2009). Therefore, for these individuals, benign interpretations of uncertainty are rare. In addition to its association with negative interpretations of uncertainty, it is proposed that high IU is associated with higher expectations for certainty. That is, when faced with a situation that induces an uncertain state, individuals high in IU might also expect to attain a state of certainty to a greater degree than individuals low in IU. For example, if a receptionist phones to announce that important test results are available, but does not disclose the outcome of those results, expectations for certainty might manifest with statements such as "The receptionist should inform me of the results immediately" and an absence of statements such as "I'd like to know the results, but I understand that the receptionist cannot inform me about the results". Therefore, elevated expectations for certainty are expressed with more statements reflecting the belief that the state of uncertainty is avoidable. Further, the relationship between IU and elevated expectations for certainty is expected to be somewhat specific such that the belief that uncertainty is unfair would be more strongly associated with higher expectations for certainty than would the belief that uncertainty has negative implications. This expectation is based on findings that the belief that uncertainty is unfair is closely associated with anger-related constructs (Deschênes et al., 2014; Fracalanza et al., 2014).

Goals and Hypotheses

The overall goal of this dissertation is to explore whether violated expectations for certainty help to explain the co-occurrence of anger and anxiety. This goal is addressed with two studies. In the first study, a questionnaire that assesses expectations for certainty was developed. It was anticipated that this measure would demonstrate evidence of internal consistency and reliability and would correlate with measures of IU, anxiety, anger and related constructs (e.g., perfectionism). As seen in Figure 1, the relationship between elevated expectations for certainty was anticipated to be rather specific to the belief that uncertainty is unfair relative to the belief that uncertainty has negative implications. Further, evidence of divergent validity was expected as scores from this questionnaire were predicted to inversely correlate with measures of perspective taking, agreeableness, and openness to experience. The goal of second study was to induce a state of uncertainty and then to manipulate whether that state is avoidable (experimental group) or unavoidable (control group). Specific hypotheses related to the second study were 1) the uncertainty induction would lead to increases in anxiety, and 2) that relative to the control group, the experimental group would report increases in anger following the manipulation. No group differences in anxiety following the manipulation were expected.
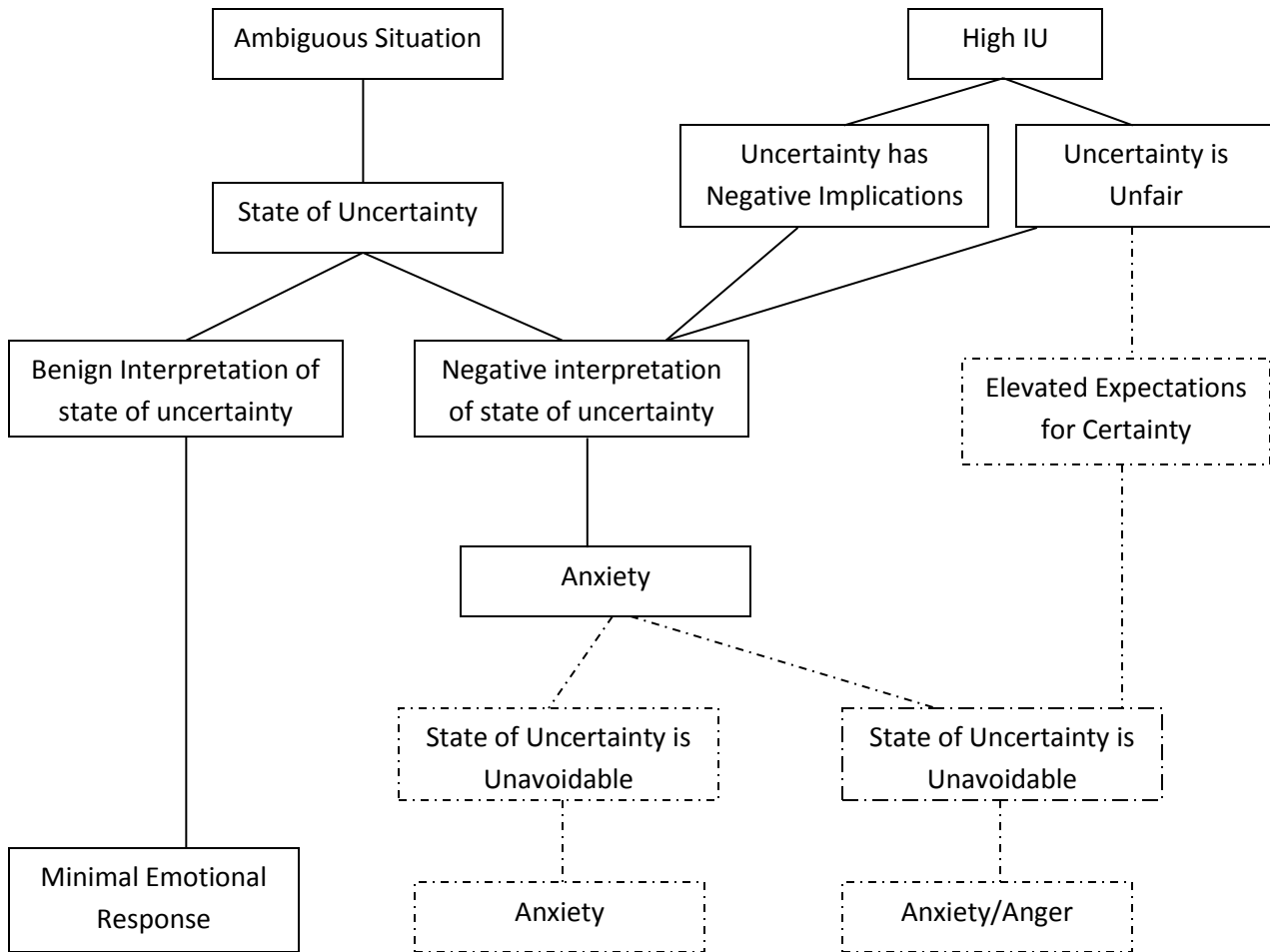
Figure 1. A proposed model to explain to co-occurrence of anger and anxiety.

CHAPTER 2:

STUDY 1: THE VIOLATED EXPECTATIONS FOR CERTAINTY DIARY

The goal of study 1 was to develop and validate a new measure of expectations for

certainty. To do this, the Violated Expectations for Certainty Diary (VEC-D) was developed. It

was hypothesized that the VEC-D would demonstrate evidence of internal consistency, test-retest

reliability, and convergent and divergent validity. In addition, the factor structure of the VEC-D

was explored using exploratory factor analysis (EFA).

Method

Participants

Participants ($N = 407$) were undergraduate students at Concordia University who

received course credit in exchange for their participation. Of the 407 participants, 18 were

excluded from analyses due to an incorrect response to the instruction check question (see

below). This left a total of 389 participants (333 female). Participants had an average age of $M =$

22.52, $SD = 4.88$ (range 18 to 50). Most participants were full time students ($n = 365$) in their

first ($n = 115$), second ($n = 130$) or third ($n = 85$) year of university[3]. Most participants reported

their first language as English ($n = 256$), whereas fewer reported their first language as French (n

$= 56$), or other ($n = 77$). Reported ethnicity was European origin/White ($n = 259$), Asian Origin

($n = 27$), Middle Eastern ($n = 22$), Hispanic ($n = 17$), Bi-racial/Multi-racial ($n = 20$), African-

American/Black ($n = 14$), Native Canadian ($n = 1$), or other ($n = 29$). Informed consent was

obtained from all participants (see Appendix A)

Procedure

All potential participants read about the study on the Concordia Psychology Participant

Pool website, and if interested, signed up to participate. Potential participants were e-mailed a

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[3] Data about year of university were missing for 11 participants

link to complete the study questionnaires online. The first page of the questionnaire link

contained a consent form which outlined the goals of the study and informed participants of their

right to withdraw from the study at any point. Questionnaires were presented in 1 of 5

randomized orders with the demographic form and the VEC-D presented first. In addition, an

instruction check question was included immediately after the consent and demographic forms.

Evidence suggests that some participants do not adequately read online instructions

(Oppenheimer, Meyvis, Davidenko, 2009), which is problematic given that all questionnaires

used in this study contain specific instructions about how they should be completed. Failure to

attend to instructions affects the validity of the responses (Oppenheimer et al.). Therefore, to

assess whether or not participants were adequately reading instructions, an instruction check

question was included. If answered correctly, participants selected "other" and typed "I read

instructions" in the space next to "other". All other responses were incorrect. Participants who

responded incorrectly to the instruction check question were excluded from analyses ($n = 18$).

Following completion of the questionnaires, a subset of participants ($n = 53$) were e-mailed a

link two weeks later to complete the VEC-D again (no other questionnaires were completed at

this time). Participants who completed the questionnaire again received an additional course

credit as compensation.

Questionnaires

The **Violated Expectations for Certainty Diary** (VEC-D) contains 18 short descriptions

of scenarios where uncertainty is present but could be perceived as avoidable. For example, the

scenario "Three weeks ago, you went to the doctor for some tests. The doctor told you that s/he

would call with the results" contains uncertainty given that the tests results are unknown.

Importantly, it is possible to perceive this state of uncertainty as being avoidable if one concludes

that the doctor could phone to disclose the results which would eliminate feelings of uncertainty. Of the 18 scenarios, 8 were adapted from previous measures, and 10 new scenarios were developed for the VEC-D. Of the 8 adapted items, 4 were taken from the Interpretation Questionnaire (Butler & Mathews, 1983; Franklin, Huppert, Langner, Leiberg, & Foa, 2005) and 4 were taken from the Ambiguous/Unambiguous Situations Diary (AUSD; Davey et al., 1992; Koerner, & Dugas, 2008). The original version of the Interpretation Questionnaire contains ten ambiguous scenarios (e.g., "you call up a friend and suggest going out and he says he cannot go with you"), to which participants provide an interpretation (e.g., "why do you think your friend cannot go with you?"). The original and extended versions of the AUSD contain positive, negative, and ambiguous scenarios to which participants rate their level of concern. An example of an ambiguous scenario from the AUSD is "While on my way out tonight I was stopped in the street".

  Disentangling the meaning of expect. The goal of the VEC-D is to assess expectations for certainty when faced with an ambiguous situation that induces a state of uncertainty. Therefore the first question posed for each scenario inquires about those expectations. For example, below the scenario "Your teacher asks to speak with you after class", the following question appears: "To what extent do you expect your teacher to tell you what s/he wants to talk about?" The degree to which that outcome is expected is rated on a scale from 1 (*Not at all*) to 8 (*Completely*). After careful review, it became apparent that the word "expect" could have two meanings in these scenarios. Specifically, one can expect an event to occur because one believes that the event *should* occur or one can expect an event to occur because one believes that the event *will* occur (e.g., higher likelihood). In considering this distinction, many examples became apparent. For instance, the statement "I expect politicians to tell the truth" likely refers to the

belief that "Politicians *should* tell the truth" rather than "Politicians *will* tell the truth". Similarly, the statement "I expect that Indian food is spicy" likely translates to the statement "Indian food *will* be spicy" rather than "Indian food *should* be spicy". Therefore, to disentangle the meaning of the word expect in these scenarios, "should" and "likelihood" questions were added. Following the example scenario above, the questions "To what extent *should* your teacher tell you what s/he wants to talk about?" and "What is the likelihood that your teacher *will* tell you what s/he wants to talk about" were added. Answers to both questions are rated on a scale from 1 (*Not at all*) to 8 (*Completely*).

The final two questions posed for each scenario assess the extent to which a lack of certainty is surprising and bothersome. It seemed necessary to include these questions given that one could expect an event to occur (either because it should occur, or because it will occur), and yet not be concerned if the event fails to occur. That is, individuals may differ in the extent to which failing to attain certainty is surprising or bothersome. Given that heightened emotional responding in situations where certainty is not attained might predict psychopathology, we concluded that these questions were important to include. In keeping with the example above, the questions "How surprised would you be if your teacher did not explain what s/he wanted to talk about?" and "How bothered would you be if your teacher did not explain what s/he wanted to talk about?" were added. Responses to these questions are rated using the same scale (1-8). The VEC-D is presented in Appendix B.

The **Intolerance of Uncertainty Scale** (IUS; Buhr & Dugas, 2002) contains 27 items that assess one's beliefs about and reactions to uncertainty. The IUS has shown excellent internal consistency, $\alpha = .94$, and good test-retest reliability over 5 weeks, $r = .74$ (Buhr & Dugas). Items are rated on a 5-point Likert scale from 1 (*Not at all characteristic of me*) to 5 (*Entirely*

characteristic of me). The IUS is comprised of two distinct yet related factors. The first factor represents the belief that uncertainty has negative self-referent and behavioural implications (IUS-NI) with items such as "When it's time to act, uncertainty paralyses me", and the second factor represents the belief that uncertainty is unfair and spoils everything (IUS-US) with items such as "One should always look ahead so as to avoid surprises". Internal consistency scores in the current sample were α = .95 for the total score, α = .92 for IUS-NI, and α = .92 for IUS-US.

The **State-Trait Inventory for Cognitive and Somatic Anxiety- Trait version** (STICSA-T; Ree et al., 2008) contains 21 items that assess cognitive (10 items) and somatic (11 items) symptoms of anxiety. An example of a cognitive item is "Can't get thoughts out of my mind" and an example of a somatic item is "Feel trembly and shaky". Items are rated on a 4-point Likert scale from 1 (*Not at all*) to 4 (*Very much so*). The STICSA-T demonstrates evidence of internal consistency (α = .88), as well as convergent and divergent validity (Gros, Antony, Simms, & McCabe, 2007). Internal consistency in the current sample was α = .91 for the total score, α = .85 for the somatic subscale, and α = .88 for the cognitive subscale.

The **Centre for Epidemiological Studies- Depression scale** (CES-D; Radloff, 1977) contains 20 items that assess the presence and frequency of depressive symptoms during the past week. Items are rated on a 4-point Likert scale from 0 (*Rarely, or none of the time (Less than 1 day)*) to 3 (*Most or all of the time (5-7 days)*). An example item is "I could not get going". The CES-D shows very good internal consistency in general (α = .85) and in clinical populations (α = .90), and demonstrates good test-retest reliability over a period of 4 weeks (*r* = .67; Radloff). Finally, the scores on the CES-D correlate with scores from other depression measures (e.g., Beck Depression Inventory; Plutchik & van Praag, 1987). Internal consistency of the CES-D in the current study was α = .91.

The **Multidimensional Perfectionism Scale** (MPS; Hewitt & Flett, 1991) consists of 45 items that assess perfectionistic beliefs and standards. The MPS is comprised of 3 subscales: (1) self-oriented perfectionism (SOP), which assesses the extent that one imposes perfectionistic standards on the self (e.g., "When I am working on something, I cannot relax until it is perfect"); (2) socially prescribed perfectionism (SPP), which assesses the extent that one believes that others impose perfectionistic standards on the self (e.g., "Anything I do that is less than excellent will be seen as poor by those around me"); and (3) other-oriented perfectionism (OOP), which assesses the tendency to impose perfectionistic standards on others (e.g., "Everything that others do must be top-notch quality"). Items are rated on a 7-point Likert scale from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). All subscales of the MPS show good internal consistency (α = .82 to .87) and good test-retest reliability over a period of 3 months (*r*s = .75 to .88; Hewitt & Flett). Further, the MPS demonstrates evidence of convergent and divergent validity (Hewitt & Flett). Internal consistency scores in the current sample were α = .90 (SOP), α = .85 (SPP) and α = .77 (OOP).

The **Need for Cognitive Structure** (NCS; Bar-Tal, 1994) contains 20 items that assess the tendency to prefer clear-cut situations and to experience uneasiness in situations where ambiguity is present. An example item is "I prefer things to be predictable and certain". Items are rated on a 6-point Likert scale from 1(*Completely disagree*) to 6 (*Fully agree*). The NCS demonstrates evidence of internal consistency (α = .88), test-retest reliability over 5 weeks (*r* = .85), and convergent and divergent validity (Bar-Tal; Bar-Tal, Kishon-Rabin, & Tabak, 1997). The internal consistency in the current sample was α = .89.

The **State-Trait Anger Expression Inventory- 2** (STAXI-2; Spielberger, 1999) contains 57 items that assess various dimensions of anger with three subscales. The STAXI-2 retains 42

items from the original STAXI (Spielberger, 1988), with 15 new items. The first subscale of the

STAXI-2 contains 10 items that assess anger as a dispositional trait (STAXI-T) with items such

as "I have a fiery temper". The second subscale contains 32 items to assess different forms of

anger expression. Specifically, the tendency to suppress angry feelings (AX-I) with items such as

"I keep things in", the tendency to express angry feelings (AX-O) with items such as "I strike out

at whatever infuriates me", and the ability to control feelings of anger (AX-C) with items such as

"I do something relaxing to calm down" comprise the anger expression subscale. Only the AX-I

and AX-O scales were used in the current study. The third subscale, the State Anger subscale

(STAXI-S, 15 items) assesses current feelings of anger, and was not used in the current study.

For each item, participants rate the degree to which they generally feel that way (STAXI-T), or

respond that way (AX) on a 4-point Likert scale from 1 (*Almost never*) to 4 (*Almost always*).

Internal consistencies for the subscales range from $\alpha = .73$ to .95. In addition to demonstrating

evidence of convergent and divergent validity, scores from the STAXI-2 (particularly scores on

the AX-I and AX-O subscales) show evidence of predictive validity as they are associated with

increased risk of cardiovascular problems (Spielberger). Internal consistencies in the current

sample were $\alpha = .85$ (STAXI-T), $\alpha = .75$ (AX-O), and $\alpha = .79$ (AX-I).

The **Aggression Questionnaire** (AQ; Buss & Perry, 1992) contains 29 items that assess

four dimensions of aggression (Physical aggression, verbal aggression, anger, and hostility).

Only the Hostility scale (AQ-H) was retained for the current study given that the other subscales

overlap with the AX and STAXI-T subscales (see above). Each item is rated on a 5-point Likert

scale from 1 (*Extremely uncharacteristic of me*) to 5 (*Extremely characteristic of me*). The AQ-H

subscale contains 8 items such as "When people are especially nice to me, I wonder what they

want". The AQ-H shows evidence of internal consistency, $\alpha = .77$, and very good test-retest

reliability over a 9 week period (r = .72; Buss & Perry). Additionally, the AQ-H demonstrates evidence of convergent validity with strong positive correlations with measures of emotionality, and with number of aggressive acts committed (Archer & Webb, 2006; Buss & Perry; Harris, 1997). Further, all subscales of the AQ show evidence of divergent validity with inverse correlations with measures of agreeableness, extraversion, and conscientiousness (von Collani & Werner, 2005). Internal consistency in the current sample for the AQ-H was α = .78.

The **Ability to Achieve Cognitive Structure** (AACS; Bar-Tal, 1994) contains 24 items that assess perceived ability to achieve a sense of certainty about one's decisions. Items are rated on a 6-point Likert scale from 1 (*Completely disagree*) to 6 (*Fully agree*). An example item is "Usually, I don't have afterthoughts after making a decision". The AACS demonstrates evidence of internal consistency (α = .83; Bar-Tal), and good test-retest reliability over a period of 5 weeks (r = .86; Bar-Tal et al., 1997). The AACS also demonstrates evidence of convergent and divergent validity (Bar-Tal et al.) The internal consistency in the current sample was α = .87.

The **Interpersonal Reactivity Index** (IRI; Davis, 1980) contains 28 items that assess empathy across four subscales. For the purpose of the current study, only the Perspective Taking (PT) subscale was used. This subscale assesses the ability to understand another's point of view with items such as "I try to look at everybody's sides of a disagreement before I make a decision". Items are rated on a 5-point Likert scale from 0 (*Does not describe me well*) to 4 (*Describes me very well*). All subscales demonstrate good internal consistency (α = .71 to .77), and test-retest reliability over a 9-week period (rs = .61 to .81; Davis). Further, all subscales correlate with measures of similar constructs (e.g., emotionality, Davis, 1983). Internal consistency of the PT subscale in the current sample was α = .82.

The **International Personality Item Pool** (IPIP; Goldberg, 1999) is a publicly accessible website with access to multiple personality measures. For this study, the 10-item Agreeableness (IPIP-A) and 10-item Intellect (IPIP-I) scales were selected. An example IPIP-A item is "Am interested in people" and an example IPIP-I item is "Have a vivid imagination". All items are rated on a 5-point Likert scale from 1 (*Very inaccurate*) to 5 (*Very accurate*). Both scales have demonstrated evidence of internal consistency, αs = .82 (IPIP-A) and .84 (IPIP-I), and evidence of convergent validity (Goldberg). In the current sample, internal consistency scores for the IPIP-A and IPIP-I scales were α = .82 and α = .79.

Results

Data Screening

Responses to the VEC-D were screened for multivariate and univariate outliers. To identify multivariate outliers, Mahalanobis distance was computed and a chi square statistic ($p <$ .001) cutoff was used. With this criterion, 25 multivariate outliers were identified and excluded from analyses. Univariate outliers for the total scores of the Expect, Should, Likelihood, Surprised, and Bothered subquestions were identified as those that exceeded 3.29 standard deviations from the mean (Tabachnick & Fidell, 2013). Using this criterion, 4 univariate outliers were identified (in all questions except the Likelihood questions). Inspection of these univariate outliers revealed that they originated from the same participant, and so this participant was excluded from analyses. To evaluate normality, the total scores of Expect, Should, Likelihood, Surprised, and Bothered were assessed for skewness and kurtosis. Skew values ranged from -.53 to .06 and kurtosis values ranged from -.22 to .10, which are both well within the acceptable limits (Kline, 2009). Normality was also assessed at the individual item level. All values for skew and kurtosis at the item level were within the acceptable range (Kline).

Pairing Down the Number of Questions

As seen in Table 1, the correlations among the Expect, Should, Likelihood, Surprised, and Bothered questions were relatively strong with correlations ranging from $r = .47$ (Likelihood and Bothered) to $r = .82$ (Expect and Should). As mentioned previously, the purpose of including the Should and Likelihood questions was to assess the meaning of the word expect in the context of avoidable uncertain situations. Therefore, the extent to which the correlation between Expect and Should differed from correlation between Expect and Likelihood was assessed. Following recommendations of Field (2009), the t statistic for dependent correlations was calculated and revealed that the correlation between Expect and Should ($r = .82$) was statistically stronger than the correlation between Expect and Likelihood ($r = .71$), $t(360) = 4.53$, $p < .001$. Therefore, expectations for certainty are more closely related to statements that one *should* attain certainty than to statements that one *will* attain certainty.

To further explore the relationships among the Expect, Should, Likelihood, Surprised, and Bothered questions, interitem correlations within each scenario were investigated. Specifically, the correlations among the 5 questions were computed for each scenario separately. By computing these 18 correlation matrices, the total number of scenarios where the correlation between any pair of questions is sufficiently strong to suggest redundancy ($r > .70$) can be tallied. For example, out of 18 scenarios, and therefore 18 correlations between Expect and Should, the number of strong correlations indicates of the number of scenarios in which the word "Expect" is statistically redundant with "Should." That is, the number of scenarios where the statement that one expects certainty is interchangeable with the statement that one should attain certainty. As seen in Table 1, 10/18 (56%) correlations between Expect and Should exceeded $r = .7$. It is of note that all correlations within each scenario were statistically significant.

Table 1

Correlations among Expect, Should, Likelihood, Surprised, and Bothered Questions (N = 363)

	1	2	3	4	5
1. Expect	--	.82***	.71***	.77***	.71***
2. Should	10	--	.62***	.67***	.75***
3. Likelihood	3	3	--	.72***	.47***
4. Surprised	6	4	7	--	.74***
5. Bothered	4	5	1	5	--

Notes. Bivariate correlations among Expect, Should, Likelihood, Surprised, and Bothered questions are presented in the upper right (***$p < .001$). In the bottom left, the total number of scenarios containing strong ($r > .7$) correlations between each pair of questions is presented.

The correlations did vary in magnitude however, from $r = .19$, $p < .001$ (Likelihood and Bothered for scenario #5), to $r = .90$, $p < .001$ (Expect and Should for scenario #15). Although the decision to use $r = .7$ is somewhat arbitrary, it provided the best balance between a value that suggests statistical redundancy while facilitating visual inspection of the data. The number of scenarios in which correlations exceeded $r = .7$ for each question is presented in the bottom left of Table 1.

Unsurprisingly, the number of strongly correlated Expect and Should (10 rs > .7) questions across the scenarios is consistent with the overall association between Expect and Should ($r = .82$). Originally, the VEC-D was proposed to assess expectations for certainty, however, the Should question appears preferable to the Expect question as it provides a clearer picture of what is meant in these situations. That is, expectations for certainty reflect the belief that one *should* attain certainty. Therefore, it was decided to retain the Should question, and eliminate the Expect and Likelihood questions.

As seen in top right portion of Table 1, the correlation between Should and Surprised was $r = .67$, and the correlation between Should and Bothered was $r = .75$. These are fairly strong correlations that might indicate statistical redundancy (particularly between Should and Bothered). The correlation between Surprised and Bothered was equally strong ($r = .74$). Following the decision process used to eliminate the Expect and Likelihood questions, eliminating the Surprised and Bothered questions seemed appropriate. However, a closer look at the number of strong correlations across each scenario presented in the bottom left of Table 1 did not support this decision. Specifically, out of 18 scenarios, there were 5 (28%) in which Surprised strongly correlated (above $r = .7$) with Bothered, and 4 scenarios (22%) in which Surprised strongly correlated with Should. Similarly, there were 5 (28%) scenarios in which

Bothered strongly correlated with Should. In contrast, strong correlations between Expect and Should were observed in more than half (56%) of all scenarios. Therefore, although the overall correlations among Should, Surprised, and Bothered questions suggest redundancy, an examination of the correlations within each scenario suggests otherwise. Given the novelty of this questionnaire, it seemed advisable to retain the Should, Surprised, and Bothered questions at this stage of scale development.

Determining which Scenarios to Retain

To determine which scenarios should be retained, an exploratory factor analysis (EFA) using SPSS Version 22 was used. Of course, it was not appropriate to subject all responses to the EFA. That is, if responses to Should, Surprised, and Bothered questions were entered simultaneously, the factor structure would be influenced by the similar scenarios and similar questions. That is, the total variability in latent factors would be composed of two sources; similar scenarios and similar questions. Because the goal was to determine which scenarios should be retained (and not to determine if Should responses load on a single factor), it was important to use responses to one question only in the EFA. To select the question for the EFA, the correlation matrices of the Should responses, Surprised responses, and Bothered responses were examined. Adequate correlation matrices for factor analyses are those that lack singularity (i.e., correlations not exceeding $r = .9$), but are stronger than $r = .2$ or $.3$ (Field, 2009). The average interitem correlation for the Should and Surprised matrices were $r = .16$ and $r = .15$ and so were not appropriate for EFA. The average interitem correlation for the Bothered matrix was relatively stronger ($r = .23$) and so was considered for EFA.

To determine the number of factors, a preliminary unrotated factor analysis using Maximum Likelihood (ML) extraction was conducted on responses to the 18 Bothered questions.

The Kaiser-Meyer-Olkin measure of sampling adequacy was KMO = .882, and for individual items ranged from KMO = .83 to .92, which exceeds the minimum requirement of KMO = .5 (Field, 2009). Correlations between items were adequate for factor analysis (Bartlett's test of sphericity χ^2 (153) = 1345.94, p < .001). Using the Kaiser (1970) rule of retaining factors with eigenvalues greater than 1.0, a four factor solution was found. However, inspection of the scree plot suggested that a 2 or 3 factor solution was more appropriate. The fourth factor explained little variance (2.25%) and given the results from the screen plot, the 2 and 3 factor solutions were explored.

The 3 factor solution was explored using direct oblimin (oblique) rotation and explained 32.18% of the variance. The direct oblimin rotation was selected rather than promax based on recommendations of Field (2009) and Tabachnick and Fidell (2013). Further, Gorsuch (1983) points out that differences in factor loadings between direct oblimin and promax rotations are negligible when the factor structure is clear. Despite this, the 3 factor solution using promax (oblique) rotation was explored for comparison purposes. As seen in Table 2, the standardized regression coefficients from the pattern matrices of the two oblique rotation methods were vastly different suggesting that the factor structure was not stable. The correlations among the factors differed depending on which rotation was used. Specifically, when direct oblimin was used, the correlations were r = .32 (Factor 1 and 2), r = .43 (Factor 1 and 3), and r = .64 (Factor 2 and 3) whereas for the promax rotation, correlations were r = .67 (Factor 1 and 2), r = .52 (Factor 1 and 3), and r = .42 (Factor 2 and 3). Considering the differing standardized regression coefficients, and the discrepant correlations among factors, the 3 factor solution was not appropriate. The 2 factor solution, which explained 27.57% of the variance, was then explored twice; once using

Table 2

Promax and Direct Oblimin Rotated Factor Standardized Coefficients and Final Communality (h^2) Estimates for the 3 Factor

Solution of the VEC-D Bothered Questions (N = 363)

	Direct Oblimin			Promax			
Scenario No.	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3	h^2
8	**.98**	-.04	.07	-.00	-.06	**1.03**	1.00
1	-.02	**.63**	-.06	-.07	**.65**	-.04	.35
5	.09	**.57**	.02	.01	**.58**	.06	.38
3	-.04	**.54**	.00	-.00	**.55**	-.07	.28
9	.15	**.52**	.04	.02	**.52**	.13	.37
2	-.07	**.51**	.03	.03	**.52**	-.09	.26
6	-.02	**.37**	.03	.03	**.38**	-.04	.15
13	.02	**.38**	.26	.26	**.38**	-.01	.34
14	-.13	-.07	**.80**	**.83**	-.09	-.16	.50
15	-.05	-.05	**.49**	**.51**	-.06	-.07	.20
4	.03	-.00	**.49**	**.50**	-.01	.02	.25
11	.22	-.01	**.45**	**.45**	-.02	.22	.34

17	.00	.07	**.43**	**.44**	.06	-.01	.23
18	.07	.07	**.43**	**.44**	.06	.06	.27
10	.06	.06	**.41**	**.42**	.06	.05	.23
12	.10	.09	**.40**	**.40**	.09	.09	.26
16	.07	.09	**.37**	**.38**	.08	.05	.22
7	.05	.12	**.32**	**.32**	.12	.04	.19

Notes. VEC-D = Violation of Expectations for Certainty Dairy. Standardized regression coefficients from the pattern matrices >.30 appear in boldface. The three-factor solution accounted for 32.18% of the variance. Correlations among factors were $r = .32$ (Factor 1 and 2), $r = .43$ (Factor 1 and 3), and $r = .64$ (Factor 2 and 3) for the direct oblimin rotation and were $r = .67$ (Factor 1 and 2), $r = .52$ (Factor 1 and 3), and $r = .42$ (Factor 2 and 3) for the promax rotation.

direct oblimin and once using promax rotation. As seen in Table 3, the standardized regression coefficients were nearly identical for both rotation methods suggesting that the factor structure was stable. Further, the correlations between the factors were similar across rotations ($r = .66$ for direct oblimin, and $r = .67$ for promax). Considering the data, the 2 factor solution was retained.

To facilitate inspection of the two factors, the scenarios associated with each factor are presented in Table 4. Inspection of the relevant scenarios suggests that the first factor reflects ambiguous situations where the potential negative outcome is non-social in nature with scenarios such as "Three weeks ago, you went to the doctor for some tests. The doctor told you that s/he would call with the results". The second factor reflects ambiguous situations where the potential negative outcome is social in nature with scenarios such as "You're talking with a small group of colleagues. Just as you start to speak, someone gets up to leave the group" The two factors were consequently labeled "non-social" and "social".

To determine if expectations for certainty and emotional responses to the lack of certainty differed as function of scenario type, dependent sample t tests were used. Results were that responses to the non-social Should, Surprised, and Bothered questions were statistically higher than responses to the social Should, Surprised, and Bothered questions (see Table 5 for means and standard deviations). In other words, the belief that one should attain certainty, the degree of surprise experienced in the absence of certainty, and the extent to which the absence of certainty is bothersome were more pronounced in the non-social relative to the social scenarios.

Reliability

Responses to all three questions demonstrated evidence of internal consistency with Cronbach's alphas of $\alpha = .77$ (Should), $\alpha = .76$ (Surprised) and $\alpha = .84$ (Bothered). To assess the stability of

Table 3

Promax and Direct Oblimin Rotated Factor Standardized Coefficients and Final Communality (h^2) Estimates for the 2 Factor Solution of the VEC-D Bothered Question (N = 363)

Scenario No.	Direct Oblimin		Promax		
	Factor 1	Factor 2	Factor 1	Factor 2	h^2
11	**.66**	-.09	**.66**	-.09	.36
14	**.64**	-.02	**.64**	-.02	.39
8	**.56**	-.03	**.56**	-.02	.29
12	**.52**	.02	**.52**	.03	.29
4	**.52**	-.03	**.52**	-.03	.26
10	**.47**	.03	**.46**	.04	.24
18	**.47**	.06	**.47**	.07	.26
15	**.43**	-.03	**.43**	-.03	.17
17	**.42**	.07	**.41**	.08	.22
16	**.39**	.10	**.39**	.10	.21
7	**.34**	.13	**.33**	.13	.19
1	-.10	**.66**	-.12	**.67**	.36

5	.08	**.56**	.06	**.57**	.38
2	-.01	**.52**	-.03	**.53**	.26
3	.01	**.51**	-.01	**.53**	.27
9	.15	**.48**	.14	**.49**	.35
13	.28	**.36**	.27	**.37**	.34
6	.04	**.35**	.03	**.36**	.14

Notes. VEC-D = Violation of Expectations for Certainty Dairy. Standardized regression coefficients from the pattern matrices >.30 appear in boldface. The two-factor solution accounted for 27.57% of the variance. Correlations between the factors were $r = .66$ (direct oblimin) and $r = .67$ (promax)

Table 4

Scenarios from the Violation of Expectations for Certainty-Diary (VEC-D)

Number	Scenario	Factor 1	Factor 2
11	The train you take every morning to get to work is now 10 minutes late.	**.66**	-.09
14	Three weeks ago, you went to the doctor for some tests. The doctor told you that s/he would call with the results	**.64**	-.02
8	While driving to a new restaurant one evening, you discover that the route to get there is closed for construction.	**.56**	-.03
12	The metro you're riding comes to an abrupt stop between 2 stations and the alarm goes off	**.52**	.02
4	You're having a routine chest x-ray. The doctor looks carefully at the images And then asks the nurse to take more x-rays	**.52**	-.03
10	Your last exam of the semester took place 3 weeks ago	**.47**	.03
18	your close friend came over for dinner. At the end of the night, your friend opts to walk home, but it's late and dark so you asked your friend to call you when s/he arrives home. Although it usually only takes your friend 15 minutes to walk home, after 30 minutes, you still have not received a call.	**.47**	.03
15	You're making an online purchase when you receive a call from an employee at the company that there is a problem with your credit card.	**.43**	-.03
17	You're waiting to pick up your father outside the baggage claim area of the Airport. According to the arrival and departure screen, your father's plane landed 40 minutes ago.	**.42**	-.03

16	You've been waiting for 30 minutes at the drugstore for the pharmacist to process your prescription.	**.39**	.10
7	You hear a rumour that your supervisor will announce a team meeting to discuss major changes to the salary structure in your company.	**.34**	.13
1	You call up a friend and suggest going out. S/he says s/he cannot go with you.	-.10	**.66**
5	Three days ago, you went out on a date with a colleague and had a really good time. At the end of the date s/he said they would call.	.08	**.56**
2	You're talking with a small group of colleagues. Just as you start to speak, someone gets up to leave the group.	-.01	**.52**
3	Someone you know walks past you on the street.	.01	**.51**
9	You haven't spoken to a friend in over a year, so last week you sent an e-mail	.15	**.48**
13	Your teacher asks to speak with you after class	.28	**.36**
6	While you were out, your friend called and left a message on your voicemail saying that s/he needs to talk about something important.	.04	**.35**

Note. Standardized regression coefficients from the pattern matrix >.30 appear in boldface.

Table 5

Means and Standard Deviations for Non-social and Social Scenarios (N = 363)

	Non-social *M* (*SD*)	Social *M* (*SD*)	*d*
Should Question	6.44 (.84)	4.87(1.05)	1.61
Surprised Question	5.24 (1.13)	4.41(1.00)	.75
Bothered Question	6.19 (1.08)	4.71(1.26)	1.34

Note. All pairs of means are statistically different (*p* < .001).

responses over time, 47[4] participants completed the questionnaire again 2 weeks later.

Bivariate correlations between time 1 and time 2 were all positive, strong, and statistically significant (all $ps < .001$). Specifically, the correlation between Time 1 and Time 2 was $r = .90$ for the Should responses, $r = .87$ for the Surprised responses, and $r = .90$ for the Bothered responses. Thus, responses to the Should, Surprised, and Bothered questions were stable over a 2 week period.

Convergent Validity

As evidence of convergent validity, it was expected that scores from the Should, Surprised, and Bothered questions would positively correlate with the IUS, STICSA-T, SOP, SPP, OOP, STAXI-T, CES-D, NCS, and AQ-H. As seen in Table 6, the Bothered question was positively and significantly correlated with all measures with the highest numerical correlation observed with the IUS-US ($r = .46, p < .001$). The Should question positively and significantly correlated with all measures except the STICSA-T, and CES-D, and the Surprised question positively and significantly correlated with almost half of the measures. Taken together, the Bothered and Should questions demonstrated evidence of convergent validity across a number of different scales, and the Surprised question demonstrated some evidence of convergent validity, albeit not to the same extent as the Bothered and Should questions.

Of particular note are the correlations between scores from the VEC-D and responses to the IUS. As seen in Figure 1, it was proposed that relatively high IU would be associated with higher expectations for certainty and that this relationship would be more pronounced with the belief that uncertainty is unfair (IU-US) relative to the belief that uncertainty has negative implications (IU-NI). As seen in Table 6, the correlation between IU-US and Should ($r = .37$) is

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[4] Although 53 participants completed the retest, 6 were excluded as responses at time 1 were identified as a multivariate outlier or due to an incorrect instruction check response at time 1.

Table 6

Correlations to Establish Convergent and Divergent Validity (N = 363)

	Should	Surprised	Bothered
IUS-tot	.33***	.29***	.45***
IU-NI	.25***	.27***	.39***
IUS-US	.37***	.27***	.46***
STICSA-T	.05	.08	.22***
STICSA-Som	-.04	.03	.11*
STICSA-Cog	.12*	.10	.27***
CES-D	.06	.07	.17**
SOP	.19***	.05	.19***
OOP	.22**	.11*	.21***
SPP	.17**	.11*	.26***
NCS	.38***	.34***	.44***
STAXI-T	.13*	.05	.21***
AX-Out	.14**	.06	.14**
AX-In	.13*	.06	.25**
AQ-H	.20***	.10*	.31***
AACS	-.09	-.12*	-.27***
PT	-.11*	-.09	-.16**
IPIP-A	-.02	.04	-.01
IPIP-I	-.05	-.06	-.10

Notes. IUS = Intolerance of Uncertainty Scale; IU-NI = Uncertainty has Negative Implications;

IU-US = Uncertainty is Unfair; STICSA-T = State-Trait Inventory for Cognitive and Somatic

Anxiety Trait; STICSA-Som = State-Trait Inventory for Cognitive and Somatic Anxiety –

Somatic subscale; STICSA-Cog = State-Trait Inventory for Cognitive and Somatic Anxiety –

Cognitive subscale; SOP = Self-Oriented Perfectionism; OOP = Other-Oriented Perfectionism;

SPP = Socially Prescribed Perfectionism; NCS = Need for Cognitive Structure; AQ-H =

Aggression Questionnaire – Hostility Subscale; STAXI-T = State-Trait Anger Expression

Inventory, Trait; AX-O = Anger Expression- Out; AX-I = Anger Expression-In; AACS = Ability

to Achieve Cognitive Structure; PT = Perspective Taking; IPIP-A = International Personality

Item Pool – Agreeableness; IPIP-I = International Personality Item Pool – Intellect

p < .05, **p* < .01, ***p* <.001

stronger than the correlation between IU-NI and Should (r = .25). Follow up analyses showed that this difference was statistically significant ($t(358)$ = -3.35, p < .001). Similarly, the correlation between IU-US and Bothered (r = .46) was statistically stronger than the correlation between IU-NI and Bothered (r = .39; $t(358)$ = -2.09, p < .05). No differences were observed for correlations between IU-NI and IU-US with Surprised. Therefore, the extent to which one thinks one should attain certainty, and the extent to which one is bothered by the absence of certainty were more strongly related to the belief that uncertainty is unfair compared to the belied that uncertainty has negative implications.

Divergent Validity

As evidence of divergent validity, it was expected that scores from the Should, Surprised, and Bothered questions would inversely correlate with the AACS, PT, IPIP-A, and IPIP-I. As seen in Table 6, significant inverse correlations were detected with the AACS, with the Bothered questions demonstrating the strongest correlation (r = -.27). In addition, the PT scale demonstrated inverse correlations with the Should (r = -.11) and Bothered questions (r = -.16). The Should, Surprised, and Bothered questions were not correlated with the IPIP-A and IPIP-I scales. Thus, the Should, Surprised, and Bothered questions demonstrated some evidence of divergent validity.

<div align="center">

Discussion

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The goal of Study 1 was to develop and validate a new measure of expectations for certainty. To do this, we developed the Violated Expectations for Certainty Diary (VEC-D), which contains 18 scenarios where uncertainty is present but could be perceived as avoidable. For all scenarios, the extent to which certainty is expected and emotional responses to the non-attainment of certainty are assessed.

Prior to scale development, this construct was labelled as expectations for certainty. However, after considering that expectations for certainty can reflect either beliefs that an outcome *should* occur or beliefs that an outcome *will* occur, it became important to disentangle the meaning of the word expect in the context of avoidable uncertainty; therefore the Should and Likelihood questions were added. After comparing correlations, results showed that in the context of the avoidable uncertain scenarios described in the VEC-D, the word "expect" reflects statements that an outcome should occur to a greater extent than statements that an outcome will occur. Therefore, expectations for certainty more closely resemble the belief that certainty should occur in the newly developed questionnaire.

The VEC-D demonstrated evidence of reliability and validity. Specifically, correlations between responses at Time 1 and responses at Time 2 were all positive, strong, and statistically significant. As evidence of convergent validity, responses to the VEC-D correlated with measures of similar constructs and as evidence of divergent validity, inverse correlations with measures of dissimilar constructs were observed. Finally, internal consistency scores were high for all questions. Taken together, the VEC-D appears to be psychometrically sound.

As expected, higher scores from the Should, Surprised, and Bothered questions were associated with higher scores of negative beliefs about uncertainty, which suggests that expectations for certainty are negatively valenced. Further, the belief that uncertainty is unfair is more strongly associated with expectations for certainty than is the belief that uncertainty has negative implications. Considering that the belief that uncertainty is unfair is more strongly associated with anger-related constructs (Fracalanza et al., 2014), expectations for certainty might help to explain the association between IU and anger.

As discussed throughout the introduction, heightened expectations for certainty are proposed to lead to conclusions that the state of uncertainty is avoidable, which in turn can lead to anxiety and anger. Given this proposition, it was expected that the responses to the VEC-D would correlate with scores from the STAXI-T (anger) and STICSA-T (anxiety). Interestingly, only responses to the Bothered question correlated with both the STAXI-T and STICSA-T. The Should question correlated only with the STAXI-T. Further, all observed correlations were weak in strength. Considering this, it is possible that avoidable uncertainty does not completely explain the relationship between anxiety and anger. However, emotional responses such as anxiety and anger might only emerge when avoidable uncertainty is made more salient. That is, reading short descriptions of scenarios containing avoidable uncertainty may be insufficient to elicit emotional responding; the actual occurrence of an avoidable uncertain situation might be necessary to observe such a response. Future research is needed to explore this possibility.

Exploratory factor analysis revealed that the VEC-D is comprised of two factors. The first represents avoidable uncertainty where the potential negative outcome is non-social, and the second factor represents avoidable uncertainty where the potential negative outcome is social in nature. Although it is possible that reactions to avoidable uncertainty are distinguished by the absence or presence of a social context, it is also possible that this factor structure is a function of the scale itself. For example, only two scenarios are related to health (see Table 4). Perhaps if more scenarios related to health were included in the scale, a third health-related factor would have emerged.

As mentioned in the introduction, most experimental studies that examined legitimate versus illegitimate goal-blocking used a confederate (e.g., Dill & Anderson, 1995). That is, in all cases, a confederate acted in a justified or unjustified way to block a participant's goal of

completing a task. Although the VEC-D does not assess the occurrence of legitimate and illegitimate goal-blocking per se, it does assess expectations that the goal of attaining certainty will be met. In all scenarios, failure to attain certainty (a goal-blocking event) could be attributed to an individual (in the social scenarios) or not (in the non-social scenarios). Conceivably, expectations for certainty and emotional responses to the absence of certainty would be most pronounced in social situations as opposed to non-social situations given that an identifiable individual could be held responsible (Averill, 1982). Surprisingly, the opposite finding emerged such that avoidable uncertain situations that are non-social in a nature elicited the strongest responses.

Several limitations of the current study deserve mention. Firstly, the method used to eliminate the Expect and Likelihood questions was somewhat arbitrary. Specifically, correlations among questions were assessed for statistical redundancy and the total number of scenarios containing redundant correlations between questions was tallied. A stronger method for eliminating one scale would be to demonstrate that the Expect and Should questions load to a single underlying factor. Importantly, the nature of this questionnaire is such that items are nested within scenarios and so variability in scores is derived from two sources: similar questions and similar scenarios. Therefore, a multilevel factor analysis would be required to address this research question. With a multilevel factor analysis, variability attributable to the questions only (similar to variability from Level 1) is analyzed separately from variability attributable to scenarios (similar to variability from Level 2; Muthén, 1994; Reise, Ventura, Nuechterlein, & Kim, 2005). Importantly, the sample size required to perform such an analysis was well beyond the size of the current sample. That is, a ratio of 10:1 is generally regarded as adequate for factor analysis (Tabachnick & Fidell, 2013). With 18 scenarios each containing 5 questions, an

adequate sample would require at least 900 participants. Given the timeframe of data collection, it was not possible to obtain a sample of 900 participants; this analysis was therefore not considered. A second limitation of the study concerns the interval chosen to assess test-retest reliability. Although a 2-week interval is used in many scale development studies (e.g., Brazier et al., 1992), this interval may have been too brief given that expectations for certainty are proposed to be relatively stable. Therefore, the stability of responses over a longer period of time (e.g., 2 months) should be assessed in future studies. Although not a limitation of the study, a remaining concern with the VEC-D is its length. The elimination of the Expect and Likelihood questions reduced the total number of questions from 90 to 54; however, the questionnaire remains lengthy. To further reduce the number of questions, and thus increase the usability of the scale, the elimination of scenarios should be considered.

In addition to assessing expectations for certainty, the VEC-D might have clinical utility. Currently, existing treatments that target negative beliefs about certainty do not explicitly address expectations for certainty (e.g., Dugas et al., 2010). Therapeutically addressing these expectations might be beneficial such that decreases in expectations for certainty following treatment might be associated with an improved treatment response. In sum, the VEC-D is a psychometrically sound questionnaire which assesses expectations for certainty in avoidable uncertain non-social and social scenarios.

CHAPTER 3:

STUDY 2: DOES AVOIDABLE UNCERTAINTY LEAD TO ANGER AND ANXIETY?

The general goal of study 2 was to explore the relationship between avoidable

uncertainty, anger and anxiety. To address this goal, uncertainty was induced and then

manipulated to be either avoidable (experimental group) or unavoidable (control group). It was

hypothesized that: 1) the uncertainty induction would lead to increases in anxiety; and 2) relative

to the control group, the experimental group would report increases in anger following the

manipulation. No group differences in anxiety following the manipulation were expected.

Method Study 2

Participants

Participants were 131 undergraduate students at Concordia University who received

course credit in exchange for their participation. Of the 131 participants, 46 were excluded from

analyses due to difficulties during the testing session (e.g., non-adherence to the study script; $n =$

7), or due to an incorrect response to the manipulation check question ($n = 39$). Details regarding

the manipulation check are presented below. This left a total of 85 participants ($M_{age} = 23.05$, SD

$= 5.39$) who were mostly female ($n = 69$). Participant's first language was English ($n = 57$),

French ($n = 17$), French and English ($n = 1$), or other ($n = 6$)[5]. Self-reported ethnic identity

included European Origin/White ($n = 57$), Middle Eastern ($n = 6$), Black ($n = 6$), Asian Origin (n

$= 6$), Hispanic ($n = 3$), Multi-racial ($n = 2$), or other ($n = 5$). Informed consent was obtained for

all participants (see Appendix C for consent form).

Measures

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[5] Information about first language was missing for 4 participants

Visual Analogue Scales (VASs) are used to assess state levels of specific emotions. For the current study, VASs were used to assess state levels of anxiety, sadness, anger, and happiness. For each emotion, a 100mm horizontal line is presented with anchors of "*Not at all*" and "*Completely*" at either end. For each emotion, instructions are to indicate the current level of the emotion by placing a written vertical line at the appropriate location on the 100mm horizontal line. State levels of each emotion are inferred by measuring the distance between the start of the line and the location at which the placed vertical line intersects with the horizontal line.

The **Penn State Worry Questionnaire** (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) is a 16-item measure that assesses the tendency to experience excessive and uncontrollable worry. Items are rated on a 5-point Likert scale from 1 (*Not at all typical*) to 5 (*Very typical*). An example item is "Once I start worrying, I can't stop". The PSWQ has demonstrated excellent internal consistency, α = .91 to .95, and good test-retest reliability over 2 to 10 weeks, r = .74 to .93. Moreover, the PSWQ has shown evidence of convergent validity with measures of anxiety, r = .64, and divergent validity with measures of thrill seeking, r = -.20 (Meyer et al.). The internal consistency score in the current sample was α = .94.

The **Anger Rumination Scale** (ARS; Sukhodolsky, Golub, & Cromwell, 2001) contains 19 items that assess the tendency to recall and focus on the causes, consequences, and experiences of anger. The ARS is comprised of 4 subscales which include Angry Afterthoughts ("I re-enact the anger episode in my mind after it has happened"), Thoughts of Revenge ("When someone makes me angry, I can't stop thinking about how to get back at this person"), Angry Memories ("I ponder about the injustices that have been done to me"), and Understanding of Causes ("When someone provokes me, I keep wondering why this should have happened to

me"). All items are rated on a 4-point Likert scale from 1 (*Almost Never*) to 4 (*Almost Always*). The ARS demonstrates evidence of internal consistency (α = 77 to .93), good test-retest reliability over a 1-month period (*r* = .77), and evidence of convergent validity as the total score and all subscale scores correlate with measures of anger and negative affect (Sukohodolsky et al). The internal consistency score in the current sample was α = .92.

The **Brief Fear of Negative Evaluation scale** (BFNE; Leary, 1983) assesses the tendency to fear negative evaluation with 12 items. An example item is "I am frequently afraid of other people noticing my shortcomings". Items are rated on a 5-point Likert scale from 1 (*Not at all characteristic of me*) to 5 (*Extremely characteristic of me*). The BFNE demonstrates excellent internal consistency (α = .96) and good test-retest reliability over 4 weeks (*r* = .75; Leary). The BFNE correlates with measures of social phobia and depression (Collins, Westra, Dozois, & Stewart, 2005; Duke, Krishnan, Faith, & Storch, 2006) and can discriminate between socially anxious and non-anxious individuals (Collins et al.). The internal consistency score in the current sample was α = .93.

The trait (STICSA-T) and state (STICSA-S) versions of the **State Trait Inventory for Cognitive and Somatic Anxiety** (STICSA; Ree et al., 2008), the **Centre for Epidemiological Studies – Depression Scale** (CES-D; Radloff, 1977), the **Intolerance of Uncertainty Scale** (IUS; Buhr & Dugas, 2002), the Anger-Out (AX-Out), Anger-in (AX-In), state (STAXI-S), and trait (STAXI-T) subscales of the **State-Trait Anger Expression Inventory- 2** (Spielberger, 1999), and the Hostility subscale of the **Aggression Questionnaire** (AQ-H; Buss & Perry, 1992) were also included in the current study. Psychometric properties of these questionnaires are presented in pages 28 through 32. Internal consistency scores in the current sample ranged from α = .63 (CES-D) to α = .94 (IUS).

Mock Intelligence Tests

The **Operation Span** (Turner & Engle, 1989) is a computerized cognitive task that requires participants to assess math equations and to remember words. Each trial is presented for 5 seconds and contains a math equation which has been solved either correctly or incorrectly and an unrelated lowercase word. Participants are required to press the "y" key if the math equation is solved correctly and the "n" key if the equation is solved incorrectly. In addition, participants are instructed to remember the word that was presented beside the math equation. Each block contains 2 to 6 trials. Following each block, participants are instructed to type the words that were presented in the order of their presentation. A total of 67 trials were presented in 17 blocks. The total duration of this task was 10 minutes.

The **Anagram task** requires participants to rearrange the letters of a word (an anagram) to form a new word. For example, the letters in the word CALLER can be rearranged to form the word RECALL. Participants were exposed to 60 anagrams which ranged in length from 5 to 8 letters. Each anagram was presented for 12 seconds. Participants are informed that all nonresponses and partial responses are counted as incorrect and that they must use all letters of the anagram to form a new word. The Anagram task took 12 minutes to complete.

Procedure

The procedure of the experiment is divided into four phases, which are described below. The first two phases included the introduction/intelligence tests and the induction. These first two phases occurred in the exact same way for all participants, regardless of experimental condition. Following the induction, the third phase (the manipulation) occurred where depending on which group they were randomized to, participants experienced either the experimental or

control condition. Following the manipulation, all participants completed the fourth phase, which consisted of completing questionnaires and being debriefed.

Introduction and mock intelligence tests. Potential participants read about the study on the Participant Pool website, and if interested signed up to participate. All participants were tested individually. Upon arrival, participants were told that the goal of the study was to investigate the relationship between intelligence and emotions and that they would complete a computerized intelligence test along with questionnaires to assess different emotions. Once the consent form was signed, the experimenter explained that although it was not part of the study, the results of the intelligence test would be available for the participant by the end of the experiment. Usually, research participants do not receive individualized results in a given experiment and so it was important to mention this so that participants knew to expect their results. Participants then completed baseline questionnaires which included the VAS, STICSA-T, CES-D, PSWQ, IUS, STAXI-T, AX-Out, AX-In, and AQ-H. Participants completed two computerized mock intelligence tests which were the Operation Span followed by the Anagram task. To ensure that participants understood the tasks, two practice trials per task were completed at the beginning with the experimenter in the room. To minimize variability in how participants felt about their performance, both tasks were designed to be extremely difficult. For example, in the Anagram task, participants are given 12 seconds to solve each anagram. When the anagram is 5 letters in length, the task is manageable (e.g., CHARM → MARCH), however when the anagram is 8 letters in length, the task is very difficult (e.g., SUNLIGHT → HUSTLING).

The induction. Once the participant signalled to the experimenter that they had completed the intelligence test, the experimenter and a confederate entered the testing room. The confederate proceeded to "copy over the responses" to a USB key so that the intelligence test

results could be analyzed. Once the files were copied, the confederate explained that she would

let the experimenter know when the intelligence test results were ready and then left the room.

The confederate left the door ajar and waited in the hallway. Participants then completed the

second set of questionnaires. The experimenter explained that because these questionnaires

would not take long to complete, she would sit in the room while the participant completed them.

The order of the second set of questionnaires was fixed with the ARS presented first, the BFNE

second, and VASs presented third. This order of questionnaires was selected so that the

experimenter could signal (by tapping her arm) to the confederate when the participant started

the BFNE (which was always the third page of the questionnaire package). Following the signal,

the confederate knocked at the door and asked to speak with the experimenter. The experimenter

informed the participant that she would return shortly and left the room leaving the door ajar. In

the hallway, the confederate explained that there were problems with the intelligence test results

of the participant's intelligence test and that it would be best to show the experimenter what had

happened. In pilot testing, we confirmed that this conversation was audible to the participant.

Given that the VAS was the final measure in the questionnaire package; it was completed after

this conversation occurred. The experimenter and confederate then entered a different room for 5

minutes, presumably to discuss the problem.

     The manipulation. The experimenter re-entered the testing room carrying a folder and

explained to the participant that there were problems with the results of their intelligence test.

Following this statement, the manipulation occurred. For those that were randomly assigned to

the experimental group ($n = 40$), the experimenter explained that she knew what the problem

was, but could not disclose the nature of the problem because she did not have permission from

her supervisor who was absent that day. For those randomly assigned to the control group ($n =$

45), the experimenter explained that she did not know the nature of the problem because the intelligence test results were sent directly to her supervisor who was absent that day. Please refer to Appendix D for exact wording in both conditions. For all participants, the experimenter then explained that due to these problems, a form for ethics was required. The experimenter then left for 5 minutes to "create the form". This final wait period was included to allow for feelings of anger to emerge. Possibly, appraisals about the avoidability of the uncertain situation may arise only when given the chance to reflect on the situation. Therefore, the final wait period was included for this reason.

Final measures and debriefing. The experimenter then re-entered the room and asked the participant to complete the final set of questionnaires which included the STICSA-S, STAXI-S, and VASs. The participant signalled to the experimenter when the questionnaires were completed. In the final part of the experiment, the manipulation check (which was disguised as the ethics form) was completed. The manipulation check is presented in Appendix E. Just prior to debriefing, the experimenter inquired about any suspicions the participant may have had about the experiment. To quantify suspiciousness, participants were asked to rate on a scale from 0 (*Not at all*) to 100 (*Completely*) 1) the extent to which they believed that the computerized tests were indeed intelligence tests, and 2) the degree to which they believed the experimenter when she announced that there were problems with the results of their intelligence tests[6]. Finally, participants were asked if anything came to mind about what the problem might be[7]. This final question was included to evaluate whether participants attributed the problem to themselves (e.g., poor performance) or to forces outside the self (e.g., computer failure). All participants were thoroughly debriefed (both verbally and in writing) about the true nature of the study and

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[6] Suspiciousness questions were not included for the first 23 participants.
[7] This question was not included for the first 72 participants.

were thanked for their participation. Finally, participants were asked to sign a second consent form which outlined the true purpose of the study (see Appendix F for second consent form).

Results

Data were first screened for normality. Specifically, the groups were collapsed and skew and kurtosis levels for all questionnaires completed prior to the manipulation were evaluated. The only questionnaires where skew and/or kurtosis levels fell outside acceptable limits were the AQ-H (kurtosis = 12.63) and VAS-Ang1 (skew = 3.44, kurtosis = 13.95). All questionnaires completed after the manipulation were evaluated for normality as well. Importantly, normality was assessed in the control and experimental groups separately given that differing patterns of results were expected based on group membership. In the experimental group, all values of skew and kurtosis were within acceptable limits; however, in the control group, a non-normal distribution was detected for VAS-Ang3 (skew = 3.36, kurtosis = 11.85) and the STAXI-S (skew = 3.85, kurtosis = 17.58).

Given that non-normal distributions can be caused by the presence of outliers (Kline, 2009), questionnaires with non-normal distributions were screened for univariate outliers. Rather than deleting outliers from the dataset, scores were replaced with the next extreme value that fell within 3.29 SD of the mean (Kline; Tabachnick & Fidell, 2013). By doing this, scores retain their extreme status relative to other scores, while not affecting normal distribution. Using the entire sample, two outliers were detected for the VAS-Ang1 ($Z = 5.12$, $X = 63$ and $Z = 4.76$, $X = 59$). The next highest value for the VAS-Ang1 was $Z = 3.14$, $X = 41$, and so the score of 41 was used to replace the values of the two outliers. Skew and kurtosis levels were then re-evaluated and fell within acceptable limits (VAS-Ang1 skew = 2.50, kurtosis = 7.00). In the control group, data from the STAXI-S and VAS-Ang3 were screened for univariate outliers. On the STAXI-S, one

outlier ($Z = 5.25$, $X = 42$) was detected and was replaced with the next extreme score ($Z = 2.06$,

$X = 27$), and on the VAS-Ang3, two outliers were detected ($Z = 4.22$ $X = 96$, $Z = 3.97$ $X = 91$)

and were replaced with the next extreme score ($Z = 1.75$, $X = 46$). Skew and kurtosis levels for

both measures were then re-evaluated and fell within acceptable limits (STAXI-S skew $= 2.28$,

kurtosis $= 4.67$; VAS-Ang3 skew $= 2.08$, kurtosis $= 4.06$).

Between Group Comparisons and Manipulation Check

The critical point of the manipulation was the statement that the results did not appear on

the computer screen and therefore the problem could not be explained (control group), or the

statement that the results had been seen, but the problem could not be explained due to lab

protocol (experimental group). At the end of the experiment, participants were asked to indicate

if the experimenter knew what their intelligence results were by circling either yes or no.

Because it was important to ensure that participants heard and understood what the experimenter

told them during the manipulation, only those who responded correctly to this question were

included in analyses ($n = 39$ excluded). A follow-up chi-square test revealed that a similar

number of participants from each group were excluded, $\chi^2 (1) = .13$, $p = .846$, $OR = .87$. The

manipulation was also assessed with the question "To what extent do you think the experimenter

could have given you your results?" Results showed that for participants included in analyses,

the experimental group reported a higher score ($M = 4.78$, $SD = 2.11$) than did the control group

($M = 3.69$, $SD = 2.53$), $t(82.66) = -2.16$, $p = .034$, $d = .47$. A slight variation of this question: "To

what extent do you think the experimenter *should* have given you your results?" revealed no

group differences, $t(83) = -1.44$, $p = .154$, $d = .31$.

It was important to establish that any findings related to the hypotheses were not a

function of participant's perceptions of their performance on the intelligence test. Independent

sample t-tests revealed that the groups did not differ in how well they believed they performed on the intelligence test $t(83) = 1.49$, $p = .141$, $d = .32$; the extent that they wanted their intelligence results $t(83) = -.95$, $p = .344$, $d = .21$; or the likelihood that they would return in a few days to receive their results $t(83) = -.82$, $p = .414$, $d = .18$. Means and standard deviations for responses are presented in Table 7. Both groups reported that the experiment was believable. Specifically, when asked to what extent they believed that the computerized test was indeed a measure of intelligence, the experimental group ($M = 60.27$, $SD = 27.31$) and control group ($M = 64.46$, $SD = 25.81$) reported similarly high levels, $t(65) = .64$, $p = .522$, $d = .16$. When asked to what extent they believed the announcement that there were problems with the results of their intelligence test, the experimental group ($M = 67.67$, $SD = 33.26$) and the control group ($M = 62.46$, $SD = 39.11$) again reported similarly high levels, $t(65) = -.58$, $p = .565$, $d = .14$. Interestingly, when asked "How bothered are you that you do not have your results right now?" the experimental group reported a higher score than did the control group $t(59.22) = -4.06$, $p < .001$, $d = .88$.

At the end of the experiment, participants were asked about what they thought the problem with their results might be. Attributions for the problem were coded as 1) external (e.g., "There was a computer glitch") or 2) internal (e.g., "My results were too low"). Attributions that did not clearly fall in to one of these two categories (e.g., "No thoughts about what the problem might be") were not considered. In the control group, 11 responses were coded as external, and 2 responses were coded as internal (an additional 6 responses could not be classified). In the experimental group, 3 responses were coded as external and 4 responses were coded as internal (an additional 6 responses could not be classified). A chi square test revealed that attribution

Table 7

Means and Standard Deviations for Manipulation Check Questions Per Condition

	Control *M* (*SD*)	Experimental *M* (*SD*)	*d*
Perform	3.13 (1.41)	2.65 (1.59)	.32
Want	3.66 (2.08)	4.13 (2.41)	.21
Could	3.69 (2.53)	4.78 (2.11)	.47*
Should	3.51 (2.06)	4.18 (2.19)	.31
Bothered	1.84 (1.38)	3.65 (2.50)	.88**
Return	3.51 (2.14)	3.93 (2.51)	.18

Notes: Effect size associated with a statistically significant difference,*p < .05, **p < .01;

Perform = How well do you think you performed on the intelligence test? Want = To what extent

do you want your intelligence results? Could = To what extent do you think that the

experimenter *could* have given you your results? Should = To what extent do you think that the

experimenter *should* have given you your results? Bothered = How bothered are you that you

don't have your results right now? Return = How willing would you be to return in the next few

days to receive your results?

type did not statistically differ as a function of group χ2 (1) = 3.79, *p* = .122 *OR* = 7.33. Despite

not being statistically significant, the magnitude of the effect suggests that the result is of

practical importance given that the likelihood of a participant providing an external attribution

was 7.33 times higher in the control group than in the experimental group.

Prior to main analyses, differences between groups on demographic information, and

scores on questionnaires completed prior to the manipulation were assessed. The groups were

similar in sex (77.8% female in the control group, 85% female in the experimental group, $\chi^2(1) =$

.72, *p* = .422), and age, *t*(83) = -1.43, *p* =.158, *d* = .31. No statistical differences were detected

between the groups for any questionnaire completed prior to the manipulation. Means and

standard deviations per condition for demographic information and questionnaires are presented

in Table 8.

Hypothesis 1

To test the first hypothesis, which was that compared to baseline, participants would report

increases in anxiety following the induction, a repeated measures ANOVA was conducted.

Consistent with the hypothesis, results revealed a statistically significant increase in VAS-

Anxiety scores from baseline (*M* = 26.36, *SD* = 20.68) to post-induction (*M* = 39.35, *SD* = 25.51)

F(1, 84) = 36.05, *p* <.001, partial η^2 = .30. Follow-up paired sample t-tests revealed that the

magnitude of this increase was similar in both groups (Control group *t*(44) = -4.61, *p* < .001, *d* =

.69; Experimental group *t*(39) = -3.88, *p* < .001, *d* = .61).

To assess the specificity of the induction, the effect of the induction on other negative

emotions was examined. Two additional repeated measures ANOVAs were conducted with

VAS-Sadness and VAS-Anger as dependent variables. For VAS-Anger, results showed a

Table 8

Means and Standard Deviations for Demographic Variables and Questionnaires per Condition

	Control *M* (*SD*)	Experimental *M* (*SD*)	*d*
Pre-Manipulation			
Age	22.05 (4.03)	23.67 (6.11)	.32
VAS-Anx1	23.76 (20.34)	29.30 (20.92)	.27
VAS-Sad1	10.02 (13.01)	13.85 (19.97)	.22
VAS-Ang1	4.53 (6.14)	6.97 (11.28)	.26
STICSA-Trait	36.33 (7.70)	37.58 (10.92)	.13
CES-D	14.84 (9.63)	14.50 (11.19)	.03
PSWQ	52.53 (15.40)	53.18 (14.54)	.04
IUS-tot	62.51 (18.63)	63.88 (22.73)	.08
IUS-NI	31.67 (9.64)	30.83 (12.51)	.08
IUS-US	30.84 (10.13)	33.05 (11.63)	.20
STAXI-T	18.04 (6.02)	17.33 (6.88)	.11
AX-Out	13.87 (3.05)	14.53 (4.36)	.18
AX-In	16.69 (3.27)	17.43 (5.10)	.17
AQ-H	21.84 (8.05)	22.53 (9.01)	.08
ARS	35.54 (8.78)	37.35 (11.28)	.18
BFNE	38.04 (11.24)	36.40 (11.80)	.14
VAS-Anx2	36.49 (24.48)	42.58 (26.57)	.24
VAS-Sad2	13.07 (19.70)	20.90 (24.77)	.35
VAS-Ang2	12.16 (20.94)	13.67 (21.59)	.07

Post-Manipulation

VAS-Anx3	31.07 (24.62)	45.43 (29.32)	.53*
VAS-Sad3	13.00 (21.24)	22.13 (25.10)	.40[a]
VAS-Ang3	8.49 (12.21)	20.00 (26.83)	.54*
STICSA-S	29.93 (7.61)	34.08 (11.45)	.42[a]
STAXI-S	17.00 (3.21)	18.79 (4.29)	.47*

Notes: Effect size associated with a statistically significant difference, [a] $p < .10$, *$p < .05$; VAS-Anx = Visual Analogue Scale for Anxiety; VAS-Sad = Visual Analogue Scale for Sadness; VAS-Ang = Visual Analogue Scale for Anger; 1 = Baseline, 2 = Post-induction, 3 = Post-manipulation; STICSA-T = State Trait Inventory for Cognitive and Somatic Anxiety – Trait version; CES-D = Centre for Epidemiological Studies – Depression Scale; PSWQ = Penn State Worry Questionnaire; IUS-tot = Intolerance of Uncertainty Scale- Total score; IUS-NI = Intolerance of Uncertainty Scale – Uncertainty has Negative Implications; IUS-US = Intolerance of Uncertainty Scale – Uncertainty is Unfair; STAXI-T; State Trait Anger Expression Inventory – Trait version; AX-Out = Anger Out; AX-In = Anger In; AQ-H = Aggression Questionnaire-Hostility subscale; ARS = Anger Rumination Scale; BFNE; Brief Fear of Negative Evaluation; STICSA-S = State Trait Inventory for Cognitive and Somatic Anxiety – State version; STAXI-S; State Trait Anger Expression Inventory – State version.

statistical increase from baseline ($M = 5.67$, $SD = 8.92$) to post-induction ($M = 12.86$, $SD = $

21.13) $F(1, 83) = 12.25$, $p = .001$, partial $\eta^2 = .13$. For VAS-Sadness, results showed a statistical

increase from baseline ($M = 11.80$, $SD = 16.61$) to post-induction ($M = 16.70$, $SD = 22.41$) $F(1,$

83) $= 6.99$, $p = .010$, partial $\eta^2 = .08$.

Taken together, it appeared that the induction also served to increase anger and sadness.

Emotion induction experiments commonly report increases in other emotions in addition to

increases in the target emotion, and so to evaluate the specificity of the induction, the magnitude

of the effect for each emotion should be examined (Engebretson, et al., 1999). Therefore, the

effect sizes associated with each emotion reported were compared and assessed for statistical

differences. To do this, the F ratio for each effect (i.e., anxiety, anger, and sadness) was first

converted into an r statistic and then into a Z statistic. The Z score that reflects the distance

between each pair of Z statistics was computed and was deemed statistically significant if greater

than 1.96 in absolute value (Field, 2009). Results were that the effect size associated with the

increase in anxiety (partial $\eta^2 = .30$) was statistically larger than the effect size observed for the

increase in sadness (partial $\eta^2 = .08$) $Z_{distance} = 2.11$, but not for the increase in anger (partial $\eta^2 =$

.13) $Z_{distance} = 1.54$. Therefore, the induction increased anxiety to a greater extent than sadness.

Although the effect size observed for anxiety was large whereas the effect size observed for

anger was moderate (see Cohen, 1992), these effect sizes were not statistically different.

Therefore, it can be concluded that the induction increased both anxiety and anger.

Hypothesis 2

To test the second hypothesis, which was that compared to the control group, the experimental

group would report greater increases in anger following the manipulation, a 2 X 2 mixed

ANOVA was conducted with time as the within subjects factor (post-induction, post-

manipulation), and condition as the between-subjects factor. Results revealed no main effect of time, $F(1, 82) = .22$, $p = .642$, partial $\eta^2 = .00$, no main effect of group, $F(1, 82) = 1.87$, $p = .176$, partial $\eta^2 = .02$, and consistent with the hypothesis, a statistically significant interaction, $F(1, 82) = 9.82$, $p = .002$, partial $\eta^2 = .11$. This interaction is depicted visually in Figure 2. There were no group differences in VAS-Anger scores at post-induction $t(82) = -.33$, $p = .746$, $d = .07$, however, at post-manipulation, VAS-Anger scores in the experimental group were statistically higher than scores in the control group, $t(53.08) = -2.49$, $p = .016$, $d = .55$, which is consistent with the hypothesis. Additional follow up tests revealed that in the control group, VAS-Anger scores statistically decreased from post-induction ($M = 12.16$, $SD = 20.94$) to post-manipulation ($M = 8.49$, $SD = 12.21$), $t(44) = 2.23$, $p = .031$, $d = .33$, whereas in the experimental group, VAS-Anger scores increased from post-induction ($M = 13.67$, $SD = 21.59$) to post-manipulation ($M = 18.62$, $SD = 25.69$) $t(38) = -2.85$, $p = .035$, $d = .35$. Additional support for the hypothesis was obtained given that the experimental group reported higher STAXI-S scores than did the control group at post manipulation, $t(71.63) = -2.15$, $p = .035$, $d = .47$. In sum, the manipulation produced differing patterns of self- report anger as the experimental group reported higher levels of anger at post-manipulation than did the control group. Further, the experimental group reported increased anger from post-induction to post-manipulation, whereas the control group reported decreased anger.

To assess the specificity of the manipulation across conditions, the effects of the manipulation on anxiety and sadness were examined with 2 X 2 mixed ANOVAs. With regard to VAS-Sadness, results revealed no main effect of time $F(1, 82) = .00$, $p = .958$, partial $\eta^2 = .00$, no main effect of group, $F(1, 82) = 2.78$, $p = .099$, partial $\eta^2 = .03$, and no interaction, $F(1, 82) = .01$, $p = .909$, partial $\eta^2 = .00$. Thus, the manipulation did not affect levels of sadness. With regard to
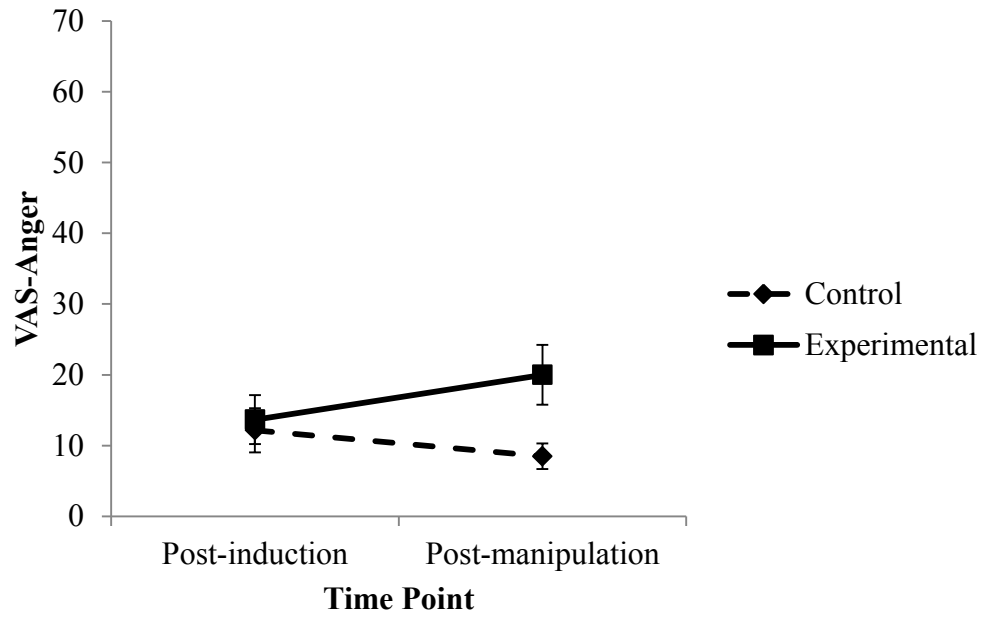
Figure 2 Anger scores from post-induction to post-manipulation in control and experimental groups.

VAS-Anxiety, results revealed no main effect of time, $F(1, 83) = .60, p = .440$, partial $\eta^2 = .01$, and no main effect of group, $F(1, 83) = 3.52, p = .064$, partial $\eta^2 = .04$; however, the interaction was statistically significant $F(1, 83) = 6.21, p = .015$, partial $\eta^2 = .07$. This interaction is depicted visually in Figure 3. Follow-up independent sample t tests revealed similar VAS-Anxiety scores at post-induction $t(83) = -1.10, p = .275, d = .24$, but differing levels at post-manipulation $t(83) = -2.45, p = .016, d = .53$ with the experimental group reporting higher VAS-Anxiety levels than the control group (see Table 8 for means). Follow-up paired sample t tests revealed that in the control group, VAS-Anxiety scores statistically decreased from post-induction ($M = 36.49, SD = 24.48$) to post manipulation ($M = 31.07, SD = 24.62$), $t(44) = 2.49, p = .017, d = .37$ whereas in the experimental group, no change was observed from post-induction ($M = 42.58, SD = 26.57$) to post-manipulation ($M = 45.43, SD = 29.32$), $t(39) = -1.13, p = .267, d = .18$. Finally, as seen in Table 8, group differences were detected on STICSA-S as the experimental group reported higher scores than did the control group, at the level of a statistical trend $t(66.51) = -1.94, p = .056, d = .42$. In sum, the manipulation produced differing patterns of self-report anxiety as the experimental group reported higher levels of anxiety at post-manipulation than did the control group. Further, the experimental group reported similar levels of anxiety from post-induction to post-manipulation, whereas the control group reported decreases in anxiety.

To examine the specificity of the manipulation, the effect sizes associated with each emotion were compared in the manner described for hypothesis 1. Results were that the effect size associated with the increase in anger (partial $\eta^2 = .11$) was statistically larger than the effect size observed for sadness (partial $\eta^2 = .00$) $Z_{distance} = 2.06$, but not for anxiety (partial $\eta^2 = .07$) $Z_{distance} = .44$. Therefore, although the goal of the manipulation was to affect anger alone, the manipulation also affected anxiety.
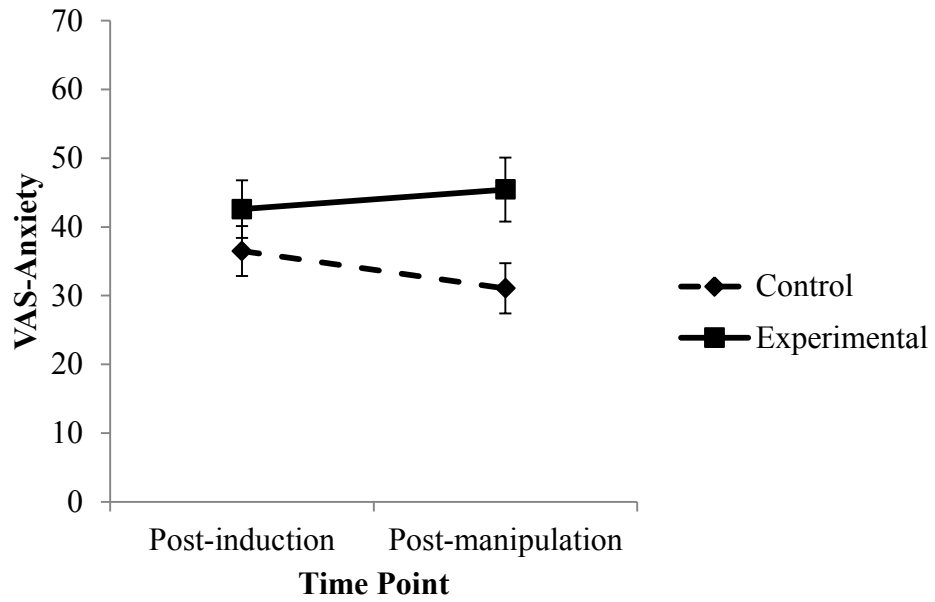
Figure 3. Anxiety scores from induction to post-manipulation in control and experimental

groups.

Exploratory Analyses

Given that the manipulation was designed to create two types of uncertain situations: avoidable and unavoidable uncertain situations, we explored whether IU-NI and IU-US accounted for post-manipulation levels of state anger and anxiety above and beyond baseline state and trait levels in each group separately. A total of 4 hierarchical regressions were conducted; two with the VAS-Ang3 as the criterion variable (one for each group), and 2 with the VAS-Anx3 as the criterion variable (one for each group). In all regressions, VAS-Ang1 or VAS-Anx1 (i.e., baseline state levels) scores were entered in the first step, STAXI-T and STICSA-T (i.e., baseline trait levels) scores were entered in the second step, and IUS-NI and IUS-US scores were entered in the third step. The IUS-NI and IUS-US did not account for additional variability in VAS-Ang3 scores in the control group ($\Delta R^2 = .02$, $p = .556$), but did account for additional variability in the experimental group ($\Delta R^2 = .12$, $p = .015$). As seen in Table 9, only the IUS-US (and not the IUS-NI) was a significant predictor, $\beta = .59$, $p = .015$. Similarly, the IUS-NI and IUS-US accounted for additional variability in VAS-Anx3 scores in the experimental group ($\Delta R^2 = .15$, $p = .008$), but not in the control group ($\Delta R^2 = .01$, $p = .511$). Again, only the IUS-US was a significant. predictor, $\beta = .65$, $p = .006$. Thus, it appears that when faced with an avoidable uncertain situation, the belief that uncertainty is unfair explains increases in anger and anxiety.

Discussion

The goal of the current study was to induce a state of uncertainty and then to experimentally create one of two conditions: 1) an uncertain state that is avoidable or 2) an uncertain state that is unavoidable. The first hypothesis was that anxiety would be greater following the induction than at baseline. Results support this hypothesis; increases in anxiety were observed from baseline to

Table 9

Examining the Unique Contributions of IU-NI and IU-US to Anger and Anxiety

	Control			Experimental		
	ΔR^2	β	*p*	ΔR^2	β	*p*
VAS-Anger3						
Step 1	.11*			.22**		
VAS-Ang1		.33	.026		.47	.002
Step 2	.16*			.22**		
VAS-Ang1		.29	.035		.33	.023
STICSA-T		.29	.036		-.27	.106
STAXI-T		.28	.043		.62	.001
Step 3	.02			.12*		
VAS-Ang1		.28	.053		.32	.014
STICSA-T		.29	.131		-.66	.008
STAXI-T		.32	.037		.35	.061
IUS-NI		.22	.345		.121	.620
IUS-US		-.23	.327		.591	.015
VAS-Anxiety3						
Step 1	.50***			.33***		
VAS-Anx1		.71	<.001		.57	<.001
Step 2	.09*			.04		
VAS-Anx1		.65	<.001		.49	.002
STICSA-T		.18	.101		.06	.754

STAXI-T		.23	.025	.19	.287
Step 3	.01			.15**	
VAS-Anx1		.63	<.001	.42	.003
STICSA-T		.27	.087	-.21	.380
STAXI-T		.28	.014	-.10	.591
IUS-NI		.05	.757	.01	.984
IUS-US		-.19	.278	.65	.006

Notes: ** $p < .01$, * $p < .05$; VAS = Visual Analogue Scale (1 = Baseline, 3 = post-manipulation); STICSA-T = State Trait Inventory for Cognitive and Somatic Anxiety- Trait version; STAXI-T = State Trait Anger Expression Inventory- Trait version; IUS-NI = Intolerance of Uncertainty-Scale- Uncertainty has Negative Implications; IUS-US = Intolerance of Uncertainty-Scale- Uncertainty is Unfair.

post-induction. The second hypothesis was that the manipulation would produce differing patterns of anger in the experimental and control conditions. More specifically, it was expected that in the experimental group, an increase in anger would be observed from post-induction to post-manipulation, whereas in the control group, no change in anger would be observed. Consistent with the hypothesis, results were that that in the experimental group, anger increased from post-induction to post-manipulation. Unexpectedly, results showed that in the control group, anger decreased from post-induction to post-manipulation.

The Anxiety Induction

Although the induction produced the expected increase in anxiety, increases in anger were observed as well. Given the frustrating and unpleasant nature of the task, it is not surprising that anger was also affected (Berkowitz, 2012). A comparison of the effect sizes associated with each increase revealed that while the effect size associated with the increase in anxiety (partial η^2 = .30) was numerically stronger than the effect size associated with the increase in anger (partial η^2 = .13), this difference was not statistically significant. Because emotion induction paradigms typically produce increases in other emotions in addition to the target emotion (e.g., Polivy, 1981), authors highlight the importance of noting a stronger increase in the target emotion (Lobbestael et al., 2008). Importantly, emotion inductions are deemed specific when effect sizes for the target emotion are numerically stronger than effect sizes for non-target emotions (e.g., Lobbestael et al.). For the current study, a more conservative criterion to establish specificity was used; specifically, a statistically stronger effect size was required, which leads to the conclusion that the induction was only somewhat specific to anxiety.

The Manipulation

The manipulation produced increases in anger in the experimental group only, which supports the proposition that relative to unavoidable uncertainty, avoidable uncertainty leads to anger. In fact, of the negative emotions assessed, anger was the only emotion to increase in the experimental group following the manipulation (i.e., there were no changes in anxiety or sadness). Therefore, the extent to which one's state of uncertainty is perceived as avoidable might be an important determinant to the onset of anger. Given that in the current study, an identifiable individual (the experimenter) could be held responsible for the continuing state of uncertainty, appraisals of blame or other accountability may have been primed to a greater extent in experimental group compared to the control group (Smith & Lazarus, 1993). If blame-related appraisals were more accessible in memory, this may account for the increases in anger observed in the experimental group. The finding that anger is increased following avoidable uncertainty compared to unavoidable uncertainty suggests that therapeutic efforts to increase tolerance for uncertainty should also address appraisals that the state of uncertainty is avoidable. It is possible that greater reductions in negative affect would occur if these appraisals were targeted.

Unexpectedly, decreases in anger and anxiety from post-induction to post-manipulation were observed in the control group. That is, receiving information that the experimenter did not know the nature of the problem led to decreases in anger and anxiety. It is possible that the information delivered to the control group was unintentionally calming for participants. There was a tendency for participants in the control condition to attribute the problem to external sources (e.g., computer glitch) rather than to internal sources (e.g., problem with their intelligence), and although this effect was not statistically significant, the effect size suggests practical importance. In contrast, participants in the experimental condition were equally likely to attribute the cause of the problem to external or internal sources. Conceivably, attributions that

the problem was due to external forces led to decreases in negative affect in the control group (McFarland & Ross, 1982); however, it is also possible that decreases in negative affect lead to more external attributions. Because attributions were assessed at the end of the experiment, it is not possible to determine the directionality of this relationship.

Avoidable Uncertainty or Proximity to Threat?

The goal of the manipulation was to experimentally create two types of uncertainty eliciting situations: avoidable and unavoidable. Despite careful efforts to ensure that the manipulation affected the intended construct only, it is possible that the manipulation affected proximity to threat. Specifically, the possible threat (i.e., low intelligence result) may have been more proximal in the experimental than control group. In the experimental group, the experimenter announced the she knew what the problem was whereas in the control group, the experimenter announced that she did not know what the problem was. Therefore, the knowledge about the potential threat (low intelligence result) was in physical proximity in the experimental group only. Given that proximal threats produce more arousal and create more distress than do distal threats (Riskind, 1997; Wise, Eckler, Konova, & Littau, 2009), group differences may be attributable to proximity of threat rather than to avoidable uncertainty. In addition, compared to the control group, the experimental group reported that they were more bothered by the fact that they did not have their intelligence test results, which is consistent with the notion that the threat was more proximal for participants in this group. It will be important for future studies seeking to manipulate the avoidability of uncertain situations to ensure that the proximity to threat is equivalent across groups.

Avoidable Uncertainty or Differing Attributions?

Conclusions about the nature of the problem varied; this was expected, as participants in both groups were unaware of the cause of the problem. Individuals in the control group tended to provide a benign (external) rather than negative (internal) explanation for the problem. To consider the proximity of threat, it is necessary to first acknowledge the existence of threat. Considering the tendency for individuals in the control group to provide benign (non-threatening) explanations, the potential for threat may not have been considered. Therefore, it is possible that the current findings are due to the experimental group reporting more threat-related attributions than the control group. It is important to mention that data about attributions were not collected for the entire sample and that many attributions could not be classified. Therefore, conclusions about how attributions might account for the current findings are preliminary and require further investigation. Nonetheless, it will be important to determine whether or not experimentally created avoidable and unavoidable uncertain situations can produce similar attributions across groups or if differing patterns continue to emerge.

Accounting for Anger and Anxiety

Considering the nature of the two uncertainty eliciting situations, we explored how the two beliefs about uncertainty (uncertainty has negative implications and uncertainty is unfair) predicted increases in negative emotions in both groups separately. As mentioned in the introduction and outlined in Figure 1, the belief that uncertainty is unfair is proposed to be more closely associated with heightened expectations for certainty (this hypothesis was confirmed in study 1) and would therefore be associated with appraisals of avoidability and consequently, feelings of anger. Results showed that beliefs about uncertainty explained increases in anger in the experimental group only, and that this increase in anger was predicted by the belief that uncertainty is unfair only. In other words, it appears that the belief that uncertainty is unfair leads

to increased anger when one is faced with an avoidable uncertainty eliciting situation whereas the belief that uncertainty has negative implications does not. Interestingly, this effect is not specific to anger as the belief that uncertainty is unfair also predicted increased anxiety in the experimental condition. These findings fit nicely with previous research demonstrating associations between IU and anger (Fracalanza et al., 2014) and IU and anxiety (Meeten, Dash, Scarlet, & Davey, 2012), and suggest that avoidable uncertainty might be relatively more important than unavoidable uncertainty.

Excluded Participants

The number of excluded participants warrants attention; 46 out of 131 individuals were excluded prior to data analysis. Of the 46, 39 were excluded due to a failed manipulation check question. That is, despite receiving information that the experimenter knew (experimental) or did not know (control) the nature of the problem, 39 individuals responded incorrectly to the question "Does your experimenter know what your results are?" A number of explanations are possible. First, elevated anxiety during the manipulation may have interfered with participants' ability to attend to and remember what was being said. As seen in Table 2, anxiety levels were relatively high prior to the manipulation, and it is likely that the experimenter re-entering the room to discuss intelligence test results produced even higher levels of anxiety, which may have impacted manipulation receipt. Second, the time delay between the manipulation and the manipulation check question may have contributed to the error rate. Finally, the wording of the manipulation check question may have been problematic because the question did not distinguish between what participants were told and what participants believed. That is, participants may have heard and understood the experimenter, but believed something different. For example, despite understanding the experimenter's explanation that she was not aware of the intelligence

test results, some participants may have believed that to be untrue and instead believed that the experimenter did in fact have the results.

Conclusion

Results from the current study support the hypothesis that avoidable uncertainty leads to anger. Although future studies are required to address limitations and alternate explanations for the findings, it does appear that the extent to which an uncertainty eliciting situation is avoidable might be an important factor that can account for the co-occurrence of anger and anxiety. Given that most research examining the relationship between anger and anxiety is correlational (e.g., Deschênes, Dugas, Fracalanza, & Koerner, 2012; Moscovtich, McCabe, Antony, Rocca, & Swinson, 2008), this study represents an important step in understanding the nature of the relationship between anger and anxiety.

CHAPTER 4:

GENERAL DISCUSSION

This program of research explored the relationship between anxiety and anger across two studies. The main goal was to determine if violated expectations for certainty could account for the co-occurrence of anxiety and anger. In the first study, a new measure was developed to assess expectations for certainty. In the second study, a state of uncertainty was induced and then manipulated to be either avoidable or unavoidable to observe its effects on anxiety and anger.

Summary of Findings

Study 1. In study 1, we developed the VEC-D to assess expectations for certainty. The VEC-D included modified versions of ambiguous scenarios used from previously validated measures (i.e., Ambiguous Unambiguous Situations Diary, Davey et al., 1992) as well as ambiguous scenarios created specifically for this study. Each scenario involved an element of uncertainty that could be perceived as avoidable, and participants' expectations for certainty were assessed via a series of questions. The word "expect" contains multiple connotations. That is, an individual's expectations for certainty can reflect the belief that an event *should* occur and/or the belief that an event *will* occur. We therefore assessed the relative associations of each of these beliefs with the expectation for certainty.

Our results demonstrated that, in the context of avoidable uncertainty, expectations for certainty more closely reflect the belief that one *should* attain certainty rather than the belief that one *will* attain certainty. Of note, the belief that one *should* attain certainty was more closely associated with the belief that uncertainty is unfair than with the belief that uncertainty has negative implications. This finding is consistent with previous research (Fracalanza et al., 2014), as well as the proposed relationship between beliefs about uncertainty and expectations for certainty depicted in Figure 1. Using an exploratory factor analysis, we found that a two-factor

structure best fit the data of the VEC-D. The first factor reflected avoidable uncertainty in which the potential negative outcome is not socially-related (e.g., the train you take every morning to get to work is now 10 minutes late) and the second factor reflected avoidable uncertainty in which the potential negative outcome is socially-related (e.g., you call up a friend and suggest going out. S/he says s/he cannot go with you). It is noteworthy that compared to social scenarios, non-social scenarios elicited stronger endorsements of statements that (A) certainty should occur, (B) it would be surprising if certainty did not occur, and (C) it would be bothersome if certainty did not occur. In other words, non-social scenarios involving avoidable uncertainty increased feelings of surprise or being bothered and increased the belief that certainty should occur to a greater extent than socially-related scenarios. Finally, the VEC-D demonstrated good psychometric properties with excellent test-retest reliability, good internal consistency, as well as evidence of convergent and divergent validity.

Study 2. In study 2, we experimentally induced a state of uncertainty by withholding participants' results from a challenging mock intelligence test. Participants were randomized to one of two feedback conditions: half of participants received "avoidable uncertainty" feedback (i.e., told that the experimenter knew the test results but could not disclose them), whereas the other half of participants received "unavoidable uncertainty" feedback (i.e., told that the experimenter did not know the test results and was therefore unable to disclose them). The uncertainty induction was successful, as we observed increased self-reported anxiety from baseline to post-induction.

Following the manipulation, results supported the hypothesis that avoidable uncertainty leads to increases in anger. Participants in the avoidable uncertainty condition reported significant increases in anger from post-induction to post-manipulation. This manipulation

appears to have been anger-specific, rather than affecting general negative affectivity: no changes occurred in anxiety or sadness in the avoidable uncertainty condition. Although no changes in emotional states were expected for individuals in the unavoidable uncertainty condition, we observed decreases in both anger and anxiety from post-induction to post-manipulation. As previously discussed, this decrease in anger and anxiety may have been due to a relatively greater number of external compared to internal attributions provided. Overall, results from study 2 support the hypothesis that avoidable uncertainty leads to anger.

Future Directions

The VEC-D includes 18 uncertainty-eliciting scenarios that could be perceived as avoidable. It is possible that the inclusion of different scenarios would improve the validity of this measure. Specifically, different scenarios may elicit expectations for certainty to a greater degree than the current scenarios included in the VEC-D. To generate new scenarios, qualitative interviewing may prove useful. Specifically, conducting comprehensive interviews regarding the situations in which uncertainty is appraised as avoidable may provide a wider range of scenarios that could be incorporated into the VEC-D. The extent to which the inclusion of different scenarios could improve the psychometric properties (and value) of the VEC-D is an avenue for future research.

In addition to extending the range of scenarios in the VEC-D, qualitative interviews would produce descriptive information about the nature of avoidable uncertainty that could direct future research. Such information could include the frequency that avoidability appraisals are considered in uncertainty eliciting situations as well as the proportion of uncertainty eliciting situations that can be categorized as avoidable relative to unavoidable. If this descriptive information is first established in a non-clinical sample, comparisons can then be made to a

clinical sample or to a sample of individuals who are relatively high in IU. With this information, future research could determine whether the frequency or outcome of avoidability appraisals changes following successful treatment for angry or anxious affect.

The intent was to include uncertainty-eliciting scenarios in the VEC-D that could be perceived as avoidable; however the "avoidableness" of each scenario was determined by the research team. Therefore, it is possible that participants did not perceive these scenarios being potentially avoidable. Future research should establish that the uncertainty elicited by these scenarios is indeed perceived as being potentially avoidable.

As seen in Figure 1, we propose that a negative interpretation of uncertainty results in anxiety and is followed by appraisals of avoidability. This temporal sequence was derived based on the possibility that avoidability appraisals require additional time to become salient. In other words, individuals may need to devote cognitive energy to consider potential ways in which their state of uncertainty could have been avoided. For this reason, a wait period of 5 minutes was included in study 2. Undoubtedly, research is needed to determine the speed with which these appraisals are made. Moreover, although we propose that avoidability appraisals follow rather than precede anxiety, empirical testing is required to determine the temporal sequence of events.

Our results are likely to differ in clinically anxious individuals or those high in IU. For example, given their relative intolerance of uncertainty, it is unlikely that clinically anxious individuals would report declines in negative affect as was observed for participants in the control condition of study 2. That is, although the situation was manipulated such that the state of uncertainty was unavoidable (i.e., the experimenter did not know the results and therefore could not disclose them), individuals with clinical levels of anxiety may persist in their belief that their state of uncertainty is avoidable. For example, statements such as "She should have made sure

that she could give me my results before this experiment started" may lead to conclusions that the state of uncertainty could have been avoided. In other words, the criteria used to conclude that expectations for certainty are violated may be less stringent for clinically anxious individuals.

Anger and Anxiety: A Functional Relationship?

The goal of this program of research was to explore the nature of the association between anxiety and anger and to propose a cognitive model that would account for this association. Although shared characteristics such as negative emotionality and biased cognitive interpretations may partially account for the co-occurrence of anxiety and anger (Wenzel & Lystad, 2005), it is possible that differing perceptions of control point to a functional relationship between anxiety and anger. Unlike anxiety, anger is associated with a perceived sense of control as evidenced by its association with the motivation to approach the source of the threat (e.g., Harmon-Jones, 2004). Because anxiety is associated with a lack of perceived control (Gallagher, Bentley, & Barlow, 2014) episodes of anger may represent an attempt to regain a subjective sense of control. There is evidence to suggest that when individuals perceive a lack of control, they engage in behaviours aimed at regaining feelings of control. For example, Friedland, Keinan, and Regev (1992) asked participants to play a lottery game under conditions of high or low stress. Relative to the low stress condition, individuals in the high stress condition preferred to select their lottery numbers as opposed to allowing the computer to generate numbers for them. Although both options contained equal probabilities of success, Friedland et al argued that *the act of choosing* one's lottery numbers encourages feelings of control, which explains why it was selected at a higher frequency in the high-stress condition. Interestingly, participants in the high stress condition continued to select the option that provided greater perceptions of control

even when this option was manipulated to have a lower probability of success. In other words, even though it lowered their chances of success, participants preferred the option that enabled them to regain feelings of control. Although some research demonstrates that reducing perceived control increases anger (Carmony & DiGuiseppe, 2003), it may be that the experience of anger following such a manipulation is a strategy used to regain a sense of control. Future research is needed to address the possibility that anger can be used to increase perceived control.

Not all Uncertainty is Alike

The general theme of the current research was that a state of uncertainty can be appraised as being either avoidable or unavoidable, and that emotional reactions to uncertainty will differ based on this appraisal. This delineation of avoidable versus unavoidable uncertainty represents a novel contribution to the field, in addition to the focus on the resulting emotional states. Generally, clinical research has focused on IU as a characteristic of anxious individuals (e.g., Genetes & Ruscio, 2011) without a discussion of how (or if) states of uncertainty may differ. For the purpose of the current research, the extent to which one's uncertain state is avoidable was proposed to be an important distinguishing factor for uncertain states. However, other distinguishing factors for uncertain states exist. In the field of social psychology, Wilson, Centerbar, Kermer, and Gilbert (2005) noted that when a positive event contains elements of uncertainty, positive mood persists longer as compared to positive events containing no uncertainty. For instance, if the source of a compliment is unclear (i.e. the deliverer of the compliment is unknown), the recipient's positive affect lasts longer than if its source is unambiguous (i.e., the deliverer of the compliment is known; Wilson et al., 2005). Therefore, uncertainty associated with a positive event is another dimension that can differentiate the type

of uncertainty. Taken together, it appears that not all uncertainty is alike and utility may be derived from identifying these nuances.

Concluding Remarks

Results from studies 1 and 2 assess part of the sequence of events depicted in Figure 1. In study 1, expectations for certainty were assessed and were more closely associated with the belief that uncertainty is unfair compared to the belief that uncertainty has negative implications. Results from study 2 support the assertion that avoidable uncertainty leads to anger. Admittedly, the current program of research represents a first step in this area of research, and does not assess all of the proposed sequences of events depicted in Figure 1. Further research is required to provide support for the proposed relationships among constructs. For example, it is unknown if those with heightened expectations for certainty conclude that uncertainty-eliciting situations are more often avoidable than unavoidable. As mentioned previously, qualitative interviewing to fully capture the nature of expectations for certainty may prove useful. In addition, an investigation of avoidable and unavoidable uncertainty in clinically-anxious populations may identify the threshold at which expectations for certainty are violated.

There are numerous correlational studies demonstrating an association between anxiety and anger (e.g., Hawkins & Cougle, 2011; Moscovtich, et al., 2008). This program of research represents a novel contribution to the understanding of this association. Given that problematic anger appears to interfere with the treatment of anxiety disorders (Erwin, Heimberg, Schneier, Liebowitz, 2003), identifying specific factors that underlie the co-occurrence of both emotions may unveil novel targets for therapeutic intervention. The current results suggest that appraisals of avoidability in uncertainty-eliciting situations may be one such factor.

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Appendix A

Consent Form for Study 1

CONSENT TO PARTICIPATE IN RESEARCH

This is to state that I agree to participate in a program of research being conducted by Kristin Anderson, under the supervision of Dr. Michel Dugas in the Department of Psychology at Concordia University. Kristin Anderson may be reached at 514-848-2246 ext. 2246 or by email at k_and@live.concordia.ca

A. PURPOSE

I have been informed that the purpose of the research is to validate a new measure which assesses reactions to different types of situations.

B. PROCEDURES

I have been informed that I will first be asked to read and sign this consent form. Next, I will be asked to fill out a general information form and 11 questionnaires online. The completion of this study will take approximately 45 minutes. I will receive 1 participant pool credit as compensation for my participation. Code numbers alone will be used to identify the questionnaires. I understand that my participation in the study, and the information I provide, are strictly confidential. I understand that I am free to discontinue my participation in the study at any time without negative consequences.

I understand that I will be asked to complete one questionnaire online approximately 2 weeks later. Participation in the retesting session will take approximately 15 minutes and I will receive another participant pool credit for completing the retesting session.

C. RISKS AND BENEFITS

There is minimal risk associated with this study, however, it is possible that some of the questions I am about to answer may temporarily cause slight uneasiness. All questionnaires, except one, have been used in previous research and discomfort is rare. If I experience uneasiness or discomfort during testing, I should contact the experimenter.

I will benefit from my participation in this study in that I will contribute to the development of a new measure that will be used in future research.

D. 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 ANONYMOUS (i.e., my participation will be tracked to provide course credit, but it will be impossible for my data to be linked to my identity).

- I understand that the data from this study may be published.

If you have questions about this study, please contact the study's Principal Investigator, Dr. Michel Dugas of the Department of Psychology at Concordia University at 514-848-2424 ext. 2215 or by email at Michel.Dugas@concordia.ca.

If you have questions about your rights as a research participant, please contact the Research Ethics and Compliance unit, Concordia University, Kyla Wiscombe, at (514) 848-2424 x2425 or by email at kwiscomb@alcor.concordia.ca .

I HAVE CAREFULLY STUDIED THE ABOVE AND UNDERSTAND THIS AGREEMENT. IF I CONSENT AND VOLUNTARILY AGREE TO PARTICIPATE IN THIS STUDY, I WILL PROCEED WITH THE QUESTIONS BELOW.

Appendix B

Violation of Expectations for Certainty Diary (VEC-D)

VEC-D

Please imagine that the following situations are happening to you. Each situation is followed by 5 questions which assess your reaction to the situation. Please respond to each question using the 1-8 rating scale and make only one rating on each scale. There are no right or wrong answers; just decide how you would feel in each situation.

1. **You call up a friend and suggest going out. S/he says s/he can't go with you.**

    *To what extent do you **expect** your friend to tell you why s/he can't go with you?*

    Not at all   Completely

    ....1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……

    *To what extent **should** your friend tell you why s/he can't go with you?*

    Not at all   Completely

    ....1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8………

    *What is the **likelihood** that your friend will explain why s/he can't go with you?*

    Not at all   Completely

    ....1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8………

    *How **surprised** would you be if your friend did not explain why s/he can't go with you?*

    Not at all   Completely

    ....1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8………

    *How **bothered** would you be if your friend did not offer an explanation as to why s/he can't go with you?*

    Not at all   Completely

    ....1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8………

2. **You're talking with a small group of colleagues. Just as you start to**

speak, someone gets up to leave the group.

*To what extent do you **expect** your colleague to explain why s/he's leaving?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*What is the **likelihood** that your colleague will explain why s/he's leaving?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*To what extent **should** your colleague explain why s/he's leaving?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*How **surprised** would you be if your colleague left without an explanation?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*How **bothered** would you be if your colleague left without an explanation?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

3. **Someone you know walks past you on the street.**

*To what extent do you **expect** to be greeted by the person you know?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8………
.

*To what extent **should** you be greeted by the person you know?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*What is the **likelihood** that you will be greeted?*

      Not at all   Completely

..............1...... ......2...... ......3..... ......4...... ......5..... ......6...... ......7...... ..…8.…......

*How **surprised** would you be if you weren't greeted?*

      Not at all   Completely

..............1...... ......2...... ......3..... ......4...... ......5..... ......6...... ......7...... ..…8.…......

*How **bothered** would you be if you weren't greeted?*

      Not at all   Completely

..............1...... ......2...... ......3..... ......4...... ......5..... ......6...... ......7...... ..…8.…......

4. **You're having a routine chest x-ray. The doctor looks carefully at the images and then asks the nurse to take more x-rays.**

*To what extent do you **expect** your doctor to explain why you require additional x-rays?*

      Not at all   Completely

..............1...... ......2...... ......3..... ......4...... ......5..... ......6...... ......7...... ..…8.…......

*What is the **likelihood** that your doctor will provide an explanation?*

      Not at all   Completely

..............1...... ......2...... ......3..... ......4...... ......5..... ......6...... ......7...... ..…8.…......

*To what extent **should** your doctor explain why you require additional x-rays?*

      Not at all   Completely

..............1...... ......2...... ......3..... ......4...... ......5..... ......6...... ......7...... ..…8.…......

*How **surprised** would you be if your doctor did not provide an explanation?*

      Not at all   Completely

..............1...... ......2...... ......3..... ......4...... ......5..... ......6...... ......7...... ..…8.…......

*How **bothered** would you be if your doctor did not provide an explanation?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...….8……….

5. **A few days ago, you went out on a date with a colleague and had a really good time. At the end of the date s/he said they would call.**

*To what extent do you **expect** your date to have called by now?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...….8……….

*To what extent **should** your date have called by now?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...….8………
*What is the **likelihood** that your date will call soon?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...….8……….

*How **surprised** would you be if your date did not call by now?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...….8……….
*How **bothered** would you be if your date did not call by now?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...….8……….

6. **While you were out, your friend called and left a message on your voicemail saying that s/he needs to talk about something important.**
*To what extent do you **expect** your friend to tell you on the voicemail what the conversation will be about?*

Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8……….

*What is the **likelihood** that your friend will tell you on the voicemail what the conversation will be about?*

     Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8……….

*To what extent **should** your friend tell you on the voicemail what the conversation will be about?*

     Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8……….

*How **surprised** would you be if your friend did not tell you what the conversation would be about?*

     Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8……….

*How **bothered** would you be if your friend did not tell you what the conversation would be about?*

     Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8……….

7. **You hear a rumour that your supervisor will announce a team meeting to discuss major changes to the salary structure in your company.**

*To what extent do you **expect** your supervisor to clarify whether the changes will be positive or negative?*

     Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8……….

*To what extent **should** your supervisor clarify during the announcement whether the changes will be positive or negative?*

     Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8……….

*What is the **likelihood** that your supervisor will clarify whether the changes will be positive or negative?*

      Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8………

*How **surprised** would you be if your supervisor does not clarify whether the changes will be positive or negative?*

      Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*How **bothered** would you be if your supervisor does not clarify whether the changes will be positive or negative?*

      Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

8. **While driving to a new restaurant one evening, you discover that the route to get there is closed for construction.**

*To what extent do you **expect** there to be a detour sign that will help you get you to your destination?*

      Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*What is the **likelihood** that there will be a detour sign?*

      Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*To what extent **should** there be a detour sign that will help you get you to your destination?*

      Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*How **surprised** would you be if there was no detour sign?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

How **bothered** would you be if there was no detour sign?

Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

9. You haven't spoken to a friend in over a year, so last week you sent an e-mail.

To what extent do you **expect** your friend to have responded to your e-mail by now?

Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

To what extent **should** your friend have responded to your e-mail by now?

Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

What is the **likelihood** that your friend will write back soon?

Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

How **surprised** would you be if your friend hasn't written back yet?

Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

How **bothered** would you be if your friend hasn't written back yet?

Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

10. Your last exam of the semester took place 3 weeks ago.

To what extent do you **expect** to have received your grades by now?

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*What is the **likelihood** that you will receive your grades soon?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*To what extent **should** you have received your grades by now?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*How **surprised** would you be if you haven't received your grades yet?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*How **bothered** would you be if you haven't received your grades yet?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

11. The train you take every morning to get to work is now 10 minutes late.

*To what extent do you **expect** an announcement to be made about when the train will arrive?*

Not at all   Completely
...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7.... ...…8…

*To what extent **should** there be an announcement made about when the train will arrive?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*What is the **likelihood** that there will be an announcement?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*How **surprised** would you be if no announcement is made?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*How **bothered** would you be if no announcement is made?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

12. **The metro you're riding comes to an abrupt stop between 2 stations and the alarm goes off.**

*To what extent do you **expect** to be informed about why the alarm went off?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*What is the **likelihood** that you will be informed about why the alarm went off?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*To what extent **should** you be informed about why the alarm went off?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*How **surprised** would you be if you weren't informed about why the alarm went off?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*How **bothered** would you be if you weren't informed about why the alarm went off?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

13. Your teacher asks to speak with you after class.

*To what extent do you **expect** your teacher to tell you what s/he wants to talk about?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*To what extent **should** your teacher tell you what s/he wants to talk about?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*What is the **likelihood** that your teacher will tell you what s/he wants to talk about?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*How **surprised** would you be if your teacher doesn't tell you what s/he wants to talk about?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

*How **bothered** would you be if your teacher doesn't tell you what s/he wants to talk about?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

14. **Three weeks ago, you went to the doctor for some tests. The doctor told you that s/he would call with the results.**

   *To what extent do you **expect** your doctor to have called you with the results by now?*

   Not at all   Completely

   ....1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8……….

   *What is the **likelihood** that your doctor will call soon?*

   Not at all   Completely

   ....1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8……….

   *To what extent **should** your doctor have called you with the results by now?*

   Not at all   Completely

   ....1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8……….

   *How **surprised** would you be if your doctor hasn't called by now?*

   Not at all   Completely

   ....1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8……….

   *How **bothered** would you be if your doctor hasn't called by now?*

   Not at all   Completely

   ....1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8……….

15. **You're making an online purchase when you receive a call from an employee at the company that there is a problem with your credit card.**

   *To what extent do you **expect** the employee to explain what the problem is with your credit card?*

   Not at all   Completely

   ....1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8……….

   *To what extent **should** the employee explain the problem with your credit card?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8..........

*What is the **likelihood** that the employee will explain the problem with your credit card?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8..........

*How **surprised** would you be if the employee did not explain the problem
with your credit card?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8..........

*How **bothered** would you be if the employee did not explain the problem
with your credit card?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8..........

**16. You've been waiting for 30 minutes at the drugstore for the pharmacist to
process your prescription.**

*To what extent do you **expect** the pharmacist to inform you about the status of your
prescription?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8..........

*What is the **likelihood** that the pharmacist will inform you about the status of your
prescription?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8..........

*To what extent **should** the pharmacist inform you about the status of your prescription?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ......8..........

*How **surprised** would you be if the pharmacist does not inform you about the status of your prescription?*

       Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ..….8……….

*How **bothered** would you be if the pharmacist does not inform you about the status of your prescription?*

       Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ..….8……….

17. You're waiting to pick up your father outside the baggage claim area of the airport. According to the arrival and departure information screen, your father's plane landed 40 minutes ago.

*To what extent do you **expect** to be informed about when the passengers should arrive at baggage claim?*

       Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ..….8……….

*To what extent **should** you be informed about when the passengers should arrive at baggage claim?*

       Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ..….8……….

*What is the **likelihood** that you will be informed about when the passengers will arrive at baggage claim?*

       Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ..….8……….

*How **surprised** would you be if you were not informed about when the passengers should arrive at baggage claim?*

       Not at all   Completely

..............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ..….8……….

*How **bothered** would you be if you were not informed about when the passengers should arrive at baggage claim?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8……….

18. **Your close friend came over for dinner. At the end of the night, your friend opts to walk home, but it's late and dark, so you asked your friend to call you when s/he arrives home. Although it usually takes your friend 15 minutes to walk home, after 30 minutes, you still have not received a call.**

*To what extent do you **expect** your friend to have called by now?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8…….

*What is the **likelihood** that your friend will call soon?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8…….

*To what extent **should** your friend have called by now?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8…….

*How **surprised** would you be if your friend hasn't called after 30 minutes?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8…….

*How **bothered** would you be if your friend hasn't called after 30 minutes?*

Not at all   Completely

...............1...... ......2...... ......3...... ......4...... ......5...... ......6...... ......7...... ...…8…….

Appendix C

Consent Form for Study 2 (pre-study)

CONSENT FORM TO PARTICIPATE IN RESEARCH

This is to state that I agree to participate in a program of research being conducted by Kristin Anderson, under the supervision of Dr. Michel Dugas (Michel.Dugas@concordia.ca) of the Department of Psychology at Concordia University.

A. PURPOSE

I have been informed that the purpose of this research is to examine the relationship between intelligence and emotions/states associated with anxiety.

B. PROCEDURES

After reading and signing this consent form, you will be asked to complete a series of questionnaires that assess emotions related to anxiety followed by a computerized intelligence test. The final part of the experiment includes a second series of questionnaires. The experiment lasts approximately 1 hour and 15 minutes.

C. RISKS AND BENEFITS

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. Benefits from participating in the current experiment include receiving 1.5 Participant Pool points, and enabling a better understanding of the relationship between emotions and intelligence.

D. CONDITIONS OF PARTICIPATION

- I understand that I am free to withdraw my consent and discontinue my participation at any time without negative consequences.
- I understand that my participation is 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 _____

Date _____

If at any time you have questions about the proposed research, please contact the study's Principal Investigator Dr. Michel Dugas, Department of Psychology, Michel.dugas@concordia.ca.

If you have questions about your rights as a research participant, please contact the Research Ethics and Compliance Advisor, Concordia University, 514.848.2424 ex. 7481 ethics@alcor.concordia.ca

Appendix D

Script for Manipulation for Experimental and Control Groups

Experimental Condition:

 "There are problems with the results of your intelligence test. I've just spent the past 5 minutes reviewing the problems, and so I know what they are, and the nature of the problem is really clear to me. I actually have your results right here in this folder. I would really like to discuss it with you, because it's really important that you know what's going on. The issue is that in our lab, we have a protocol that when there are problems with someone's intelligence results, we have to inform our supervisor Dr. Michel Dugas before we can discuss anything with the participant. Once Dr. Dugas reviews your results, then he gives permission for me to discuss it with you. It only takes him a few minutes to review your file, but he has to do that before I am permitted to discuss it with you. The thing is that it's INSERT DAY, and he sees patients at the hospital today, so I actually can't get in touch with him. I feel badly because I'd really like to tell you what's happened with your intelligence test. He should be back at the university tomorrow, so hopefully I can get in contact with him to review your file. We can discuss this more at the end of the study. When there are problems with intelligence results, I have to create a report for ethics that states that you did not receive your intelligence results today. I need to create the report immediately because I'll need to get your signature on it before you leave. It doesn't take long, I will be back in about 5 minutes and we can finish up the rest of the experiment.

Control Condition:

 "There are problems with the results of your intelligence test. Unfortunately, I actually don't know what those problems are. When there are problems with intelligence results, the results don't show up on my computer and instead are sent directly to my supervisor Dr. Michel Dugas' computer. Once he reviews your results, he will tell me what the problem is and then I can discuss it with you. The thing is that it's INSERT DAY, and he sees patients at the hospital today, so I actually can't get in touch with him. I feel badly because I'd really like to tell you what's happened with your intelligence test. He should be back at the university tomorrow, so hopefully I can get in contact with him to review your file. We can discuss this more at the end of the study. I'm very sorry, if I knew what your results are, I would give them to you. I just don't know what they are. Whenever something like this happens, I have to create a report for ethics that states that you did not receive your intelligence results today. I need to create the report immediately because I'll need to get your signature on it before you leave. It doesn't take long, I will be back in about 5 minutes and we can finish up the rest of the experiment.

Appendix E

Manipulation Check Questionnaire

University Human Research Ethics Committee

ID #_____   DATE:_____

Please answer the following questions using the 1 (Not at all) to 8 (completely) scale. All answers are kept confidential.

How well do you think you performed on the intelligence tests?

1	2	3	4	5	6	7	8

Very poorly   Very Well

To what extent do you want your intelligence results?

1	2	3	4	5	6	7	8

Not at all   Completely

To what extent do think that the experimenter *could* have given you your results?

1	2	3	4	5	6	7	8

Not at all   Completely

To what extent do think that the experimenter *should* have given you your results?

1	2	3	4	5	6	7	8

Not at all   Completely

How bothered are you that you don't have your results right now?

1	2	3	4	5	6	7	8

Not at all   Completely

How willing would you be to return in the next few days to receive your results?

1	2	3	4	5	6	7	8

Not at all   Completely

Your experimenter did not give you your intelligence results today. Does your experimenter know what your results are? Please circle either yes or no.

YES   **NO**

Appendix F

Consent Form for Experimental and Control Groups in Study 2 (post-study)

CONSENT FORM TO PARTICIPATE IN RESEARCH

Experimental 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 Kristin Anderson 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 how a state of uncertainty that is perceived as avoidable affects feelings of anger and anxiety.

I have been informed that the computerized tasks that I completed were **not** an intelligence test and that the results were not analyzed. The computerized tasks were cognitive tasks. Further, I have been informed that the reason why I was told that there were problems with my intelligence results was to induce a state of uncertainty. Further, I was told that the experimenter was not able to give the "intelligence" results due to lab protocol. I was told this to increase the likelihood that I would perceive my state of uncertainty as being avoidable. During the experiment, I was told to wait while the experimenter created a report. I have been informed that there was no report created. The reason why I was told that a report was being created was to allow enough time for feelings of anxiety and anger to surface. It was important to conceal the true purpose of the study (by claiming that the goal of the study was related to intelligence and emotions) 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 AND BENEFITS

It may be possible that receiving (false) information that there were problems with your intelligence results may have caused some distress or discomfort. If you experience distress or discomfort, please discuss it with the experimenter. Benefits from your participation include receiving 1.5 participant pool credits, and enabling a better understanding of the relationship between feelings of avoidable uncertainty and anger and anxiety.

D. 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 _____

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

CONSENT FORM TO PARTICIPATE IN RESEARCH

Control 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 Kristin Anderson 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 how a state of uncertainty that is perceived as avoidable affects feelings of anger and anxiety.

I have been informed that the computerized tasks that I completed were **not** an intelligence test and that the results were not analyzed. The computerized tasks were cognitive tasks. Further, I have been informed that the reason why I was told that there were problems with my intelligence results was to induce a state of uncertainty. Further, I was told that the experimenter was not able to give the "intelligence" results because the results were unavailable to the experimenter. I was told this to increase the likelihood that I would perceive my state of uncertainty as being unavoidable. During the experiment, I was told to wait while the experimenter created a report. I have been informed that there was no report created. The reason why I was told that a report was being created was to allow enough time for feelings of anxiety to surface. It was important to conceal the true purpose of the study (by claiming that the goal of the study was related to intelligence and emotions) 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 AND BENEFITS

It may be possible that receiving (false) information that there were problems with your intelligence results may have caused some distress or discomfort. If you experience distress or discomfort, please discuss it with the experimenter. Benefits from your participation include receiving 1.5 participant pool credits, and enabling a better understanding of the relationship between feelings of unavoidable uncertainty and anxiety.

D. 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 _____

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