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The Impact Of Exposure On Generalized Anxiety Disorder-Related Symptoms And Cognitive Processes: The Role Of Stimulus Variation

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THE IMPACT OF EXPOSURE ON GENERALIZED ANXIETY DISORDER-RELATED SYMPTOMS AND COGNITIVE PROCESSES: THE ROLE OF STIMULUS VARIATION

by

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ABSTRACT

Theories indicate that individuals with generalized anxiety disorder (GAD) avoid imagining threatening scenarios that have not occurred. Cognitive exposure to these images is a component of treatment; however, few studies have examined its efficacy. The current study assessed the impact of cognitive exposure and varying exposure content on GAD symptoms and cognitive processes. Forty-eight individuals with GAD were assigned to three sessions of: (1) variable exposure (VE), (2) consistent exposure (CE), or (3) neutral control writing (NC). Emotional activation was assessed during each session. Outcome measures were administered at pretest and 1-week follow-up. The CE condition showed improvements in GAD symptoms and cognitive processes, the VE condition showed less belief that their worst worry would occur, and the NC condition showed reduced GAD symptoms and interpretation bias. Emotional activation decreased across sessions in the CE condition; however, this did not predict outcomes. The theoretical and clinical implications are discussed.

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Table of Contents

List of Tables

List of Figures

List of Appendices

The Impact of Exposure on Generalized Anxiety Disorder-Related Symptoms and Cognitive Processes: The Role of Stimulus Variation

Generalized anxiety disorder (GAD) is a chronic and debilitating condition that is characterized by excessive and uncontrollable worry (American Psychiatric Association, 2000). GAD is one of the most common anxiety disorders, with a 12-month prevalence rate of 3.1% in the general population (Kessler et al., 2005). GAD is associated with many other chronic health problems, including cardiovascular disease, diabetes, and cancer (Newman, 2000). Individuals with GAD also report higher rates of other psychological disorders compared to individuals without GAD (Angst, 1993). Several studies have established the efficacy of cognitive behavioural treatment (CBT) for GAD (for a review, see Covin, Ouimet, Seeds, & Dozois, 2008); however, 23% to 40% of treatment completers fail to attain full symptom remission (Dugas et al., 2003; Fisher, 2006; Ladouceur et al., 2000). In fact, GAD is the most treatment-resistant anxiety disorder (Gould, Safren, O'Neill Washington, & Otto, 2004). This suggests that evidence-based treatments for GAD, such as CBT, should be further refined. An empirical understanding of the effects of particular CBT treatment strategies and the optimal parameters for the use of such strategies in treatment is a necessary step toward improving treatment for GAD. The current experiment focused on one treatment strategy for GAD, namely cognitive exposure.

Cognitive Models of GAD

Dugas and colleagues (Dugas et al., 1998a; Dugas & Robichaud, 2007) proposed that intolerance of uncertainty, positive beliefs about the usefulness of worry, a negative orientation toward problems and problem-solving, and a tendency to engage in cognitive avoidance increase the likelihood that a person will develop GAD. Dugas and colleagues incorporated cognitive

avoidance into their model based on seminal work by Borkovec and colleagues (Borkovec, 1972, 1974, 1979; Grayson & Borkovec, 1978). However, it should be noted that Dugas and Borkovec differ slightly in the way that they discuss cognitive avoidance. Borkovec has proposed that worry, in itself, is a cognitive avoidance strategy. Dugas' definition is broader; his group has defined cognitive avoidance as a collection of strategies that enable people with GAD to avoid anxiety-provoking thoughts (e.g., thought suppression, distraction). Among these strategies is the replacement of mental images with verbal thoughts, which closely resembles Borkovec's conceptualization of worry, described in the following section.

Borkovec's Theory of Worry as Cognitive Avoidance

Borkovec, Alcaine, and Behar (2004) described worry as "talking to ourselves in anxious ways" (pg. 82). Dugas and colleagues have similarly described worry as an "internal monologue" (Dugas & Ladouceur, 2000). Borkovec and colleagues (Borkovec & Inz, 1990; Borkovec & Lyonfields, 1993) have suggested that worry is primarily a thought-based, as opposed to imagery-based mental activity, and several studies support this theory. Borkovec and Inz (1990) examined "thought samples" of individuals with GAD and nonanxious individuals during relaxation and worry. They found that during relaxation individuals with GAD reported an approximately equal amount of thoughts and images, whereas nonanxious individuals reported predominately images. When asked to worry, people with GAD and nonanxious individuals reported a greater frequency of thoughts than images. After GAD treatment, the thought samples reported by individuals with GAD during relaxation matched those of nonanxious individuals (i.e., predominantly images). Borkovec and Lyonfields (1993) found that individuals reported a predominance of thoughts (70%) over images (30%) while worrying. In an extension of this study, Freeston, Dugas, and Ladouceur (1996) examined excessive worriers and

individuals who did not report excessive worry and found that both groups of individuals reported that their worry was made up of predominantly thoughts (70%) as opposed to images (25%).[1] This investigation also found that excessive worriers reported a greater percentage of thoughts than images during worry relative to individuals with an average level of worry. Additional support for the thought-based nature of worry comes from studies that have examined brain wave recordings. Borkovec and colleagues (Borkovec, Ray, & Stöber, 1998; Carter, Johnson, & Borkovec, 1986) found that elevated left-hemisphere frontal beta activation (which is associated with verbal-linguistic processing) was associated with state worry and GAD. Stöber and colleagues (1998) found that participants reported greater difficulty generating images of worry-related topics than of non-worry related topics. Taken together, the existing findings provide evidence for the thought-based nature of worry.

The Avoidance Theory of Worry (Borkovec et al., 2004; Sibrava & Borkovec, 2006) was developed to explain the function of worry. The theory posits that the thought-based nature of worry reduces the intensity of mental images of feared scenarios and diminishes the anxious arousal that accompanies these images (Sibrava & Borkovec, 2006). Vrana, Cuthbert, and Lang (1986) found that articulating verbal thoughts about feared scenarios was associated with less heart rate activity (suggesting reduced anxious arousal) than imagining the same fearful material. Several studies have demonstrated that worrying before imagining an anxiety-provoking task coincides with reduced heart rate activity during the task compared to engaging in relaxed thinking prior to the task (Borkovec & Hu, 1990; Borkovec, Lyonfields, Wiser, & Deihl, 1993; Peasley-Miklus & Vrana, 2000). Despite the finding that worrying is associated with reduced heart rate activity, it should be noted that individuals who worried before imagining an anxiety-

[1]In this study the percentages did not sum to 100% because participants were not required to give answers that summed to 100%.

provoking task also reported higher subjective fear in response to the task than individuals who engaged in neutral thinking (Borkovec & Hu, 1990), or relaxed thinking (Borkovec et al., 1993) prior to the task. Together these studies suggest that worry may help to temporarily mitigate the somatic anxious arousal that accompanies mental images of feared outcomes. Thus, from an operant conditioning perspective, worry may be negatively reinforcing in the short-term. However, in the long-term, the consequences of worry may outweigh the "benefits" as chronic worry may prevent or hinder emotional processing of feared scenarios (Borkovec et al., 2004). Foa and Kozak (1986) proposed that full emotional processing occurs when a "full fear structure" is activated and new information that is incompatible with an existing fear structure is incorporated into the structure. According to the Avoidance Theory of Worry, worry prevents the full activation of worry-related fear structures. As a result, fear structures remain "unchallenged" and emotional processing is blocked.

Exposure for GAD

Generally, exposure is the systematic and repeated confrontation of a feared and avoided stimulus (Rachman, 1997) and is a component of CBT for anxiety disorders. In-vivo exposure (i.e., exposure in real-life) is indicated for anxiety disorders that involve a fear of an observable and tangible object or situation (e.g., public speaking in social phobia; snakes or heights in specific phobia). The challenge in conducting in-vivo exposure with people with GAD is that there is often no tangible fear object or situation to expose them to. The avoided stimuli (according to Borkovec's theory) are mental images of feared hypothetical scenarios and the anxious arousal that accompanies these images. Thus, in CBT for GAD cognitive exposure is used. In the treatment of GAD, cognitive exposure is the systematic and repeated confrontation

of mental images of threatening hypothetical scenarios, and the anxiety that accompanies these images.

In practice, cognitive exposure for GAD involves either tape recording or writing out a detailed "script" that is used to generate a mental image of a person's worst fear coming true. To be effective, an exposure script must meet certain specifications. The following are guidelines proposed by Dugas and Robichaud (2007). The client is asked to describe the worst case scenario in a narrative format, with a beginning, middle, and end. Clients are to use the present tense and the first person perspective as much as possible to orient to the here-and-now (versus the past or future). Clients are to describe the feared scenario in as much detail as possible, with references to emotional reactions (e.g., "I am crying," "I am scared") and various sensory modalities (e.g., "I hear the sirens," "I feel nauseous"). Since people with GAD cannot actually expose themselves to their feared hypothetical scenarios, developing a script that meets the above specifications makes the scenario seem as real as possible, which presumably assists with emotional processing (Dugas & Robichaud, 2007). After generating the exposure script, the client is then asked to repeatedly listen to, read, or write about the scenario described in the script. Clients are asked to engage in cognitive exposure for 30 to 60 minutes each day for 2 to 3 weeks, or until imagining the feared scenario no longer generates anxiety (Dugas & Robichaud, 2007). Dugas and Robichaud (2007) have suggested that the principal mechanism by which cognitive exposure improves GAD symptoms is through reduced cognitive avoidance.

There has been very limited empirical work on cognitive exposure for GAD. Although full CBT treatment (which employs several treatment strategies, including cognitive exposure) leads to improvements in GAD symptoms and cognitive processes, the extent to which cognitive exposure specifically contributes to these improvements is not known. Further, there has been no

empirical work on the parameters of cognitive exposure (e.g., number of sessions, duration of sessions, content of exposure), even though these are described at length in treatment manuals (e.g., Zinbarg, Craske, & Barlow, 2006, and Dugas & Robichaud, 2007).

There have been two published investigations of the impact of cognitive exposure on worry to date. Provencher, Dugas, and Ladouceur (2004) examined problem solving and cognitive exposure as independent treatments for GAD using a case series design. Participants in the cognitive exposure condition (n = 10) received 12 treatment sessions in total – with seven sessions used for cognitive exposure and the other sessions used for treatment rationale, training on positive beliefs about worry, and relapse prevention. Participants' worst case scenarios were identified using the downward arrow technique (see Page 32 of this thesis for more information about the downward arrow technique). Participants then recorded their worst case scenario on an audiotape and listened to the recording for 20 to 60 minutes per day until it no longer evoked anxiety. Provencher and colleagues found that cognitive exposure led to significant reductions in GAD symptoms, anxiety, and depressive symptoms from pre- to posttreatment, and that these gains were maintained at 6-month follow-up. Further, 70% of participants did not endorse symptoms meeting the diagnostic criteria for GAD immediately following cognitive exposure, and 75% of participants no longer had GAD at 6-month follow-up. This study provides preliminary evidence that cognitive exposure can be helpful in reducing GAD.

In a more recent investigation, Goldman, Dugas, Sexton, and Gervais (2007) used a modified *written disclosure paradigm* (Pennebaker & Beall, 1986) to examine the impact of cognitive exposure on GAD-relevant symptoms and processes. The written disclosure paradigm has been widely used in experimental research (for a review, see Sloan & Marx, 2004). The paradigm involves a written disclosure condition in which people write about a distressing

emotional experience. The written disclosure condition is often compared to a control condition in which people write an unemotional account of how they would spend their time (e.g., what they would do with a day off). In the written disclosure literature writing session length has ranged from 10 to 45 minutes, and the number of writing sessions has ranged from one to seven (Sloan & Marx, 2004). In their seminal study, Pennebaker and Beall (1986) found that individuals who engaged in 15 minutes of written disclosure on four consecutive days reported fewer physical health complaints and fewer medical visits 6 months following participation in the procedure than did individuals who wrote repeatedly about a neutral topic. The written disclosure paradigm has since been used with several populations: individuals who have lost their jobs (Spera, Buhrfeind, & Pennebacker, 1994), prison inmates (Richards, Beal, Seagal, & Pennebaker, 2000), patients with cancer (de Moor et al., 2002), patients with asthma or rheumatoid arthritis (Smyth Stone, Hurewitz, & Kaell, 1999), and individuals who have experienced trauma (Sloan, Marx, & Epstein, 2005). In these studies, people who wrote about their emotional experience reported improvements in physical or psychological health relative to people in the control condition, or relative to their pretest assessment scores. Overall, written disclosure has demonstrated a robust association with medium effect sizes on psychological health (Cohen's d = .66), reported health (Cohen's d = .42), and physiological functioning (Cohen's d = .68; Smyth, 1998).

Several potential mechanisms of change have been proposed to underlie written disclosure, including: emotional disinhibition, cognitive adaptation, and exposure (emotional processing). Emotional disinhibition has been proposed based on findings that emotional inhibition is associated with physical health problems (e.g., Smith 1992) and the notion that expressing previously inhibited emotions, through written disclosure or otherwise, should

facilitate positive change (Pennebaker, 1989). Cognitive adaptation is the theory that changing responses to threatening stimuli requires changing existing cognitive schemas. Written disclosure is thought to facilitate change in cognitive schemas by providing structure, organization, and cohesion to a threatening scenario (e.g., losing one's job). Lastly, exposure has been theorized to account for change following written disclosure because the act of writing about a threatening situation may allow an individual to confront feared mental imagery that has previously been avoided. According to the emotional processing theory of exposure, the confrontation of a feared stimulus allows for new learning about the feared stimulus to occur, producing positive change (e.g., Foa & Kozak, 1986).

Goldman and colleagues (2007) proposed that written disclosure, if adapted appropriately for GAD, may have several practical advantages over the conventional looped audiotape method of conducting cognitive exposure. Specifically, written disclosure is cost effective, easy to administer, and does not rely on the use of technology. Further, written disclosure may allow for the exploration of additional aspects of a feared scenario at each exposure, since writing can be modified at each session, whereas an audio recording is static. Based on these potential advantages, Goldman et al. translated the classic written disclosure paradigm into a cognitive exposure procedure for individuals with GAD symptoms. In their study, people reporting high levels of worry were randomly assigned to cognitive exposure or neutral writing. In the cognitive exposure condition, participants were instructed to write about their worst fear coming true. In the neutral condition, participants wrote about what they would do if they found out that they had the day off work or school. Participants wrote about their assigned topic for 30 minutes each day on five consecutive days. The authors found that participants in both conditions reported reduced worry, GAD-associated symptoms (e.g., fatigue, muscle tension), and depressive symptoms over

time. The authors further investigated differences between the exposure and control conditions by comparing the slope of each condition's change on the outcome measures to a slope of zero. They found that individuals in the cognitive exposure condition reported scores on measures of worry, GAD-associated symptoms, and depressive symptoms which had a declining slope over time that was significantly different than a slope of zero. They also found that people in the neutral condition reported GAD-associated symptom scores that had a declining slope over time that was significantly different than a slope of zero. Goldman and colleagues found a discrepancy between change in symptoms and change in GAD-related cognitive processes. The slope of the improvement in intolerance of uncertainty over time reported by both conditions was not significantly different than a slope of zero. At 2-week follow-up, only 10% of the participants in the cognitive exposure condition reported symptoms that met the diagnostic criteria for GAD, whereas 56% of the participants in the neutral condition met GAD criteria. Although these results are promising, they require replication given that there were no significant differences between the exposure condition and the neutral condition on outcome measure scores. Moreover, factors that may moderate the impact of cognitive exposure (e.g., the content of exposure) require investigation.

Stimulus Variation in Exposure

There are several principles that guide how in-vivo exposure is conducted in practice. For example, many treatment manuals recommend that clients should vary the object or situation that they confront during exposure to promote greater generalization of learning (e.g., Antony & Swinson, 2008). So, a person with a fear of dogs might be encouraged to expose him or herself to dogs that vary in breed and size. Similarly, a person with panic disorder and agoraphobia who

avoids taking public transportation might be asked to practice travelling on a subway, a street car, and a bus.

The notion that varying the exposure task optimizes learning comes from theory and empirical work on variation in the general learning literature. On the whole, varying the to-be-learned task enhances the retention of non-emotional material (Magill & Hall, 1990). There have been several theories proposed to explain the advantage of varying material to be learned. Bjork and Bjork (1992) argue that varying the form of the material to be learned is beneficial because it makes the retrieval of learned information easier. Using various to-be-learned stimuli (e.g., several dogs) increases the number of retrieval cues (e.g., colour, size) associated with the learned material, thus increasing the chances that a retrieval cue will be present when the information is to be recalled. Schmidt and Bjork (1992) suggest that that varying the tasks to be learned leads to the generation of a mental rule that captures the commonalities among tasks. This mental rule allows for learning to be applied even when there are dissimilarities between previously learned tasks and novel tasks, in other words, it leads to greater generalization of learning. Taken together, the facilitation of memory retrieval and greater generalization of learning that are proposed to be associated with varying the to-be-learned task imply that varying the feared stimulus during exposure treatment should be beneficial.

Two studies have directly tested the notion that varied stimulus exposure leads to a better outcome than does single-stimulus exposure. Rowe and Craske (1998) randomly assigned participants with a fear of spiders to either a varied exposure condition, in which they were exposed to a different spider on each of four sessions or a consistent exposure condition in which they were exposed to the same spider on each of four sessions. To assess fear at 3-week follow-up, behavioural avoidance tests (BATs) were used in which participants were exposed to a

"control spider" [2] and two new spiders. Participants in both conditions showed reductions on indices of fear in response to the control spider from pretest to posttest, and these gains were maintained on most indices of fear at 3-week follow-up. The exception to this was that participants who had received consistent exposure reported a significant increase in anticipatory anxiety in response to the control spider from posttest to follow-up, whereas participants who had received varied exposure did not. Participants in both exposure conditions showed more fear in response to a new spider than they did to the control spider at posttest and follow-up. The authors also examined beliefs about fear of spiders and found that participants who were exposed to different spiders predicted that they would be less afraid of spiders outside of the experiment than participants who were exposed to a single spider at posttest, although these differences were not significant at follow-up. Thus, this study provides modest support for the practice of varying the exposure stimulus during in-vivo exposure treatment.

In an investigation of stimulus variation in the treatment of fear of heights, Lang and Craske (2000) randomly assigned participants to either a consistent or varied exposure condition. Participants in the consistent exposure condition approached the same balcony rail in the same manner (first standing back from the railing, then approaching the railing, and then looking down) repeatedly before moving up to a higher balcony rail. Participants in the varied exposure condition approached balcony rails of different heights in a random order, and approached balcony rails in a different manner at each exposure trial (e.g., facing away from the rail, leaning against the rail, hanging their hands over the rail). Participants in the varied exposure condition also completed half of the exposures in one location, and the other half in another location. Participants in each condition completed 12 five-minute exposures, and completed the same

[2]Participants in both conditions had seen the control spider at pretest. Participants in the consistent exposure condition had also seen the control spider repeatedly during exposure.

number of exposures at each height. The authors found that people in the consistent and varied exposure conditions reported less fear and avoidance of heights following exposure, and this was maintained by participants in both conditions at 1-month follow-up. The authors found that only people in the varied exposure condition reported decreases in anxiety over time, as measured by the *Beck Anxiety Inventory* (BAI; Beck, Epstein, Brown, & Steer, 1988). Overall this study suggests that varied and consistent exposure yield similar outcomes, although there may be some advantage of varied exposure for decreasing anxiety in general.

The empirical evidence suggests that varying the exposure stimulus may be advantageous when the stimulus to be learned is a concrete object or situation; however, it is less clear whether this is also the case when the exposure stimulus is a mental image. Stimulus variation has not been investigated in relation to cognitive exposure for GAD; however, there has been research on this in the area of posttraumatic stress disorder (PTSD) that may be useful for formulating predictions for studies involving GAD. PTSD is an appropriate comparator to GAD in this case because both anxiety disorders involve intangible fear stimuli (i.e., one or more traumatic memories in PTSD, and catastrophic hypothetical scenarios in GAD), necessitating the use of cognitive exposure.

In a study by Sloan and colleagues (2005), people who reported that they had experienced at least one traumatic event (76% of the sample reported that they had experienced more than one traumatic event) on the *Posttraumatic Stress Diagnostic Scale* (Foa, 1996) were assigned to one of three conditions: varied cognitive exposure, consistent cognitive exposure, or neutral writing control. Participants in the varied exposure condition were instructed to write about a different traumatic event for 20 minutes each day on three consecutive days. Participants in the consistent exposure condition were instructed to write about the same traumatic event for

20 minutes each day on three consecutive days. Participants in the control condition were instructed to write for 20 minutes each day on three consecutive days, about what they would do if they had a day off work or school. Participants in the consistent exposure condition reported faster reductions in subjective and physiological anxious arousal than did participants in the varied exposure condition. Participants in the consistent exposure condition also reported significantly decreased PTSD symptoms, depressive symptoms, physical health complaints, and sick days at 4-week follow-up compared to people in the varied exposure and control conditions. Participants in the consistent exposure condition maintained their gains at 8-week follow-up. In contrast to the results of Rowe and Craske (1998) who found an advantage for varying the exposure stimulus, these findings suggest that consistent exposure to the same trauma memory across a small number of sessions leads to greater improvements in symptoms and faster extinction of responses to trauma memories than does exposure to memories of different traumatic events in the same short period of time.

These findings may imply that stimulus variation is not important if the exposure stimulus is a mental image, as is the case in PTSD and GAD. On the other hand, there are important differences between PTSD and GAD that limit this conclusion. For individuals with PTSD, the exposure stimulus is typically a memory of one past concrete traumatic event, thus there may be little reason to vary the exposure stimulus in most cases. On the other hand, individuals with GAD experience anxiety about many things; therefore, there are potentially multiple mental images to work with in treatment. In addition, for people with GAD, the focus of worry is constantly "shifting," and for this reason, they may benefit from exposure to a variety of feared scenarios. Based on the theoretical importance of varying the to-be-learned stimulus, the positive outcomes associated with stimulus variation in in-vivo exposure, and the potential

differences between PTSD and GAD, it is proposed that varying the imagined threatening scenario across exposure sessions may lead to a better outcome in people with GAD than keeping the exposure scenario constant. Research has not yet examined whether exposure to a variety of feared hypothetical scenarios facilitates greater positive change in GAD symptoms and cognitive processes compared with consistent exposure to a single feared scenario.

Present Study

Study Objectives and Hypotheses

The *first* objective of the current study was to examine whether individuals with GAD show more improvement in GAD symptoms, anxiety and depressive symptoms, and GAD cognitive processes when writing about a different worst case scenario on each of three days (Varied Exposure [VE]), when writing about the same worst case scenario on each of three days (Consistent Exposure [CE]), or when writing the same neutral scenario on each of three days (Neutral Control [NC]). In addition, this study aimed to investigate whether people's perceptions of their worst case scenarios would improve as a function of the writing condition to which they were assigned. As findings pertaining to the first research question are equivocal, two empirically-derived competing hypotheses were proposed:

In line with theory and research suggesting that varying the to-be-learned stimulus is beneficial (e.g., Schmidt & Bjork, 1992), it was predicted that participants in the VE condition would report greater improvements in GAD symptoms, anxiety and depressive symptoms, and GAD cognitive processes from pretest to 1-week follow-up than would participants in the CE condition and the NC condition. Related to this, it was predicted that following exposure, participants in the VE condition would perceive their worst case scenario as less likely to occur, less costly, and would report a greater ability to cope with it than participants in the CE condition

and participants in the NC condition. It was predicted that participants in the CE condition would, in turn, report greater improvements on all of the above-mentioned variables than participants in the NC condition.

Based on the findings of Sloan and colleagues (2005) supporting consistent exposure for PTSD, the *competing hypothesis* was that participants in the CE condition would show the greatest improvements in symptoms and processes (as described above), followed by participants in the VE condition and finally, participants in the NC condition.

Both GAD symptoms and GAD-related cognitive processes were examined in the present study to provide more information about the impact of cognitive exposure, and to explore which cognitive factors (if any) are amenable to change with cognitive exposure. Further, although GAD symptoms and cognitive processes are moderately correlated (e.g. the correlation between worry and intolerance of uncertainty has been found to be $r = .57$; Dugas, Schwartz, & Francis, 2004), they may not necessarily change simultaneously. GAD symptoms may change in the absence of change in GAD cognitive processes, or vice versa. The cognitive processes examined in the present study were: intolerance of uncertainty, cognitive avoidance, the tendency to interpret ambiguous scenarios as threatening, and perceptions of the worst case scenario coming true (perceived likelihood, cost, and ability to cope). Intolerance of uncertainty was examined because it is the central cognitive process thought to underlie the development and maintenance of GAD according to Dugas' cognitive model of GAD (Dugas et al., 1998a). It has been theorized that cognitive exposure may indirectly target intolerance of uncertainty through the confrontation of a scenario with an uncertain likelihood of occurrence (Dugas & Robichaud, 2007). In this way, cognitive exposure may indirectly help individuals learn that they can cope with uncertainty. Cognitive avoidance was examined because it is thought to be involved in the

maintenance of GAD, and because cognitive exposure is proposed to directly target the tendency to engage in cognitive avoidance (Dugas & Robichaud, 2007). As mentioned, it has been suggested that individuals with GAD use verbal-linguistic thought to avoid confronting threatening mental images of feared scenarios and associated emotional responding. Cognitive exposure may counter avoidance by facilitating the confrontation of such feared imagery and emotions. The tendency to interpret ambiguous scenarios as negative was examined because this may be one manifestation of intolerance of uncertainty. High intolerance of uncertainty has been linked to interpretation bias under conditions of ambiguity (e.g., Dugas et al., 2005; Koerner & Dugas, 2008). Lastly, scenario-specific cognitive processing related to the worst case scenario was examined to investigate the direct impact of cognitive exposure on perceptions of the specific worst case scenarios being imagined. The above-mentioned cognitive processes were an important part of the present investigation as there is currently very limited research on the impact of cognitive exposure on GAD-related cognitive processes.

The *second* objective of the current study was to examine subjective anxious arousal and unpleasant affect at initial exposure (Session 1), *across sessions* of exposure, and *within* sessions of exposure, as a function of writing condition. In their seminal paper on emotional processing theory, Foa and Kozak (1986) proposed that a reduction in anxious arousal within exposure sessions is an indicator of immediate emotional processing, and that an overall reduction in anxious arousal over the course of exposure is an indicator of longer-term processing. Emotional processing theory has since been revised (Foa, Huppert, & Cahill, 2006), as data pertaining to the original theory's predictions about within-session reductions in anxious arousal are equivocal. The revised emotional processing account states that within-session anxious arousal is not a reliable indicator of emotional processing, as several studies have found that anxiety symptoms

improve over time in the absence of within-session reductions in anxiety (e.g., Kozak, Foa, & Steketee, 1988). Further, it has been proposed that some factors that can impede emotional processing (e.g., cognitive avoidance, distraction) can also serve to produce within-session reductions in anxiety. Although within-session reductions in anxiety are not currently considered essential to emotional processing, this was examined in the present study for completeness. Based on the revised emotional processing theory it was predicted that participants in the exposure conditions (VE and CE) would report greater subjective anxious arousal in Session 1 and a greater decrease in subjective anxious arousal from Session 1 to Session 3 than would participants in the NC condition. There were no specific hypotheses proposed for within-session reductions in anxious arousal given past inconsistencies in the literature.

Studies that have examined anxious arousal and unpleasant affect simultaneously over the course of exposure have found that changes in unpleasant affect generally follow the same pattern as changes in anxious arousal (e.g., Sloan et al., 2005). That is, when participants report high levels of anxious arousal, they typically report corresponding unpleasant affect. Based on this, the predictions regarding unpleasant affect were the same as the predictions advanced regarding anxious arousal.

The *third* objective of the present study was to assess whether anxious arousal during exposure predicts outcomes. Research by Sloan and colleagues (2005) on written exposure and trauma indicated that: (1) the average level of anxious arousal during the first exposure session and (2) a reduction in anxious arousal from the first exposure session to the last exposure session were predictors of PTSD symptom improvement. Based on this research, it was hypothesized that in the exposure conditions (VE and CE): (1) higher anxious arousal in the first writing session and (2) reductions in anxious arousal from the first exposure session to the third exposure

session would be significant predictors of improvement in GAD symptoms, anxiety and depressive symptoms, and GAD-related cognitive processes.

There were no a priori predictions regarding the association between unpleasant affect during the initial exposure session and outcome, given that there has been no research bearing on this association. However, it was expected that greater improvements in unpleasant affect from the first exposure session to the last exposure session would be associated with greater improvements in GAD symptoms, anxiety and depressive symptoms, and GAD-related cognitive processes. This hypothesis is grounded in prior research that found that improvements in self-reported unpleasant affect across sessions of exposure significantly predicted reductions in PTSD symptom severity (Sloan et al., 2005).

The *fourth* objective of the present study was an exploratory investigation which used modified behavioural avoidance tests (BATs) to assess responses to brief mental images of worst case scenarios prior to writing and at 1-week follow-up. The goals of this investigation were to: (1) obtain a "behavioural" assessment of fear and avoidance in response to threatening mental imagery, and (2) to determine whether varied or consistent exposure results in superior generalization of learning from exposure, as measured by reactions to new threatening mental images. Using a similar methodology as Rowe and Craske (1998), the current study assessed fear and avoidance in response to imagining the *original worst case scenario*[3] for 30 seconds at pretest and follow-up. In addition, at follow-up, reactions to: (1) the original worst case scenario, (2) a "new" worst case scenario in the same worry domain as the original, and (3) a "new" worst case scenario in a different worry domain than the original were compared to examine potential

[3] The original worst case scenario was the worst case scenario indicated as the worst fear by participants during Session 1. Participants in the varied exposure condition wrote about their original worst case scenario during Session 1, and participants in the consistent exposure condition wrote about their original worst case scenario on all three sessions of exposure.

differences in the generalization of any learning that had occurred to new images across conditions. New BATs with differing degrees of familiarity (i.e., a new BAT in the same worry domain as the original BAT, and a new BAT in a different worry domain than the original BAT) were used to assess the degree of potential generalization of learning across the exposure conditions. Given that the fourth objective was exploratory, no specific a priori hypotheses were formulated.

Method

Participants

Participants were recruited using several methods: (1) advertisements posted throughout Ryerson University and the University of Toronto, (2) advertisements placed in a Toronto community newspaper, and (3) advertisements posted online on Toronto community discussion boards (e.g., Craigslist, Kijiji). In total, 149 individuals participated in the telephone screen. Of these individuals, 66 met the inclusion criteria (see below) and were invited to take part in the current study. The main reasons for exclusion were subclinical levels of worry, and symptoms of other diagnoses (e.g., social phobia, depression) that were more severe than symptoms of GAD. Twelve individuals who were eligible to participate in the present study did not begin study participation, and six individuals began participating in the present study but did not complete all study visits. Individuals who did not complete all study visits were excluded from the statistical analyses. The final sample consisted of 48 adults – 21 participants were undergraduate students and 27 participants were recruited from the Greater Toronto Area (GTA) community.

Inclusion criteria. Individuals were invited to participate in the current study if they: (1) endorsed symptoms consistent with a principal or co-principal diagnosis of GAD, assessed using the *Mini International Neuropsychiatric Interview* (MINI; Sheehan et al., 1998); (2) were between 18 and 65 years of age; (3) did not meet criteria for a current alcohol or substance use disorder; (4) were not currently receiving psychotherapy; (5) were not taking psychotropic medication or were taking a stable dose of psychotropic medication for at least 12 weeks; (6) did not endorse symptoms of bipolar disorder; and (7) did not endorse current suicidal ideation, intent, or plan.

Demographic characteristics. The sample consisted of 36 women and 12 men. Participants ranged in age from 18 to 61 years (M = 34.93 years; SD = 13.82 years). The majority (75%) of participants in the final sample reported their marital status as single, 17% reported being married or living common-law, and 8% reported being divorced. The ethnic breakdown of the participants was: 50% White, 15% East Asian, 13% Black, 6% Multiethnic, 6% Other (an ethnicity not listed), 4% South Asian, 4% South East Asian, 2% Latin American. In terms of educational attainment, most participants (56%) reported that they had completed an undergraduate degree; 16% reported holding a college diploma; 15% reported holding a high school diploma; 9% reported holding a Master's degree, and 4% reported holding a Doctoral degree.

There was no difference between the undergraduate and community participant samples in the ratio of women to men, $\chi^2 = 2.29$, $p = .13$. The undergraduate participants were significantly younger (M = 25.14 years, SD = 8.69 years) than the individuals recruited from the community (M = 43.16 years, SD = 11.86 years), t (44) = 5.78, $p = .01$. The undergraduate participants reported a significantly higher level of educational attainment than did the community participants, $\chi^2 = 11.85$, $p = .02$. There were no significant differences between the undergraduate participants and the community participants in ethnicity, employment status, or marital status. Importantly, there were no significant differences in the number of undergraduate participants or community participants assigned to each of the three study conditions.

Clinical Characteristics. Participants with comorbid diagnoses were included in the current study to facilitate recruitment and to increase the generalizability of the study results to individuals presenting for treatment in clinical settings. A subset of participants (36%) endorsed symptoms consistent with GAD only, and no additional diagnoses. Among participants who

endorsed symptoms of another psychological condition, 8% met the diagnostic criteria for a co-principal mood or anxiety disorder, and 56% met the diagnostic criteria for another disorder that was less distressing or impairing than GAD. Conditions other than GAD reported by participants included: social phobia, obsessive-compulsive disorder, panic disorder, major depressive disorder, and dysthymic disorder.

The 9-point *Clinician's Severity Rating* scale from the *Anxiety Disorders Interview Schedule for DSM-IV* (ADIS-IV; Di Nardo, Brown, & Barlow, 1994) was used to rate the severity of GAD assessed using the MINI. The GAD severity ratings of participants in the current sample ranged from 4 (the cutoff for clinical severity) to 7 (M = 5.56, SD = 1.09). The severity of GAD symptoms in the current sample was also inferred from scores on the *Penn State Worry Questionnaire* (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990). The PSWQ is a self-report measure that has been used to identify GAD in nonclinical populations. Several different PSWQ cut-scores have been used to establishing the presence of GAD. Behar, Alcain, Zuellig, and Borkovec (2003) reported that a cut-score of 45 on the PSWQ is appropriate for screening for GAD; 98% of the current sample reported scores above 45 on the PSWQ. Provencher et al. (2004) used a cut-score of 55 on the PSWQ to differentiate clinical from nonclinical levels of worry based on normative data from individuals with GAD; 81% of the current sample scored above 55 on the PSWQ. Lastly, Fresco, Mennin, Heimberg, and Turk (2003) examined the use of the PSWQ for screening for GAD in a specialized anxiety clinic, and suggested that a score of 65 on the PSWQ is optimal to differentiate GAD from other anxiety disorders; 56% of the current sample scored above 65 on the PSWQ. The range of PSWQ scores reported by participants in the current study was 43 to 80 (M = 62.73, SD = 8.23). Overall, clinician severity ratings and self-report scores on the PSWQ suggest that the current sample was generally representative of

individuals with clinical levels of GAD symptoms. See Table 1 for a summary of the demographic and clinical characteristics of participants in the present study. There were no significant differences in any demographic or clinical variables between the study conditions.

Measures

Mini International Neuropsychiatric Interview, Version 5.0.0 (MINI; Sheehan et al., 1998). The MINI is an abbreviated, semistructured diagnostic interview designed for use in research and clinical settings. The MINI assesses for the presence of several Axis I DSM-IV disorders including mood disorders, anxiety disorders, substance use disorders, suicidal risk, eating disorders and schizophrenia. The MINI has very high interrater reliability, with kappa coefficients ranging from .88 to 1.0, and good test-retest reliability, ranging from r = .76 to r = .93 across the disorders (Lecrubier et al., 1997; Sheehan et al., 1998). The MINI also has high convergent validity in relation to other semistructured clinical interviews, such as the *Structured Clinical Interview for the Diagnostic and Statistical Manual* (SCID; Lecrubier et al., 1997; Sheehan et al., 1998). In addition, the MINI has good specificity for all diagnoses and good sensitivity.

MINI Screen, Version 5.0.0 (Sheehan et al., 1998). The Mini Screen is a screening module that is used in conjunction with the MINI. It consists of 21 closed-ended gateway questions about current symptoms of mood disorders, anxiety disorders, suicidality, substance use disorders, and eating disorders. Positive responses to gateway questions prompt the interviewer to use the corresponding module in the MINI to assess related symptoms in detail.

Table 1

Sample Characteristics Separated by Study Condition

	Varied Exposure (n = 16)	Consistent Exposure (n = 16)	Neutral Control (n = 16)
Age in years - *M* (*SD*)	34.50 (14.27)	29.40 (10.27)	40.93 (14.78)
Gender - Frequency (%)			
Female	12 (75.0%)	12 (75.0%)	12 (75.0%)
Male	4 (25.0%)	4 (25.0%)	4 (25.0%)
Race/Ethnicity - Frequency (%)			
White	4 (25.0%)	9 (56.3%)	11 (68.8%)
East Asian	4 (25.0%)	3 (18.8%)	0 (0.0%)
Black	3 (18.8%)	2 (12.5%)	1 (6.3%)
Mixed Race	1 (6.3%)	0 (0.0%)	2 (12.5%)
Other Ethnicity	2 (12.5%)	0 (0.0%)	1 (6.3%)
South Asian	0 (0.0%)	1 (6.3%)	1 (6.3%)
South East Asian	1 (6.3%)	1 (6.3%)	0 (0.0%)
Latin American	1 (6.3%)	0 (0.0%)	0 (0.0%)
Highest Education - Frequency (%)			
High School Diploma	1 (6.3%)	3 (18.8%)	4 (25.0%)
College Diploma	3 (18.8%)	1 (6.3%)	5 (31.3%)
Bachelor’s Degree	9 (56.3%)	8 (50.0%)	7 (43.8%)
Master’s Degree	2 (12.5%)	3 (18.8%)	0 (0.0%)
Doctorate Degree	1 (6.3%)	1 (6.3%)	0 (0.0%)
Employment Status - Frequency (%)			
Unemployed	3 (18.8%)	1 (6.3%)	2 (12.5%)
Student	2 (12.5%)	5 (31.3%)	3 (18.8%)

	Varied Exposure (n = 16)	Consistent Exposure (n = 16)	Neutral Control (n = 16)
Employed full-time	2 (12.5%)	6 (37.5%)	4 (25.0%)
Employed part-time	2 (12.5%)	1 (6.3%)	4 (25.0%)
Student and Employed part-time	7 (43.8%)	3 (18.8%)	3 (18.8%)
Marital Status - Frequency (%)			
Single	13 (81.3%)	11 (68.8%)	12 (75%)
Married/Common-law	3 (18.8%)	3 (18.8%)	2 (12.5%)
Divorced/Widowed	0 (0.0%)	2 (12.5%)	2 (12.5%)
Recruitment Source - Frequency (%)			
Community	9 (56.3%)	8 (50.0%)	10 (62.5%)
Undergraduate Student	7 (43.8%)	8 (50.0%)	6 (37.5%)
Additional Diagnoses *M* (*SD*)	0.88 (0.96)	1.25 (0.78)	1.00 (1.21)
Average GAD Severity *M* (*SD*)	5.50 (1.27)	5.81 (1.05)	5.38 (0.96)

Note. There were no significant differences between the Varied Exposure Condition, Consistent Exposure Condition, or Neutral Control Condition on any of the variables reported above.

The Mini Screen has high-internal consistency (α = .92). The sensitivity of the gateway questions on the Mini Screen ranges from 0.63 to 0.82, the specificity of the questions ranges from 0.61 to 0.83, and the overall accuracy of the Mini Screen ranges from 70% to 75% (Alexander, Haugland, Lin, Bertollo, & McCorry, 2008).

Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990). The PSWQ is a 16-item measure of the tendency to worry excessively. Examples of items are "My worries overwhelm me" and "Many situations make me worry." The items are rated on a 5-point Likert scale, from 1 (*not at all typical of me*) to 5 (*very typical of me*). The PSWQ has high-internal consistency (α = .95), and good test-retest reliability (*r* = .92; Metzger, Miller, Cohen, Sofka, & Borkovec, 1990). This measure has also been shown to assess a construct that can be distinguished from anxiety and depression (Metzger et al., 1990; Molina & Borkovec, 1994).

Worry and Anxiety Questionnaire (WAQ; Dugas et al., 2001). The WAQ is an 11-item self-report measure of DSM-IV defined GAD. Respondents rate the degree to which they experience the symptoms of GAD from 1 (*not at all*) to 5 (*very severely*). The WAQ has demonstrated adequate test-retest reliability, and good convergent and discriminant validity (Dugas et al., 2001). In a nonclinical sample, the WAQ effectively discriminates between individuals with low, moderate, and high levels of worry (Dugas et al., 2001), and has been shown to discriminate between those with and without GAD (Dugas et al., 2001). The Associated Symptoms Subscale of the WAQ (WAQ-Associated) was used in conjunction with the PSWQ to assess GAD symptoms in the present study (e.g., Koerner & Dugas, 2008). The WAQ-Associated consists of six questions that assess the severity of symptoms associated with GAD: restlessness, fatigue, concentration difficulties, irritability, muscle tension, and sleep difficulties.

Worry Domains Rating Form (WDRF; developed for the current study). The WDRF assesses the degree to which participants worry about several specific topics from 0 (*no worry*) to 10 (*extreme worry*). The WDRF consists of a list of 12 worry subjects (friendships, romantic relationships, relationships with parents, academic performance, work competence, finances, one's own health, health of loved ones, threat of physical harm or danger, the future, self-concept, and minor matters). All worry subjects listed on the WDRF were derived from published research (Davey, Hampton, Farrell, & Davidson, 1992; Dugas, Freeston et al., 1996; Dugas et al., 1998b). There were also four blank spaces for respondents to indicate and rate worries that were not listed (if they worried about a topic not listed on the WDRF). If respondents assigned the same rating to more than one worry domain, they were asked to indicate the most bothersome one.

State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA; Ree, French, MacLeod, & Locke, 2000). The STICSA consists of two scales: (1) a *State* scale (STICSA-S) that consists of 21 items that assess cognitive and somatic anxiety symptoms as they pertain to an individual's current state; and (2) a *Trait* scale (STICSA-T) that consists of the same 21 items as they pertain to an individual's general state. Examples of items are "My heart beats fast" and "I keep busy to avoid uncomfortable thoughts." On the STICSA-S, respondents rate the degree to which they are experiencing cognitive and somatic anxiety symptoms at the moment of assessment from 1 (*not at all*) to 4 (*very much so*). On the STICSA-T, respondents rate how often they generally experience cognitive and somatic anxiety symptoms from 1 (*almost never*) to 4 (*almost always*). The STICSA has demonstrated excellent internal consistency ($\alpha = .91$; Grös, Antony, Simms, & McCabe, 2007) and good convergent and discriminant validity.

Center for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977). The CES-D is a 20-item measure of depressive symptoms experienced in the past week. The CES-D was originally developed to screen for depression in the general community. The CES-D includes items about physical symptoms (e.g., "My appetite was poor"), affective symptoms (e.g., "I felt sad"), and behavioural symptoms (e.g., "I had crying spells"). Respondents rate the degree to which they experienced the depressive symptoms over the past week on a 4-point Likert scale ranging from 0 (*rarely or none of the time*) to 3 (*most or all of the time*). The CES-D has high internal consistency in nonclinical samples (α = .85), adequate test-retest reliability (r = .67), and has demonstrated concurrent and construct validity (Radloff, 1977).

Intolerance of Uncertainty Scale (IUS; English translation, Buhr & Dugas, 2002). The IUS contains 27 items that assess the extent to which a respondent experiences uncertainty as intolerable. The IUS consists of two factors that assess the degree to which respondents hold the views that: (1) uncertainty impairs performance and reflects poorly on a person's character (Factor 1), and (2) future events should be predictable, and uncertainty about the future is unfair and distressing (Factor 2). Examples of items from Factor 1 are: "When I am uncertain I can't go forward" and "Being uncertain means that I am not first rate." Examples of items from Factor 2 are: "I can't stand being taken by surprise" and "It's unfair not having any guarantees in life." Items are rated on a 5-point Likert scale, ranging from 1 (*not at all characteristic of me*) to 5 (*entirely characteristic of me*). The English version of the IUS has excellent internal consistency (Factor 1, α = .92 and Factor 2, α= .91). The IUS has good test-retest reliability (r = .92). The IUS has also demonstrated high convergent, criterion, and discriminant validity (Buhr & Dugas, 2002).

Cognitive Avoidance Questionnaire (CAQ; English translation, Sexton & Dugas, 2008). The CAQ is a 25-item measure that assesses the extent to which a respondent engages in strategies to avoid distressing thoughts and mental images. There are five avoidance strategies assessed by the CAQ including thought suppression, transformation of disturbing mental images to verbal-linguistic thoughts, thought replacement, distraction, and avoidance of situations or objects that may trigger distressing thoughts. Examples of items are "I have thoughts that I try to avoid" and "I often do things to distract myself from my thoughts." Items are rated on a 5-point Likert scale in terms of how typical they are of an individual from 1 (*not at all typical*) to 5 (*completely typical*). The CAQ has excellent internal consistency ($\alpha = .95$), and very good test-retest reliability ($r = .85$) (Sexton & Dugas, 2008). In addition, the CAQ has demonstrated convergent and divergent validity (Sexton & Dugas, 2008).

Explicit Interpretations Task (AUSD-EX; Koerner & Dugas, 2008). The AUSD-EX is a vignette task that is used to assess appraisal bias. Respondents read 55 scenarios that describe either: (1) negative nonambiguous situations (e.g., "My boss pulled me aside today to discuss my poor work ethic"); (2) positive or neutral nonambiguous situations (e.g., "This weekend, my boy/girlfriend and I are going away to celebrate our anniversary!"); or (3) potentially threatening ambiguous situations (e.g., "I was very surprised when I checked my bank account balance this morning"). Respondents rate their level of concern on a scale of 1 (*not at all concerned*) to 5 (*extremely concerned*). The scenarios cover 11 worry themes (Davey et al., 1992; Dugas et al, 1995; Dugas et al., 1998b): friendships, romantic relationships, relationships with parents, academic performance, work competence, finances, one's own health, health of loved ones, threat of physical harm or danger, the future, and self-concept. Each theme is represented in one nonambiguous negative scenario, one nonambiguous positive scenario, and three ambiguous

scenarios. Only responses to ambiguous scenarios were analyzed in the present study, as intolerance of uncertainty (a GAD-related cognitive process) is uniquely associated with negative interpretations of ambiguous situations (Dugas et al., 2005; Koerner & Dugas, 2008).

Perceived Probability, Cost, and Coping Questions (Berenbaum, Thompson, & Bredemeier, 2007; Butler & Mathews, 1983). Scenario-specific perceptions (including perceived probability, perceived cost, and perceived ability to cope) which have been identified in previous research as being important indicators of cognitive change (e.g., Berenbaum et al., 2007) were assessed. Perceived probability was assessed by asking respondents to rate the likelihood that their worst fear would come true on a 7-point Likert scale from 0 (*not at all likely*) to 6 (*almost certain*). Perceived cost was assessed by asking respondents to rate how bad it would be if their worst fear came true from 0 (*not at all bad)* to 6 (*horrific*). Perceived ability to cope was assessed by asking respondents to rate the extent to which they would be able to cope if their worst fear came true from 0 (*not at all*) to 6 (*would be able to cope*). Past research has demonstrated that perceptions of feared scenarios as highly probable and as having a high cost predict worrying (Berenbaum et al., 2007). In addition, low perceived ability to cope with a feared outcome has been proposed to be associated with worry and anxiety (Beck, 1976).

Self-Assessment Manikin (SAM; Bradley & Lang, 1994). The SAM consists of two scales that are used to measure emotional responses along two dimensions: arousal and valence (or unpleasant affect). The SAM requires participants to indicate emotional responses by circling a manikin figure (as opposed to a number) depicting how they are feeling and these are coded on a 9-point scale. For the arousal dimension, SAM figures range from a figure with closed eyes and an inactive body coded as 1 (*very calm*) to a figure with an active body and wide eyes coded as 9 (*very aroused*). For the unpleasant affect dimension, SAM figures range from a smiling figure

coded as 1 (*very pleasant*) to a frowning figure coded as 9 (*very unpleasant*). The SAM rating system has been used extensively in research on emotions, and has demonstrated strong correlations with physiological and behavioural measurements of anxious arousal and unpleasant affect (Bradley & Lang, 1994). In addition, the SAM has been used in published research on written cognitive exposure (Sloan et al., 2005). The benefit of using the SAM rating scales as opposed to numerical rating scales is that the visual markers on the SAM scales help to standardize the meaning of ratings across participants.

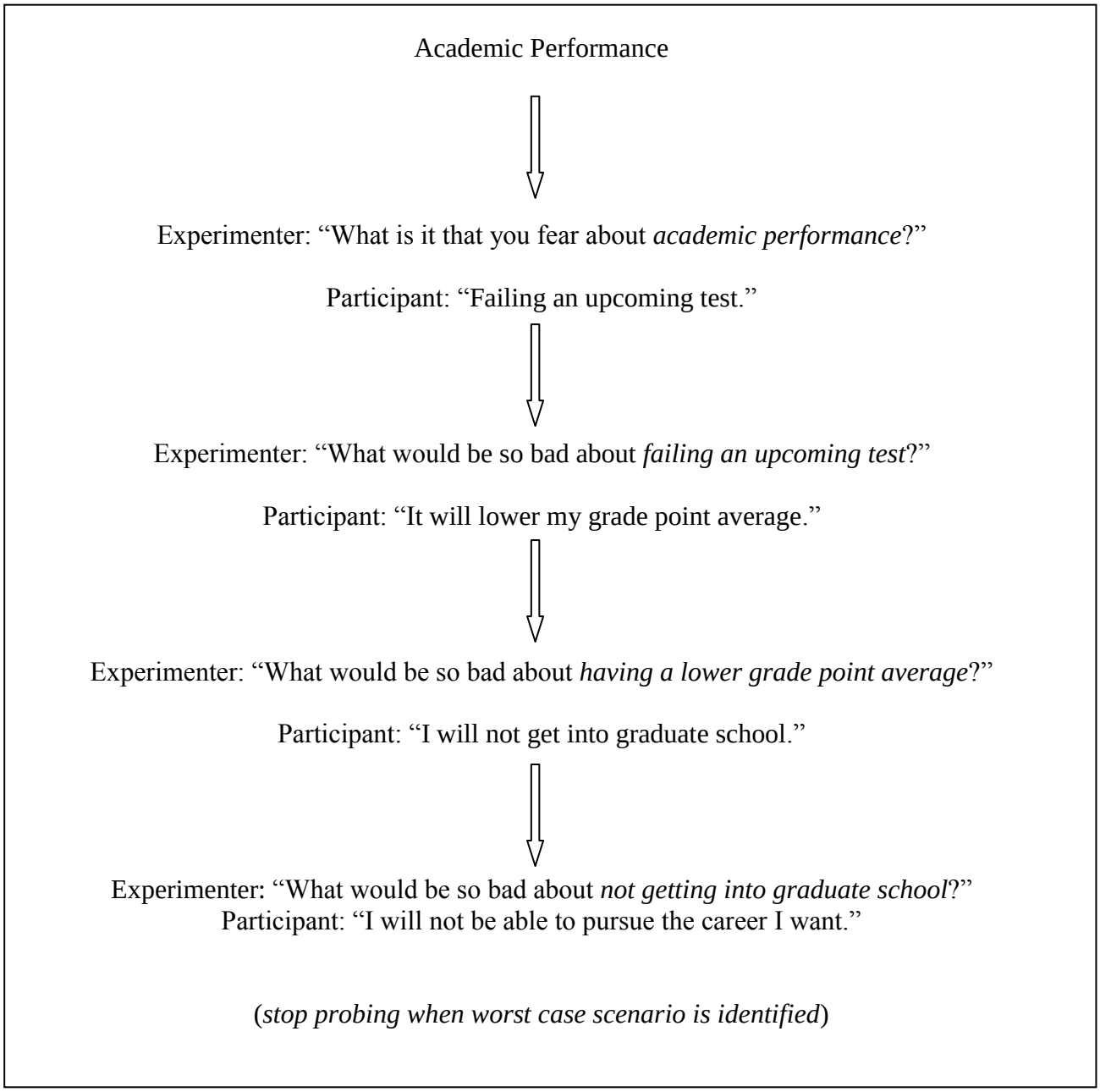
Modified Behavioural Avoidance Test (*Modified BAT*; developed for the current study). In research on exposure, the Behavioural Avoidance Test (BAT) is commonly used to assess fear and avoidance of a stimulus. For example, a BAT may be used to assess fear and avoidance of a feared animal by asking a participant to get as close as possible to the feared animal, then asking for a rating of subjective fear, and measuring the final distance between the person and the feared animal as a rating of avoidance. In the current study, the standard BAT was modified to assess fear and avoidance of mental images (as opposed to live objects or situations). In the modified BAT, participants were asked to generate and hold a mental image of a threatening hypothetical scenario for 30 seconds. After 30 seconds, participants were asked to rate their fear in response to imagining the threatening hypothetical scenario on a scale of 0 (*no fear at all*) to 10 (*the most fear they ever felt*). Participants were also asked to rate their desire to avoid imagining the threatening hypothetical scenario on a scale of 0 (*no desire to avoid imagining*) to 10 (*the highest possible desire to avoid imagining*).

Procedure

Telephone screen. A telephone screen consisting of the MINI Screen, MINI, and questions about treatment history was administered to potential participants to determine eligibility for the present study (see earlier section on inclusion criteria). Participants who met all of the study's inclusion criteria were scheduled for four visits to the Cognition and Psychopathology Lab at Ryerson University. Session 1, Session 2, and Session 3 were scheduled on three consecutive days, and Session 4 was scheduled one week after Session 3.

Session 1. Upon arrival to the Cognition and Psychopathology Lab, participants gave their written informed consent to participate in the study. Participants then completed a pretest questionnaire package consisting of a demographics questionnaire and the following measures: PSWQ, WAQ-A, WDRF, STICSA-S, STICSA-T, CES-D, IUS, CAQ, and AUSD-EX. Next, the pretest BAT to the original worst case scenario was conducted with each participant. To determine the original worst case scenario, the experimenter first identified the primary worry domain on the WDRF. Next, the downward arrow technique (see Figure 1 for an example) was used to help participants identify their worst case scenario (see Dugas & Robichaud, 2007). Specifically, this involved first asking individuals to articulate what they feared about their primary worry domain. After the fear was identified, participants were asked, "What would be so bad about that fear coming true?" This question was repeated with each successive new fear that was generated until the worst case scenario was identified. Once the worst case scenario was identified, participants were asked several questions about specific aspects of the feared scenario to help make the scenario more concrete. Examples of questions to improve concreteness were: "How would that scenario look if it were to happen?", "Where would you be?", "What would you be doing?" and "Who would be involved?"

Figure 1. Example of the Downward Arrow Technique



Participants then practiced generating a mental image of a neutral object (See Appendix B for instructions related to the practice item), after which they were asked if they understood what was meant when they were asked to generate a mental image. Next participants were asked to generate and hold a mental image of their worst case scenario coming true for 30 seconds. When the 30 seconds elapsed, participants were asked to rate (1) the degree of fear they experienced in response to the mental image of their worst case scenario; and (2) the extent to which they wished to avoid thinking about the scenario. Following the BAT, participants responded to the perceived probability, cost, and coping questions, which was taken to be an index of scenario-specific cognitive processing about the worst case scenario.

Participants were then randomly assigned to one of three conditions: (1) Varied Exposure (VE), (2) Consistent Exposure (CE), or (3) Neutral Control (NC). Participants were informed that they would be asked to write on three consecutive days and that each writing session would last 20 minutes. The parameters of written exposure chosen for the present study were based on prior research on written disclosure. Three sessions of writing were chosen based on a meta-analysis which demonstrated that written disclosure studies that have used three or more sessions have larger effect sizes (r = .08) than studies that have used less than three sessions (r = .04; Frattaroli, 2006). Walker, Nail, and Croyle (1999) have suggested that at least three writing sessions are necessary to provide the opportunity to gain insight and understanding from emotional writing. The 20 minute length of the writing sessions was chosen based on prior research demonstrating that studies in which participants wrote for less than 15 minutes were associated with smaller effect sizes (r = - .07) than were studies in which participants wrote for at least 15 minutes (r = .08; Frattaroli, 2006). Páez, Velasco, and González (1999) have suggested that writing about distressing events for short periods of time (i.e., less than 15 minutes) may be

detrimental because negative emotions are activated, but there is not enough time to organize and make sense of the emotions. Thus, the present study used three sessions lasting 15 minutes each to balance maximizing the effect of written disclosure with resource limitations.

All participants were given general instructions about the writing that they would be asked to do (see Appendix C). All participants were told that past research has suggested that writing has positive effects on health, and that the purpose of the current study was to examine the relationship between worry and writing (see Goldman et al., 2007). Next, participants were given instructions specific to their assigned condition (see Appendix D, Appendix E, and Appendix F for the exact instructions for each condition).

CE condition. Participants assigned to the CE condition were asked to write a sensory image "script" describing their worst fear coming true. Specifically, participants were instructed to: (1) write in narrative form, beginning with a description of the circumstances leading up to the feared scenario, followed by a description of the actual feared scenario, and ending with a description of the consequences of the scenario; (2) write in the present tense as though the situation was happening in the here-and-now; and (3) describe their emotional reactions to the scenario (e.g., "I am scared") and their physical reactions to the scenario (e.g., "I am nauseous") in as much detail as possible. Participants were instructed to write about the same worst case scenario that they had generated for the pretest BAT (the original worst case scenario).

VE condition. Participants assigned to the VE condition were given the same instructions as participants in the CE condition.

NC condition. Participants were asked to write about what they would do if they found out that they had the day off work or school. They were instructed to describe the activities of the day in a factual manner with no references to emotion. In experimental research on written

disclosure these instructions are frequently used as a control procedure (e.g., Goldman & Dugas, 2007).

The SAM scales were administered at the beginning and end of the writing session. Participants earned $20 for completing Session 1.

Session 2. Participants returned to the lab the day after Session 1. Participants proceeded with the writing according to the following instructions:

Participants in the CE condition were asked to write about the same scenario that they wrote about in Session 1, using the same guidelines. Participants in the VE condition were instructed to write about a *different* worst case scenario than they had written about during Session 1. The new scenario was to be in the same principal worry domain (e.g., finances, friends, school) as their original worst case scenario. For example, if an individual's principal worry domain was finances, their original worst case scenario might have been not having enough money to afford rent, and their second worst case scenario might have been not being able to obtain a bank loan. The participant and experimenter briefly discussed the second worst case scenario before the writing session began to ensure that the participant understood the instructions. Participants in the NC condition were again asked to write about what they would do if they found out they had the day off, using the guidelines communicated in Session 1. The SAM scales were administered at the beginning and end of the writing session.

Session 3. Participants returned to the lab for Session 3 the day after Session 2. The experimenter followed the same procedure as in Session 2. Participants earned $20 for completing Session 2 and Session 3.

Follow-Up Session. One week following Session 3, participants returned to the lab. Participants were asked to complete the same battery of questionnaires as they had completed at

pretest. Next, participants were asked to complete three 30-second BATs using mental images of the following scenarios: (1) the original worst case scenario imagined during the BAT task at pretest; (2) a *new worst case scenario* in the participant's principal worry domain (i.e., one that was not used for any of the exposure tasks, or the pretest BAT); and (3) a *new worst case scenario in a completely different domain* than the primary worry domain identified in Session 1. For each of the three follow-up BATs, participants were asked to rate their fear of the mental image and their desire to avoid imagining it. Participants received a debriefing form at the end of the session, and earned $15 for completing the session.

Results

Data Screening

The data were screened for the presence of outliers. In the present study, outliers were defined as *z*-score values greater than an absolute value of 3.3 (Tabachnick & Fidell, 2007). Using this criterion, there were two data points classified as outliers. The extreme data points were replaced by the next most extreme value in the measure's distribution. The data were also screened for normality. All data were approximately normal, with the exception of pretest fear ratings on the BAT. Because fear ratings on the BAT at follow-up approximated the normal distribution, the data were left untransformed. Further, although the pretest BAT fear ratings were negatively skewed, the sample size was likely large enough to preclude the necessity of transformation. Missing data were infrequent. When a value was missing on a questionnaire, it was replaced by the participant's mean score on the questionnaire and added to the total score. Although there are more sophisticated methods for replacing missing values, when less than 5% of the sample is missing data (as was the case in the current study) all methods of data replacement yield similar results (Tabachnick & Fidell, 2007).

Manipulation Check

The participants' scripts were typed and analyzed using *Linguistic Inquiry and Word Count* software (LIWC; Pennebaker, Booth, & Francis, 2007). The total number of words generated by participants in each condition summed across the three writing sessions was: VE (M = 1163 words, SD = 282 words), CE (M = 1352 words, SD = 418 words), and NC (M = 1166 words, SD = 427 words). The number of words generated did not differ significantly across conditions (p = .29). Participants in the exposure conditions (VE and CE) were instructed to write in first-person, use present tense, and include references to their emotions and sensory

experiences. To examine whether participants in the exposure conditions followed instructions to write in the first-person, a two (Pronoun: first person singular pronouns, impersonal pronouns) by three (Condition: VE, CE, NC) analysis of variance (ANOVA) was run. There was a significant main effect of Pronoun, F (1, 45) = 153.14, p = .01, η_p^2 = .77, with the percentage of first person singular pronouns (M = 30.18, SD = 10.43) being significantly greater than the percentage of impersonal pronouns (M = 14.20, SD = 5.78). There was also a significant main effect of Condition, F (2, 45) = 19.66, p = .01, η_p^2 = .47. Bonferroni post-hoc tests showed that the scripts of participants in the VE condition (M = 31.00, SD = 8.25) contained a significantly greater percentage of first person singular pronouns than did the scripts of participants in the NC condition (M = 22.50, SD = 8.46), t (30) = 2.90, p = .01. Participants in the CE condition (M = 37.03, SD = 9.46) also used a significantly greater percentage of first person singular pronouns than did participants in the NC condition, t (30) = 4.61, p = .01. Regarding impersonal pronouns, participants in the VE condition (M = 15.87, SD = 3.05) used significantly more impersonal pronouns in their scripts than did participants in the NC condition (M = 9.08, SD = 4.91), t (30) = 4.69, p = .01. Participants in the CE condition also used significantly more impersonal pronouns (M = 17.64, SD = 5.26) than did participants in the NC condition, t (30) = 4.76, p = .01. There was no significant Pronoun x Condition interaction effect.

To examine whether participants in the exposure conditions followed instructions to write in the present tense, a three (Tense: past, present, future) by three (Condition: VE, CE, NC) ANOVA was run. There was a significant main effect of Tense, F (2, 90) = 220.81, p = .01, η_p^2 = .83, a significant main effect of Condition, F (2, 45) = 8.40, p = .01, η_p^2 = .27, and a significant Tense x Condition interaction effect, F (4, 90) = 9.37, p = .01, η_p^2 = .29. Bonferroni post-hoc tests showed that participants in the VE condition (M = 37.04, SD = 6.51) used a significantly

greater percentage of present tense words than did participants in the NC condition (M = 24.72, SD = 6.32), t (30) = 5.43, p = .01. Participants in the CE condition also used a significantly greater percentage of present tense words than did participants in the NC condition, t (30) = 4.03, p = .01. In addition, participants in the NC condition (M = 10.75, SD = 5.86) used a significantly greater percentage of future tense words than did participants in the VE condition (M = 5.02, SD = 2.00), t (30) = 3.70, p = .01 and participants in the CE condition (M = 4.92, SD = 3.06), t (30) = 3.53, p = .01.

To examine whether participants in the exposure conditions followed instructions to reference their emotions and sensory experiences, one-way ANOVAs were run. There was a significant difference in the percentage of references to emotions (e.g., sad, anxious) across conditions, F (2, 45) = 11.55, p = .01. Bonferroni post-hoc tests showed that participants in the VE condition (M = 18.86, SD = 5.67) used a significantly greater percentage of references to emotions than did participants in the NC condition (M = 11.69, SD = 6.05), t (30) = 3.62, p = .01. Participants in the CE condition (M = 19.22, SD = 3.60) also used a significantly greater percentage of references to emotions than did participants in the NC condition, t (30) = 4.49, p = .01. There were no significant differences between conditions in the percentage of references to sensory experience (e.g., seeing, hearing) even though participants in the exposure conditions were explicitly instructed to include such references in their writing. The mean percentages of sensory references by condition were: VE (M = 6.44; SD = 2.32), CE (M = 8.23; SD = 2.76), NC (M = 7.85; SD = 3.21).

Taken together, the manipulation check suggests that participants in the cognitive exposure conditions (varied and consistent) followed instructions to write in the first person, in the present tense, and to reference their emotions.

Between-Group Differences at Pretest

One-way ANOVAs were conducted to examine differences between conditions on outcome measures at pretest. There were no statistically significant differences between conditions, with the exception of scores on the WAQ Associated Symptoms Subscale, on which participants in the CE condition (M = 22.19, SD = 3.92) and participants in the NC condition (M = 21.75, SD = 3.79) scored significantly higher than did participants in the VE condition (M = 17.63, SD = 4.54), F (2, 45) = 6.04, p = .01.

There were pretest differences on the PSWQ that approached significance, F (2, 45) = 2.70, p = .08, with participants in the CE condition (M = 66.50, SD = 7.61) scoring higher than participants in the VE condition (M = 60.81, SD = 8.55) and NC condition (M = 60.88, SD = 7.66). All analyses were first conducted uncorrected for the significant pretest differences between conditions on the WAQ-Associated subscale, then analyses which covaried the WAQ-A scores were conducted.

Objective 1: Changes in Symptoms and Cognitive Processes

Mean scores and standard deviations on symptom measures for each condition are reported in Table 2. Between-group differences, within-group differences, and interaction effects were tested using a series of univariate two (Time: pretest, follow-up) by three (Condition: VE, CE, NC) mixed analyses of variance (ANOVAs), with scores on the outcome measures as the dependent variables. Statistical significance was set at $p < .05$, and a Bonferroni correction was applied to all follow-up tests of simple main effects and simple interaction effects.

GAD symptoms. There was a significant main effect of Time, F (1, 45) = 13.47, p = .01, η_p^2 = .23, and a Time x Condition interaction effect, F (2, 45) = 6.00, p = .01, partial η^2 = .21, on the general tendency to worry (as measured by the PSWQ). There was no significant main effect of Condition. Bonferroni post-hoc tests showed that only participants in the CE condition

showed a significant reduction in worry from pretest to 1-week follow-up, F (1, 45) 23.46, p = .01, η_p^2 = .34, (Cohen's d' = 1.17), while participants in the VE and NC conditions did not. There were no significant differences between conditions on PSWQ scores at follow-up. On the measure of "state" worry (measured by the WDRF), there was a significant main effect of Time, F (1, 45) 7.71, p = .01, η_p^2 = .15, but no main effect of Condition, and no Time x Condition interaction effect. Bonferroni post-hoc tests showed that "state" worry decreased significantly on average across conditions from pretest to follow-up. Regarding GAD-associated symptoms (as measured by the WAQ-A) there were significant differences between conditions at pretest (as discussed earlier in this section). There was a significant main effect of Time on the WAQ-A, F (1, 45) = 13.67, p = .01, η_p^2 = .23, which was qualified by a significant Time x Condition interaction, F (2, 45) = 6.26, p = .01, η_p^2= .22. There was no significant main effect of Condition. Bonferroni post-hoc tests showed that participants in the CE condition reported significant reductions in GAD-associated symptoms from pretest to follow-up, F (1, 45) = 19.15, p = .01, η_p^2 = .30, (Cohen's d' = 1.05), as did participants in the NC condition, F (1, 45) = 6.75, p = .05, η_p^2= .13, (Cohen's d' = .57); whereas participants in the VE condition did not. There were no significant differences between conditions on symptoms associated with GAD at follow-up.

State anxiety, trait anxiety and depressive symptoms. There was no main effect of Time, Condition, or a Time x Condition interaction on *state anxiety* (measured by the STICSA-S). There was a significant main effect of Time on *trait anxiety* (measured by the STICSA-T), F (1, 32) = 7.07, p = .02, η_p^2 = .18, such that trait anxiety significantly decreased on average across conditions from pretest to follow-up. There was no main effect of Condition, and no Time x Condition interaction effect on trait anxiety.

Table 2

Means and Standard Deviations for Measures of Symptoms at Pretest and 1-Week Follow-up by Condition

Measure		Varied Exposure (n = 16)	Consistent Exposure (n = 16)	Neutral Control (n = 16)
PSWQ	Pretest	60.81 (8.55)	66.50 (7.60)	60.87 (7.66)
	Follow-Up	60.62 (8.15)	57.50 (7.76)	58.25 (10.06)
WDRF	Pretest	69.44 (14.88)	72.84 (17.32)	72.13 (26.31)
	Follow-Up	68.06 (15.64)	61.12 (19.47)	65.12 (17.86)
WAQ-Associated	Pretest [a]	17.63 (4.54)	22.19 (3.92)	21.75 (3.79)
	Follow-Up	18.25 (4.16)	17.34 (5.21)	18.88 (6.00)
STICSA-S [b]	Pretest	37.18 (13.96)	35.75 (8.59)	39.27 (7.96)
	Follow-Up	36.18 (9.09)	32.92 (13.88)	32.28 (7.17)
STICSA-T [b]	Pretest	45.33 (10.50)	46.63 (8.72)	46.40 (9.26)
	Follow-Up	43.73 (8.75)	40.25 (10.67)	42.90 (12.62)
CES-D	Pretest	39.95 (9.64)	42.41 (10.72)	44.45 (10.72)
	Follow-Up	39.89 (9.36)	36.19 (9.60)	43.69 (12.84)

Note. PSWQ = Penn State Worry Questionnaire; WDRF = Worry Domains Rating Form; WAQ-Associated = Worry and Anxiety Questionnaire-Associated Symptoms Subscale; STICSA-S = State-Trait Inventory for Cognitive and Somatic Anxiety-State Subscale; STICSA-T = State-Trait Inventory for Cognitive and Somatic Anxiety-Trait Subscale; CES-D = The Centre for Epidemiological Studies-Depression Scale.
a = participants' scores differed significantly on the WAQ-Associated at pretest; *b* = 35 participants completed the measure.

On *depressive symptoms* (measured by the CES-D), there was no main effect of Time, no main effect of Condition, and no Time x Condition interaction effect.

GAD cognitive processes. Mean scores and standard deviations on GAD-related cognitive process measures are reported in Table 3 for each condition. There was a significant main effect of Time, F (1, 45) = 6.37, p = .02, η_p^2= .12, and a significant Time x Condition interaction effect, F (2, 45) = 3.62, p = .04, η_p^2 = .14 on *intolerance of uncertainty* (IU; as measured by the IUS). There was no main effect of Condition. Bonferroni post-hoc comparisons revealed that only participants in the CE condition reported a significant reduction in IU from pretest to follow-up, F (1, 45) = 11.52, p = .01, η_p^2 = .20, (Cohen's d' = .72), whereas there was no significant change in IU scores for participants in the VE or NC conditions. However, at follow-up there were no significant differences in IU scores between conditions.

On the measure of the general tendency to engage in *cognitive avoidance* (measured by the CAQ), there was no main effect of Time, no main effect of Condition, and no Time x Condition interaction effect. Regarding *interpretations of ambiguous situations* (measured by the AUSD-EX), there was a significant main effect of Time, F (1, 45) = 14.78, p = .01, η_p^2 = .25, which was qualified by a significant Time x Condition interaction, F (2, 45) = 4.12, p = .02, η_p^2 = .16. There was no main effect of Condition on the interpretation of ambiguous situations. Bonferroni post-hoc comparisons showed that there was a significant reduction in the extent to which participants in the CE condition, F (1, 45) = 11.77, p = .01, η_p^2 = .21, (Cohen's d' = .40), and NC condition, F (1, 45) = 11.22, p = .01, η_p^2 = .20, (Cohen's d' = .51), interpreted ambiguous scenarios as threatening from pretest to follow-up. Participants in the VE condition did not show significant changes in their interpretations of ambiguous scenarios over time.

Table 3

Means and Standard Deviations for Process Measures at Pretest and 1-Week Follow-up by Condition

Measure		Varied Exposure (*n* = 16)	Consistent Exposure (*n* = 16)	Neutral Control (*n* = 16)
IUS	Pretest	80.88 (20.34)	85.22 (15.95)	83.98 (21.58)
	Follow-Up	82.45 (23.34)	72.13 (20.38)	78.63 (23.60)
CAQ	Pretest	74.31 (15.04)	77.44 (15.88)	70.56 (18.84)
	Follow-Up	76.19 (12.63)	74.13 (13.90)	68.50 (19.65)
AUSD-EX [a]	Pretest	109.38 (17.21)	102.75 (25.20)	105.34 (17.41)
	Follow-Up	109.75 (17.68)	92.25 (26.85)	95.09 (22.50)
Likelihood [b]	Pretest	4.21 (0.98)	3.50 (1.15)	3.81 (1.33)
	Follow-Up	2.93 (1.49)	2.77 (1.24)	4.00 (1.20)
Cost [b]	Pretest	5.36 (0.63)	5.69 (0.48)	5.00 (1.41)
	Follow-Up	4.86 (0.95)	4.31 (1.25)	4.56 (1.41)
Cope [b]	Pretest	3.21 (1.58)	3.58 (1.50)	3.63 (1.71)
	Follow-Up	3.29 (2.05)	3.54 (1.51)	4.38 (1.09)

Note. IUS= Intolerance of Uncertainty Scale; CAQ = Cognitive Avoidance Questionnaire; AUSD-EX = Explicit Interpretations Task; Likelihood = perceived likelihood of the worst case scenario coming true; Cost = perceived cost associated with the worst case scenario coming true; Cope = perceived ability to cope with the worst case scenario if it came true.
a = the ambiguous scenarios subscale of the Explicit Interpretations Task; *b* = 43 participants completed the measure.

There were no significant differences between conditions in their interpretations of ambiguous scenarios at follow-up.

Scenario-specific cognitive processing. Two participants in the VE condition and three participants in the CE condition did not complete the scenario-specific cognitive processing questions, as the questions were added after data collection was already in progress. Examining participants' ratings of the *likelihood that their "worst case scenario" would come true* there was a significant main effect of Time, F (1, 40) = 8.28, p = .01, η_p^2 = .17, which was qualified by a Time x Condition interaction, F (2, 40) = 4.36, p = .02, η_p^2= .18. There was no main effect of Condition. Bonferroni post-hoc comparisons showed that participants in the VE condition reported significantly lower likelihood estimates that their worst case scenario would come true from pretest to follow-up, F (1, 40) = 12.09, p = .01, η_p^2 = .23, (Cohen's d' = 1.02). Participants in the CE condition also reported lower likelihood estimates from pretest to follow-up, F (1, 40) = 3.63, p = .06, η_p^2 = .08, (Cohen's d' = 0.61), although the change did not reach statistical significance. Participants in the NC condition did not report a change in their likelihood estimates over time. All three conditions were equivalent in their perceptions of the likelihood that their worst case scenario would come true at pretest; however, at follow-up, participants in the VE condition reported lower likelihood estimates than did participants in the NC condition, t (28) = - 2.26, p = .03, Cohen's d' = .82. Participants in the CE condition also reported significantly lower likelihood estimates than did participants in the NC condition at follow-up, t (27) = - 2.84, p = .01, Cohen's d' = 1.05. The likelihood estimates of participants in the VE and CE conditions at follow-up did not differ significantly.

Participants also rated the *cost associated with their worst case scenario coming true*. There was a significant main effect of Time, F (1, 40) = 20.25, p = .01, η_p^2 = .34, and a Time x

Condition interaction that approached significance, F (2, 40) = 3.04, p = .06, η_p^2 = .13. There was no significant main effect of Condition. Bonferroni post-hoc comparisons showed that only participants in the CE condition reported a significant decrease in ratings of the cost associated with the worst case scenario coming true from pretest to follow-up, F (1, 40) = 19.74, p = .01, η_p^2 = .33, (Cohen's *d'* = 1.46). Participants in the VE and NC conditions did not report changes in their estimates of the cost of the worst case scenario coming true over time. There were no significant differences between conditions in their cost estimates at follow-up.

Finally, participants estimated their *perceived ability to cope* if their worst case scenario came true. There was no main effect of Time, no main effect of Condition, and no Time x Condition interaction effect.

Changes in symptoms and cognitive processes controlling for pretest differences. The series of ANOVAs that were run to analyze *Objective 1* were repeated using a series of analyses of covariance (ANCOVAs), which controlled for the pretest difference between conditions on symptoms associated with GAD (WAQ-A scores). Controlling for pretest WAQ-A scores, there was no longer a significant main effect of Time on the general tendency to worry (PSWQ), as there had been in the noncovaried analysis. However, the Time x Condition interaction effect on the PSWQ remained significant, F (1, 44) = 5.63, p = .01, η_p^2 = .20. As in the noncovaried analysis, Bonferroni post-hoc comparisons showed that only participants in the CE condition showed a significant reduction in worry from pretest to 1-week follow-up, F (1, 44) = 22.70, p = .01, η_p^2 = .34, while the VE and NC conditions did not report significant reductions in worry over time. On the measure of "state" worry (WDRF), the previously significant main effect of Time was no longer significant in the covaried analysis. There were no other significant effects on the WDRF in the uncovaried or covaried analyses.

Controlling for pretest WAQ-A scores, the previously significant main effect of Time on trait anxiety (STICSA-T) was no longer significant. There were no other significant effects on trait anxiety in the uncovaried or covaried analyses. A significant main effect of Condition on depressive symptoms (CES-D) which had not been significant in the uncovaried analysis emerged, F (1, 44) = 4.96, p = .01, η_p^2 = .18. Bonferroni post-hoc tests showed that averaging across time, depressive symptoms reported by participants in the CE condition were significantly lower than depressive symptoms reported by participants in the VE condition, t (44) = 7.92, p = .01, or participants in the NC condition, t (44) = 5.47, p = .05. There were no other significant effects on depressive symptoms in the uncovaried or covaried analyses.

On intolerance of uncertainty (IUS), the previously significant main effect of Time was no longer statistically significant when pretest WAQ-A scores were covaried (F (1, 44) = 0.00, p = .98, η_p^2 = .00), nor was the previously significant Time x Condition interaction effect (F (2, 44) = 2.94, p = .09, η_p^2 = .10). On the tendency to interpret ambiguous scenarios as threatening (AUSD-EX) the previously significant main effect of Time was no longer statistically significant as it had been in the noncovaried analysis, F (1, 44) = 2.83, p = .10, η_p^2 = .06. A significant main effect of Condition which had not been significant in the noncovaried analysis emerged, F (2, 44) = 4.69, p = .01, η_p^2 = .18. As in the noncovaried analysis, the Time x Condition interaction effect was significant, F (2, 44) = 4.48, p = .02, η_p^2 = .17. Bonferroni post-hoc comparisons showed that there was a significant reduction in the extent to which participants in the CE condition, F (1, 44) = 12.68, p = .01, η_p^2 = .22, and participants in the NC condition, F (1, 44) = 12.01, p = .01, η_p^2 = .21, interpreted ambiguous scenarios as threatening from pretest to follow-up. In the noncovaried analysis there were no differences between conditions at follow-up on AUSD-EX scores, however, in the covaried analysis participants in the VE condition reported a

significantly greater tendency to interpret ambiguous scenarios as negative than did participants in the CE condition, t (44) = 28.02, p = .01, and participants in the NC condition, t (44) = 24.16, p = .01.

On ratings of the likelihood that the worst case scenario would come true, the previously significant main effect of Time was no longer significant when pretest WAQ-A scores were controlled for. However, the previously significant Time x Condition interaction effect continued to be significant, F (2, 39) = 3.70, p = .03, η_p^2 = .16. As in the noncovaried analysis, Bonferroni post-hoc comparisons showed that participants in the VE condition reported significantly lower likelihood estimates from pretest to follow-up, F (1, 39) = 9.96, p = .01, η_p^2 = .20, and participants in the CE condition showed a trend toward lower likelihood estimates over time, F (1, 39) = 3.57, p = .07, η_p^2 = .08. Also as in the noncovaried analysis, Bonferroni post-hoc tests showed that at follow-up participants in the CE condition reported significantly lower likelihood estimates than did participants in the NC condition, t (26) = - 1.26, p = .03. However, unlike the uncovaried analysis there was no longer a significant difference between the likelihood estimates of participants in the VE and NC conditions at follow-up. Likelihood estimates of participants in the VE condition and CE condition did not differ significantly. On the perceived cost associated with the worst case scenario coming true there was no longer a significant main effect of Time, or a Time x Condition interaction effect in the covaried analysis, as there had been in the noncovaried analysis.

Objective 2: Differences in Subjective Emotion

To examine initial subjective emotion and across-session change in subjective emotion, two univariate two (Time: Session 1, Session 3) by three (Condition: VE, CE, NC) mixed ANOVAs were run using subjective ratings of anxious arousal and unpleasant affect (SAM

scores) as the dependent variables. To examine within-session change in subjective emotion, a series of univariate two (Time: beginning, end) by three (Condition: VE, CE, NC) mixed ANOVAs were run on data from Session 1, Session 2, and Session 3. A Bonferroni correction was applied to all follow-up tests of simple main effects and simple interaction effects.

Initial subjective emotion. There was a significant difference between conditions during Session 1 of exposure, F (2, 45) = 5.28, p = .01. Bonferroni post-hoc comparisons showed that participants in the VE condition (M = 4.77, SD = 1.67) reported significantly higher anxious arousal during Session 1 than participants in the NC condition (M = 3.33, SD = 1.86), t (46) = 1.44, p = .05, Cohen's d' = .81. Similarly, Bonferroni post-hoc comparisons showed that participants in the CE condition (M = 5.08, SD = 1.29) reported significantly higher anxious arousal during Session 1 than did participants in the NC condition, t (46) = 1.75, p = .01, Cohen's d' = 1.09. There was no significant difference in initial anxious arousal between participants in the VE and CE conditions.

There was also a significant difference between conditions in unpleasant affect during Session 1, F (2, 45) = 11.03, p = .01. Bonferroni post-hoc comparisons showed that participants in the VE condition (M = 5.71, SD = 1.45) reported significantly higher unpleasant affect during Session 1 than did participants in the NC condition (M = 4.08, SD = 1.18), t (46) = 1.63, p = .01, Cohen's d' = 1.23. Participants in the CE condition (M = 6.02, SD = 1.10) also reported significantly higher unpleasant affect than did participants in the NC condition, t (46) = 1.94, p = .01, Cohen's d' = 1.70. There was no significant difference in initial unpleasant affect between participants in the VE and CE conditions.

Across-session change in subjective emotion. There was a significant main effect of Time, F (1, 45) = 14.25, p = .01, η_p^2 = .24 on ratings of subjective anxious arousal, such that

participants reported lower anxious arousal from Session 1 to Session 3. This effect of Time was qualified by a significant Time x Condition interaction, F (2, 45) = 3.29, p = .04, η_p^2 = .13. Bonferroni post-hoc comparisons showed that participants in the CE condition reported reduced subjective anxious arousal from Session 1 (M = 5.08, SD = 1.29) to Session 3 (M = 3.69, SD = 1.61), F (1, 45) = 17.41, p = .01, η_p^2 = .28, (Cohen's d' = .95). Participants in the VE condition also reported reduced subjective anxious arousal from Session 1 (M = 4.77, SD = 1.67) to Session 3 (M = 4.19, SD = 1.79), although this difference was not statistically significant, F (1, 45) = 3.04, p = .09, partial η^2 = .06, (Cohen's d' = .34). Participants in the NC condition did not report a significant change in subjective anxious arousal across sessions.

On ratings of subjective unpleasant affect there was a significant main effect of Time, F (1, 45) = 14.88, p = .01, η_p^2 = .25, such that on average, participants reported lower unpleasant affect from Session 1 to Session 3. There was also a significant main effect of Condition, F (2, 45) = 11.19, p = .01, η_p^2 = .33. Bonferroni post-hoc comparisons showed that on average, participants in the VE condition (M = 5.52, SD = 1.52) reported greater unpleasant affect than did participants in the NC condition, t (46) = 1.70, p = .01, Cohen's d' = 1.25. Similarly, on average, participants in the CE condition (M = 5.52, SD = 1.18) reported greater unpleasant affect than did participants in the NC condition, t (46) = 1.70, p = .01, Cohen's d' = 1.45. There were no differences between the VE and CE conditions. There was no Time x Condition interaction effect. See Figure 2 for a graphical depiction of ratings of across-session subjective emotion.

Figure 2. Across-Session and Within-Session Changes in Subjective Emotion by Condition

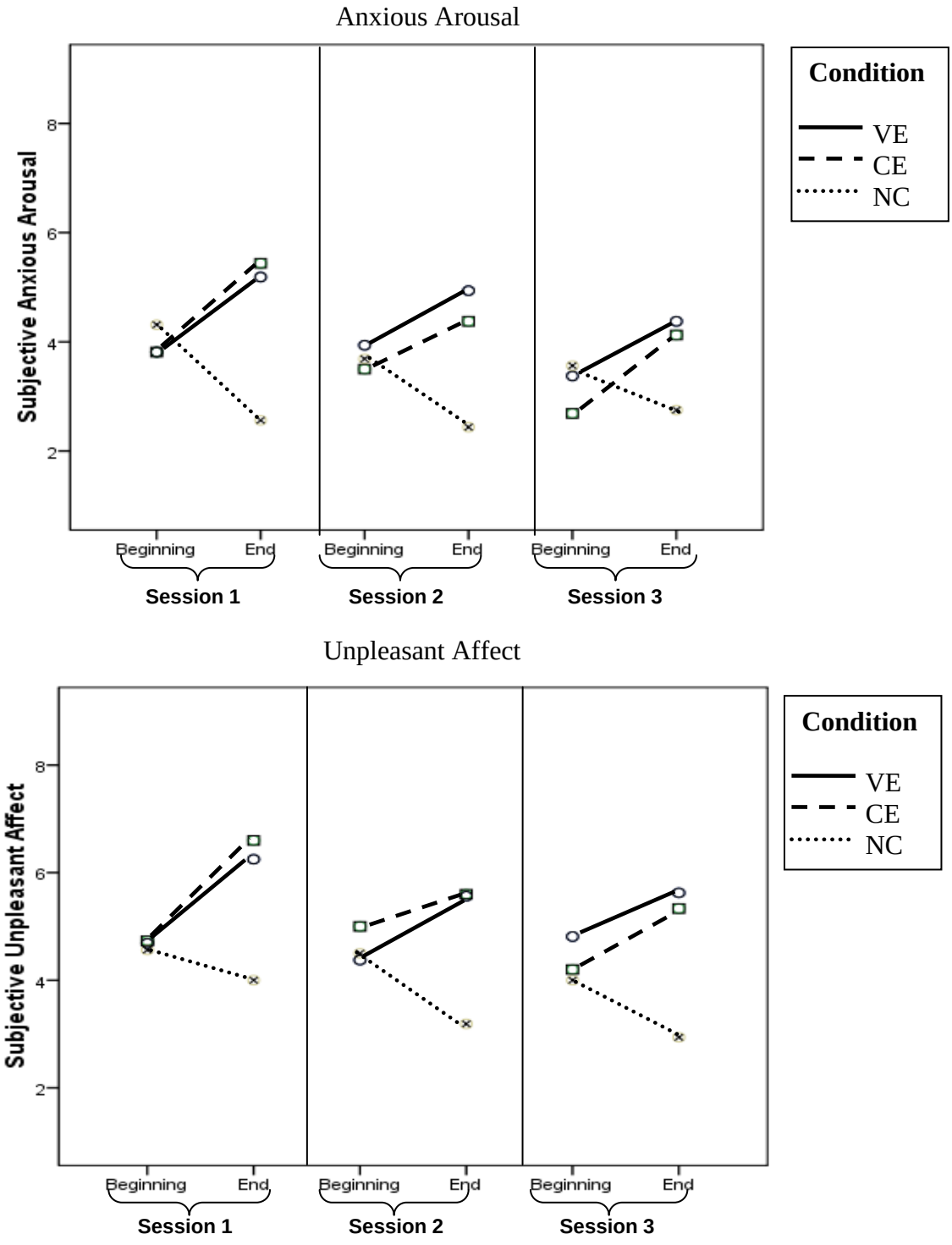


Figure 2. Changes across and within writing sessions in subjective anxious arousal (top) and subjective unpleasant affect (bottom) measured at the beginning and end of each cognitive exposure session. VE = Varied Exposure condition; CE = Consistent Exposure condition; NC = Neutral Control condition.

Within-Session Change in Subjective Emotion.

Session 1. There was no main effect of Time or Condition, however there was a significant Time x Condition interaction effect, F (2, 45) = 28.29, p = .01, η_p^2 = .34. Bonferroni post-hoc tests indicated that participants in the VE condition reported significant increases in subjective anxious arousal from the beginning to end of Session 1, F (1, 45) = 6.29, p = .02, η_p^2 = .12, (Cohen's *d'* = .74), as did participants in the CE condition, F (1, 45) = 8.78, p = .01, η_p^2 = .16, (Cohen's *d'* = .96). Participants in the NC condition reported a significant decrease in subjective anxious arousal from the beginning to end of Session 1, F (1, 45) = 10.19, p = .01, η_p^2 = .19, (Cohen's *d'* = .84). At the end of Session 1 participants in the VE condition (M = 5.19, SD = 2.17) and CE condition (M = 5.44, SD = 1.86) reported significantly higher anxious arousal than participants in the NC condition (M = 2.56, SD = 1.75).

Examining subjective unpleasant affect, there was a significant main effect of Time, F (1, 45) = 23.01, p = .01, η_p^2 = .17, a significant main effect of Condition, F (2, 45) = 6.62, p = .01, η_p^2 = .23, and a significant Time x Condition interaction, F (2, 45) = 5.72, p = .01, η_p^2 = .20. Bonferroni post-hoc comparisons showed that participants in the VE condition reported a significant increase in unpleasant affect from the beginning to end of Session 1, F (1, 45) = 7.68, p = .01, η_p^2 = .15, (Cohen's *d'* = .83), as did participants in the CE condition, F (1, 15) = 11.81, p = .01, η_p^2 = .21, (Cohen's *d'* = 1.41). Participants in the NC condition did not report a change in unpleasant affect from the beginning to end of Session 1. At the end of Session 1 participants in the VE condition (M = 6.25, SD = 2.08) and CE condition (M = 6.69, SD = 1.74) reported significantly higher unpleasant affect than participants in the NC condition (M = 4.00, SD = 1.75).

Session 2. There was no significant main effect of Time or Condition, however there was a significant Time x Condition interaction, F (2, 45) = 6.44, p = .01, η_p^2 = .22. Bonferroni post-hoc comparisons showed that participants in the VE condition reported a significant increase in anxious arousal from the beginning to end of Session 2, F (1, 45) = 4.03, p = .05, η_p^2 = .08, (Cohen's *d'* = .61), and participants in the NC condition reported a significant decrease in anxious arousal from the beginning to end of Session 2, F (1, 45) = 6.29, p = .02, η_p^2 = .12, (Cohen's *d'* = .58). Participants in the CE condition did not report a significant change in anxious arousal. At the end of Session 2 participants in the VE condition (M = 4.94, SD = 1.91) and CE condition (M = 4.38, SD = 2.28) reported significantly higher anxious arousal than participants in the NC condition (M = 2.44, SD = 2.22).

Examining subjective unpleasant affect, there was no significant main effect of Time, however there was a significant main effect of Condition, F (2, 44) = 4.52, p = .02, η_p^2 = .17, and a significant Time x Condition interaction, F (2, 44) = 6.99, p = .01, η_p^2 = .24. Bonferroni post-hoc comparisons indicated that participants in the VE condition reported a significant increase in unpleasant affect from the beginning to end of Session 2, F (1, 44) = 5.79, p = .02, η_p^2 = .12, (Cohen's *d'* = .81), and participants in the NC condition reported a significant decrease in unpleasant affect from the beginning to end of Session 2, F (1, 44) = 7.07, p = .04, η_p^2 = .14, (Cohen's *d'* = .67). Participants in the CE condition did not report a significant change in unpleasant affect. At the end of Session 2 participants in the VE condition (M = 5.56, SD = 1.59) and CE condition (M = 5.60, SD = 1.72) reported significantly higher unpleasant affect than participants in the NC condition (M = 3.19, SD = 2.04).

Session 3. There was no significant main effect of Time or Condition, but there was a significant Time x Condition interaction, F (2, 45) = 5.88, p = .01, η_p^2 = .21. Bonferroni post-hoc

comparisons showed that participants in the VE condition reported a significant increase in anxious arousal from the beginning to end of Session 3, F (1, 45) = 4.13, p = .05, η_p^2 = .08, (Cohen's *d'* = .52), as did participants in the CE condition, F (1, 45) = 8.53, p = .01, η_p^2 = .16, (Cohen's *d'* = .76). Participants in the NC condition did not report changes in subjective anxious arousal across Session 3. There were no significant differences in anxious arousal between conditions at the beginning or end of Session 3.

Examining unpleasant affect, there was no significant main effect of Time, but there was a significant main effect of Condition, F (2, 45) = 7.40, p = .01, η_p^2 = .25, and a significant Time x Condition interaction, F (2, 45) = 10.83, p = .01, η_p^2 = .33. Bonferroni post-hoc comparisons showed that participants in the VE condition reported a significant increase in unpleasant affect from the beginning to end of Session 3, F (1, 45) = 4.74, p = .04, η_p^2 = .10, (Cohen's *d'* = .47), as did participants in the CE condition, F (1, 45) = 11.21, p = .01, η_p^2 = .20, (Cohen's *d'* = .84). Participants in the NC condition reported a significant decrease in unpleasant affect from the beginning to end of Session 3, F (1, 45) = 8.10, p = .01, η_p^2 = .15, (Cohen's *d'* = .81). At the end of Session 3 participants in the VE condition (M = 5.62, SD = 2.00) and CE condition (M = 5.44, SD = 1.67) reported significantly higher unpleasant affect than participants in the NC condition (M = 2.94, SD = 1.81). See Figure 2 for a graphical depiction of ratings of within-session subjective emotion.

Objective 3: Subjective Emotion during Written Exposure as a Predictor of Outcomes

Initial subjective emotion. To test the hypothesis that initial subjective emotion predicts changes in symptoms, GAD cognitive processes, and scenario-specific cognitive processes, Pearson correlations between mean ratings on the SAM scales (anxious arousal and unpleasant affect) during Session 1 and change scores on all outcome measures were calculated for the VE condition and the CE condition separately. Subjective anxious arousal and unpleasant affect during the first writing session were not correlated with changes on any of the outcome measures in the VE or CE conditions.

Across-session change in subjective emotion. Pearson correlations were used to examine whether change in average subjective emotion (anxious arousal and unpleasant affect) from Session 1 to Session 3 was a predictor of change in symptoms, GAD cognitive processes, and scenario-specific cognitive processes. There were no significant correlations between change in subjective emotion and change in outcome variables within the varied exposure condition. Similarly there were no significant correlations between change in subjective emotion and change in outcome measures within the consistent exposure condition, with the exception of a significant negative correlation (r = - .59, p = .02) between changes in cognitive avoidance and changes in unpleasant affect.

Objective 4: Exploratory Modified Behavioural Avoidance Tests

Responses to the original BAT over time. To examine whether fear and avoidance in response to a brief mental image of the worst case scenario (a modified BAT task) differed across time and conditions, a univariate two (Time: pretest, 1-week follow-up) by three (Condition: VE, CE, NC) mixed ANOVA was run. A Bonferroni correction was applied to all follow-up tests of simple main effects and simple interaction effects. Regarding fear ratings, there was a significant main effect of Time, F (1, 45) = 11.32, p = .01, η_p^2 = .20, such that across all conditions participants' fear ratings of an image of the original worst case scenario decreased from pretest (M = 7.44, SD = 2.43) to follow-up (M = 5.85, SD = 2.56). There was no significant main effect of Condition, and no significant Time x Condition interaction effect.

In terms of avoidance ratings, there was a significant main effect of Time, F (1, 45) = 16.45, p = .01, η_p^2 = .27, such that when scores were averaged across all conditions participants' desire to avoid imagining the worst case scenario decreased from pretest (M = 8.21, SD = 2.54) to follow-up (M = 6.18, SD = 3.19). Although the Time x Condition interaction was not statistically significant, F (2, 45) = 2.11, p = .14, η_p^2 = .09, decreases in avoidance were more pronounced in participants in the exposure conditions. Participants in the VE condition reported decreases in avoidance from pretest (M = 7.97, SD = 3.45) to follow-up (M = 6.31, SD = 3.58) that approached statistical significance, F (1, 45) = 3.65, p = .07, η_p^2 = .08, (Cohen's d' = .47), and participants in the CE condition reported decreases in avoidance from pretest (M = 8.25, SD = 2.21) to follow-up (M = 4.81, SD = 3.45) that were statistically significant (although the omnibus interaction effect was not statistically significant), F (1, 45) =15.70, p = .01, η_p^2 = .26, (Cohen's d' = 1.19). Participants in the NC condition reported decreases in avoidance from pretest (M = 8.41, SD = 1.80) to follow-up (M = 7.41, SD = 1.91) that were not statistically

significant, F (1, 45) = 1.33, p = .26, η_p^2 = .03. At follow-up, participants in the CE condition reported a lower desire to avoid imagining their worst case scenario than participants in the NC condition; the difference approached statistical significance, t (30) = - 2.59, p = .07.

Responses to the original BAT and two new BATs at follow-up. To examine whether fear and avoidance in response to three modified BAT tasks differed across the conditions at 1-week follow-up, a univariate three (BAT: same worry in same domain, new worry in same domain, new worry in different domain) by three (Condition: VE, CE, NC) mixed ANOVA was run. A Bonferroni correction was applied to all follow-up tests of simple main effects and simple interaction effects. Regarding fear ratings, there was a significant main effect of BAT, F (2, 44) = 13.15, p = .01, η_p^2 = .37. Bonferroni post-hoc comparisons showed that averaged across all conditions participants' fear ratings of an image of the original worst case scenario (M = 5.85, SD = 2.56) were lower than their fear ratings of an image of a new scenario in the same worry domain as the original (M = 6.59, SD = 2.58; t (30) = - .74, p = .02) and their fear ratings of an image of a new scenario in a different worry domain than the original (M = 7.47, SD = 2.40; t (30) = -1.62, p = .01). There was no significant main effect of Condition, and no significant BAT x Condition interaction.

In terms of avoidance ratings, there was a significant main effect of BAT, F (2, 44) = 5.37, p = .01, η_p^2 = .20. Averaging across all conditions, participants' ratings of their desire to avoid imagining their original worst case scenario (M = 6.18, SD = 3.19) was lower than their ratings of their desire to avoid imagining a new scenario in a different worry domain than the original (M = 7.53, SD = 2.95; t (30) = -1.35, p = .01). Participants' ratings of their desire to avoid imagining a new scenario in the same worry domain as the original scenario (M = 6.94, SD = 2.85) did not differ significantly from either of the other BATs. Although the main effect of

Condition on avoidance ratings was not significant, F (2, 45) = 2.57, p = .09, η_p^2 = .10, participants in the CE condition did report lower avoidance ratings on average than participants in the VE or NC conditions. There was no significant BAT x Condition interaction effect.

Discussion

Purpose of the Study

Little is known about whether written cognitive exposure for GAD (e.g., as described by Dugas & Robichaud, 2007) works. The goal of the present study was to replicate findings reported initially by Goldman et al. (2007) regarding the beneficial effects of written cognitive exposure on excessive worry. The second goal of this study was to extend Goldman et al.'s findings by examining the impact of stimulus variation on exposure outcome, patterns of subjective emotion during exposure, the relation of emotional activation to outcome, and lastly fear and avoidance of feared mental images following exposure.

Objective 1: Changes in Symptoms and Cognitive Processes

Summary of main findings. In general, the results partially supported one of the competing hypotheses – that writing about the same worst case scenario coming true across exposure sessions (consistent exposure) is associated with greater improvements on GAD-relevant outcomes than writing about different worst case scenarios coming true at each exposure session (varied exposure) or neutral writing (control). Regarding changes in GAD symptoms, people who engaged in consistent exposure showed improvements in the general tendency to worry from pretest to 1-week follow-up, whereas people who engaged in varied exposure or neutral writing did not. People who engaged in consistent exposure or neutral writing reported improvements in symptoms associated with GAD (e.g., difficulty sleeping, muscle tension) from pretest to 1-week follow-up, whereas people who engaged in varied exposure did not. However, individuals who engaged in consistent exposure and individuals who engaged in neutral writing reported higher levels of GAD-associated symptoms prior to written exposure than individuals who engaged in varied exposure. Further, although individuals who engaged in consistent

exposure showed improvements in worry and other GAD symptoms over time, there were no differences between any of the three conditions at 1-week follow-up.

With regard to GAD-related cognitive processes, individuals who engaged in consistent exposure showed improvements in intolerance of uncertainty and the tendency to interpret ambiguous scenarios negatively from pretest to follow-up, whereas individuals who engaged in varied exposure did not. Individuals who engaged in neutral writing did not show improvements in intolerance of uncertainty over time, but did report improvements in the tendency to interpret ambiguous scenarios in a negative manner from pretest to follow-up. Despite changes over time, participants who engaged in any of the three types of writing reported comparable scores on measures of GAD-related cognitive processes at 1-week follow-up.

Regarding cognitive changes related to each person's specific "worst case scenario," people who engaged in varied exposure showed reductions in their estimates of the likelihood that their worst case scenario would come true from pretest to follow-up, while individuals in the neutral writing condition did not. People who engaged in consistent exposure reported lower likelihood estimates that their worst case scenario would come true over time, although the change was not statistically significant ($p = .06$). At follow-up, individuals who engaged in varied or consistent exposure reported lower likelihood estimates that their worst case scenario would come true than did individuals who engaged in neutral writing. Participants who engaged in consistent exposure also showed positive change in their perceptions of the cost associated with their worst case scenario coming true from pretest to follow-up. Individuals who engaged in varied exposure or neutral writing did not show significant improvement in their perceptions of the cost of the worst case scenario coming true over time. There were no differences between conditions at 1-week follow-up in their perceptions of the cost associated with the worst case

scenario coming true. There were no changes reported by participants in any condition in the degree to which they believed that they could cope with their worst case scenario coming true over time. In sum, individuals who engaged in consistent exposure showed improvements in worry, GAD-associated symptoms, intolerance of uncertainty, negative perceptions of ambiguous situations, and perceptions of the likelihood and cost of the worst case scenario coming true over time; however, with the exception of likelihood estimates, outcome variable scores were comparable across all three conditions at 1-week follow-up. These findings suggest that consistent exposure may be associated with positive change over time, although it cannot be concluded that consistent exposure is superior to varied exposure or neutral writing.

Previous research on cognitive exposure for worry. The results of the present study are consistent with Goldman and colleagues' (2007) preliminary study examining written cognitive exposure for GAD. The present findings replicated Goldman's findings that: (1) consistent cognitive exposure leads to reduced worry and GAD-associated symptoms over time, and (2) neutral writing leads to reduced GAD-associated symptoms over time. The present finding that consistent exposure leads to improved GAD symptoms over time is also in line with Provencher and colleagues' (2004) findings. The present findings can be compared to prior research on cognitive exposure by contrasting the effect sizes associated with outcome measures that have been used consistently across studies. In the current study the effect sizes associated with consistent exposure from pretest to follow-up were as follows: PSWQ, *d*' = 1.17; WAQ-Associated, *d*'= 1.05; CES-D, *d*' = 0.61; IUS, *d*' = 0.72. The effect sizes associated with varied exposure from pretest to follow-up were less than *d*' = 0.10 for all outcome variables, with the exception of reductions in the perceived likelihood of the worst case scenario coming true (*d'* = 1.02). The effect sizes associated with consistent exposure from pretest to follow-up in Goldman

and colleagues' (2007) study were as follows: PSWQ, *d*' = 1.27; WAQ-Associated, *d*'= 0.79; CES-D, *d*' = 0.17; IUS, *d*' = 0.44. Provencher and colleagues found the following effect sizes associated with consistent cognitive exposure: PSWQ, *d'* = 1.42; WAQ-Associated, *d'* = 1.63. The magnitude of the impact of consistent exposure on worry and GAD-associated symptoms over time in the present study was large according to standard guidelines (Cohen, 1992), and effect sizes were similar to those reported by Goldman and colleagues. Consistent exposure in the present study appeared to have a moderate to large impact on intolerance of uncertainty and a medium effect on depressive symptoms over time, whereas Goldman et al. found that consistent exposure had a small to medium effect on intolerance of uncertainty and a small impact on depressive symptoms over time. Provencher and colleagues found that cognitive exposure had a notably larger effect size on worry and associated GAD symptoms than the present study. This could be due to the difference in the amount of cognitive exposure that individuals received in the Provencher et al.'s study compared to the current study. Individuals in Provencher's study received 12 one-hour sessions spaced over 12 weeks (seven of which were dedicated to cognitive exposure), while participants in the current study received only 20 minutes of cognitive exposure on three consecutive days.

Previous research on cognitive exposure for trauma. The finding that consistent exposure was associated with a greater reduction in GAD symptoms over time than varied exposure is in line with findings from the PTSD literature. Sloan and colleagues (2005) found that writing about the same trauma for 20 minutes across three sessions was associated with greater PTSD symptom reduction at 4-week follow-up than was writing about different traumatic experiences across sessions. Although the procedure used in the present study was similar to that used by Sloan and colleagues, the results differed in several important ways. First, the present

study did not find differences in GAD symptoms between conditions at follow-up, while Sloan and colleagues found significant differences in PTSD symptoms between conditions at follow-up. Thus, consistent cognitive exposure to traumatic memories can be said to reduce PTSD symptoms more than varied cognitive exposure to several different traumatic memories or neutral writing. The same cannot be concluded about GAD symptoms as the consistent exposure group was not more improved than the other conditions at follow-up (with the exception of lower likelihood estimates compared to the neutral writing condition). Second, the degree of change reported by participants in Sloan et al.'s study differs from the degree of change reported by participants in the present study. One way to infer degree of change is to examine the change in scores on symptom measures over time as a percentage of pretest symptom scores. Individuals who engaged in consistent exposure for PTSD reported a 62% average decrease in PTSD symptoms, and individuals who engaged in varied exposure reported an 11% average decrease in PTSD symptoms. In the present study, individuals who engaged in consistent exposure reported a 14% average decrease in worry, and a 22% average decrease in GAD-associated symptoms. Individuals who engaged in varied exposure reported less than a 1% average decrease on worry and GAD-associated symptoms over time. The percentage of change scores suggest that the degree of PTSD symptom reduction reported by participants who engaged in consistent exposure to traumatic memories in Sloan and colleagues' study was about three times higher than the degree of GAD symptom reduction reported by participants who engaged in consistent exposure to the worst case scenario in the present study.

There are several potential explanations for the differences between Sloan and colleagues' findings and the present findings. One is that written cognitive exposure may be a more powerful intervention for trauma than for worry. Pennebaker and Beall (1986) originally

established that writing about traumatic experiences improves physical health and well-being, and since then several studies have been conducted supporting this (see Frattaroli, 2006 for a review). The mechanisms proposed to account for the benefits of writing about past traumatic experiences (e.g., emotional disinhibition, cognitive adaptation) may not be the same mechanisms that account for the impact of writing about hypothetical catastrophic scenarios. Further, even if the same mechanisms of change underlie writing about past traumas (as in PTSD) and worrisome scenarios (as in GAD), the change mechanisms may not have the same degree of impact on physical or psychological symptoms for each respective disorder. Another explanation for the difference between Sloan and colleagues' findings and the present findings is that Sloan et al. may have had more power to detect between-group differences because their sample was larger (N = 79) than the current sample (N = 48). Further research using larger samples is needed to determine whether written cognitive exposure can have a similar degree of impact on worry as it has on trauma symptoms.

Overall, however, findings on cognitive exposure from the PTSD literature and the present study suggest that consistent exposure is more helpful than varied exposure. This is inconsistent with prior studies on in-vivo exposure, which suggest an advantage for varied exposure. The discrepancy between cognitive exposure and in-vivo exposure findings may stem from the difference in how the exposure stimulus has been varied in the two streams of research. Prior work on cognitive exposure for PTSD has varied the entire imagined scene (e.g., different traumatic memories), whereas prior research on in-vivo exposure has varied specific stimulus features (e.g., the colour or size of the exposure spider). Varying the stimulus features may be advantageous in exposure therapy, whereas varying the exposure scenario may be less helpful.

This may be because exposure to entirely different stimuli activates several underlying fear structures, interfering with the processing of a single fear structure.

Understanding the present findings on cognitive exposure. The finding that consistent cognitive exposure leads to reductions in intolerance of uncertainty over time is intriguing because intolerance of uncertainty is theorized to be a critical factor in the development and maintenance of GAD (e.g., Dugas et al., 1998a). One potential explanation for this finding is that writing repeatedly about a feared catastrophic outcome with an uncertain likelihood of occurring may be helpful in allowing individuals with GAD to emotionally process the prospect of uncertain scenarios. Negative interpretations of ambiguous scenarios also improved over time with consistent exposure. This is in line with prior research showing that there is a strong relationship between intolerance of uncertainty and negative appraisals of ambiguous information (Dugas et al., 2005; Koerner & Dugas, 2008). Based on the connection between these two cognitive processes, it is intuitive that intolerance of uncertainty and negative interpretations of ambiguous scenarios would improve together. This was true for individuals who engaged in consistent exposure; however, individuals who engaged in neutral writing also reported improvements in the degree to which they interpreted ambiguous scenarios as negative over time, and this group did not show changes in intolerance of uncertainty. There could be a different mechanism of change underlying improvements in negative interpretations of ambiguous scenarios following consistent exposure and neutral writing. Taken together these findings suggest that repeated exposure to the same worst case scenario has a positive impact on biases to be averse to uncertainty and ambiguity.

Cognitive exposure is thought to be effective because it (presumably) decreases cognitive avoidance (Dugas & Robichaud, 2007), thus it was surprising that both conditions that engaged

in cognitive exposure (varied and consistent) did not report changes on the *Cognitive Avoidance Questionnaire* (CAQ). One explanation is that cognitive exposure does not in fact target cognitive avoidance, and that the improvements in GAD-related symptoms and processes reported by individuals who engaged in consistent exposure over time were not facilitated by reduced cognitive avoidance. It is possible that another mechanism of change (or several) could account for the reported improvements. For example, cognitive exposure may help to reduce worry because it allows for feelings and thoughts about a feared situation to become more concrete (i.e., more distinct and specific). Prior research has demonstrated that the worries of people with GAD are less concrete than the worries of people without GAD (Stöber & Borkovec, 2002). For example, individuals with GAD are more likely to worry about "something bad happening" or "nothing working out" than individuals without GAD, who are more likely to worry about specific, narrowly defined negative outcomes, for example, failing an upcoming test. Notably, the worries of people with GAD become more specific and clearly defined following treatment (Stöber & Borkovec, 2002). It has been suggested that thinking about feared situations more concretely may play an important role in reducing pathological worry, as concrete concerns are easier to find solutions to, and easier to invalidate than more abstract concerns. For example, a worry about failing a specific test next week is easier to invalidate than a worry about being a failure in general. Improving the concreteness of thoughts has been proposed as a potential mechanism through which the written emotional disclosure of traumatic experiences improves physical ailments (Jourard, 1971). In sum, a reduction in cognitive avoidance may not be necessary for written cognitive exposure to have a beneficial impact on GAD symptoms and cognitive processes, as it is possible that writing is helpful because it helps to concretize abstract thoughts and feelings about problems.

A different explanation is that cognitive exposure *can* impact cognitive avoidance, although 20 minutes of exposure on 3 days is simply not powerful enough to have an impact. The present study's assessment of participants' desire to avoid specific mental images provides some support for this notion. The data show that participants who engaged in consistent exposure reported a lower desire to avoid imagining the scenario that they confronted during exposure over time. Further, individuals who engaged in consistent exposure showed a trend toward (p = .07) lower avoidance of an image of their worst case scenario at follow-up than individuals who engaged in neutral writing. In addition, all participants reported a greater desire to avoid mental images of new worst case scenarios at follow-up compared to one that they had imagined previously, suggesting that participants showed a tendency toward reduced scenario-specific cognitive avoidance, but that it did not generalize to reduced cognitive avoidance more broadly. Overall these findings imply that cognitive exposure does in fact have some impact on cognitive avoidance, although the effect of the present study's brief cognitive exposure was localized to the specific feared scenario that was confronted by participants who engaged in exposure. It is possible that a greater number of cognitive exposure sessions of a longer duration would impact the tendency to engage in cognitive avoidance more generally. Further research is needed to explore this possibility.

Although there were minimal differences between conditions at follow-up in the present study, consistent exposure did appear to have a greater impact on GAD symptoms, cognitions related to uncertainty and ambiguity, and perceptions about the likelihood and cost of the worst case scenario coming true from pretest to follow-up than did varied exposure. From an emotional processing perspective, consistent exposure may have been associated with greater improvements over time because it provided more sessions of exposure to the same material,

which may have allowed participants to evoke more aspects (e.g., emotions, responses, meanings) of the fear structure related to their worst case scenario. Participants who engaged in varied exposure only had 20 minutes to evoke aspects of the fear structure associated with each scenario. The benefit of greater time spent imagining the same fear and evoking a greater number of elements associated with one fear is that it may have allowed for more learning to occur (e.g., that the worst case is not as bad as one had initially predicted). In sum, consistent exposure may have been associated with greater improvements over time than varied exposure because individuals who engaged in consistent exposure had more time to confront several aspects of one feared scenario and to learn new nonthreatening associations with that scenario.

Taken together, the results, at a glance, suggest that consistent cognitive exposure may lead to reductions in the features of GAD. However, this conclusion is limited by the fact that the GAD-associated symptoms of participants in the consistent exposure condition were more severe at the outset of exposure relative to participants in the varied exposure condition.[4] Although individuals in the consistent exposure condition reported significant decreases on several outcome measures from pretest to follow-up, there were few differences in scores *between* conditions at 1-week follow-up. The exception to this was that at follow-up individuals who engaged in varied exposure and consistent exposure reported lower estimates of the likelihood that their worst case scenario would come true than individuals who engaged in neutral writing. Higher scores at pretest on a measure of GAD coupled with significant declines on GAD-related measures following exposure may be an indicator that *regression toward the mean* was operating in the consistent exposure condition. If a variable is extreme (either higher or lower than expected) on its first measurement then it will tend to be closer to the mean in subsequent

[4] The GAD-associated symptom scores of participants in the neutral writing condition were higher than those reported by participants in the varied exposure condition. The GAD-associated symptom scores reported by participants in the consistent exposure condition and neutral writing condition did not differ significantly.

measurements (Galton, 1886, as cited in Hsu, 1989). In addition to possible regression toward the mean, the follow-up scores of individuals who engaged in cognitive exposure (varied and consistent) remained in the clinical range (> 55) on the *Penn State Worry Questionnaire* (PSWQ) according to guidelines suggested by Behar et al. (2003) and Provencher et al. (2004; see Table 2 for means on the PSWQ). The follow-up PSWQ scores reported by prior studies on cognitive exposure (*M* = 50.14, *SD* = 11.21 in Goldman et al., 2007; *M* = 47.70, *SD* = 10.80 in Provencher et al., 2004) fell below the clinical cut-off for worry. Of note, earlier studies on cognitive exposure used more sessions of cognitive exposure (Goldman et al. used five sessions, Provencher et al. used 12 sessions) than did the present study, which employed only three sessions. In addition, Provencher at al. incorporated other treatment components (e.g., cognitive restructuring, relapse prevention) within the 12 sessions and reported the most improved PSWQ scores at follow-up compared to other studies on cognitive exposure. Thus the "dose" of cognitive exposure and its combination with other cognitive behavioural treatment components may be important. Overall the current findings suggest that very brief cognitive exposure is not a potent intervention for worry reduction when used independently, and that more cognitive exposure may be better.

Understanding the present findings on neutral writing. There are a few ways in which the unexpected changes reported by individuals who engaged in writing about a neutral topic from pretest to follow-up might be explained. As mentioned previously, Goldman and colleagues (2007) also found that participants who engaged in neutral writing in their study reported decreases in GAD-associated symptoms following writing. In the present study and in Goldman et al.'s study, all participants were given the same rationale for the writing sessions. Participants were told that past research has suggested that writing may have a positive effect on health, and

that the purpose of the study was to examine the relationship between worry and writing. These instructions may have caused participants to expect that they would experience improvements, potentially creating a placebo-like effect. It is also possible that individuals in the neutral condition improved on some outcome measures because of non-specific effects. Possible non-specific effects may have included coming into the lab on four separate occasions within a short time frame, interacting with the experimenter, or reflecting on thoughts and feelings while completing questionnaires. However, these explanations are somewhat limited by the finding that individuals who engaged in varied exposure received the same rationale and non-specific factors, yet did not report improvements on GAD symptoms and cognitive processes (with the exception of reduced likelihood estimates that their worst case scenario would come true from pretest to follow-up). Although participants in the varied exposure condition did not generally report changes in outcomes measures over time, this may not necessarily rule out expectancy bias or non-specific factors as explanations for the improvements reported by the other conditions. It is possible that the impact of expectations and non-specific factors were counter-balanced by the activation of several fears and inadequate time for the emotional processing of any one fear in the varied exposure condition.

A separate explanation for the positive change in individuals who engaged in neutral writing is that the neutral writing task (being asked to write about what you would do with a day off work or school) was beneficial in some way. The neutral writing task may have helped people to organize tasks and activities that they wanted to accomplish, serving as a "to-do list." Alternatively the neutral writing task may have been enjoyable. The assessment of anxious arousal and unpleasant affect during each session using the *Self-Assessment Manikin* (SAM) supports the notion that neutral writing was pleasant and relaxing. On the unpleasant affect SAM

scale, individuals who engaged in neutral writing indicated a moderate degree of pleasant affect during writing, with a mean unpleasant affect score of 3.90 on a scale that ranged from 1 (*extremely pleasant*) to 9 (*extremely unpleasant*). Individuals who engaged in neutral writing reported decreases in unpleasant affect from the beginning to end of each writing session, and these declines were significant in Session 1 and Session 3 (refer to Figure 2). On the anxious arousal SAM scale, individuals who engaged in neutral writing indicated low anxious arousal, with a mean score of 3.02 across sessions on a scale that ranged from 1 (*very calm*) to 9 (*very aroused*). If participants did in fact find neutral writing to be a pleasant activity, as the SAM scores indicate, then this could help to account for the improvements in GAD-associated symptoms and negative interpretations of ambiguous scenarios over time. Engaging in pleasurable activities is associated with reductions in depressive symptoms (e.g., Lewinsohn & Gotlib, 1995), and many depressive symptoms overlap with associated symptoms of GAD (e.g., fatigue, difficulty concentrating, difficulty sleeping). In addition, if neutral writing facilitated more pleasant or relaxed mood states, then this may have led to less negative interpretations of ambiguous scenarios, as mood states can influence perceptions and judgements (e.g., Forgas & Bower, 1987). Specifically, when individuals are in particular mood states (e.g., happy, anxious) then they are more likely to interpret stimuli in a manner that is consistent with that mood state. Overall, these suggestions may account for the unexpected finding that neutral writing was associated with reductions in GAD-associated symptoms and less negative interpretations of ambiguous scenarios over time. A final point that may be important in interpreting the overall pattern of results in the present study is that the improvements reported by individuals who engaged in neutral writing over time may have contributed to the general lack of differences on outcome measures between the three conditions at follow-up.

Objective 2: Differences in Subjective Emotion

Consistent with hypotheses about subjective emotion during the first writing session, individuals in the varied and consistent exposure conditions reported higher anxious arousal and unpleasant affect than did individuals in the neutral writing condition. Hypotheses about between-session changes in subjective emotion were also partially confirmed – individuals in the consistent exposure condition reported reductions in anxious arousal from Session 1 to Session 3. Individuals in the varied exposure condition also reported reductions in anxious arousal from Session 1 to Session 3, although the change was not statistically significant. Individuals who engaged in neutral writing did not report significant changes in anxious arousal across sessions. Individuals who engaged in varied or consistent exposure reported higher levels of unpleasant affect on average than did individuals who engaged in neutral writing, and all participants reported reductions in unpleasant affect from Session 1 to Session 3, regardless of condition.

The findings regarding subjective emotion in the current study are in line with those reported by Sloan and colleagues (2005) in their study on cognitive exposure for PTSD. Sloan et al. found that during the first writing session, individuals who engaged in either varied or consistent cognitive exposure for PTSD reported higher salivary cortisol, subjective anxious arousal, and unpleasant affect than did individuals who engaged in neutral writing. Sloan et al. also found that individuals who engaged in varied or consistent exposure reported reductions in anxious arousal and unpleasant affect from Session 1 to Session 3, while individuals who engaged in neutral writing did not. The level of anxious arousal and unpleasant affect reported by participants in the present study and Sloan et al.'s study can be compared directly, as both studies used the *Self-Assessment Manikin* (SAM) to measure subjective emotion. Initial scores reported by participants in Sloan et al.'s sample on anxious arousal and unpleasant affect were higher on

average than scores reported by participants in the current study (see Table 4 for means). In addition, participants in Sloan et al.'s study reported greater decreases in anxious arousal and unpleasant affect from Session 1 to Session 3 than did participants in the present study (see Table 4). The greater initial subjective emotion and greater reduction in subjective emotion across exposure sessions found in Sloan et al.'s study relative to the present study suggests that images of trauma memories may have higher emotional potency than images of hypothetical threatening scenarios. Further, according to emotional processing theory, the greater initial anxious arousal and greater reduction in anxious arousal found in cognitive exposure for PTSD may be related to the greater benefits associated with cognitive exposure for PTSD compared to GAD in the research to date.

The general pattern of *within-session* responding was that individuals who engaged in exposure (varied or consistent) reported an increase in anxious arousal and unpleasant affect from the beginning to end of each writing session. The exception to this pattern was that the increases in negative emotion reported by participants in the consistent exposure condition across Session 2 did not reach statistical significance. On the other hand, individuals who engaged in neutral writing generally reported significant decreases in anxious arousal and unpleasant affect from the beginning to end of each writing session. The exceptions to this pattern were that the decreases in unpleasant affect reported across Session 1, and the decreases in anxious arousal reported across Session 3 by participants who engaged in neutral writing did not reach statistical significance.

Table 4

Comparison of Subjective Emotion during Cognitive Exposure

Subjective Emotion	Exposure Session	Consistent Exposure		Varied Exposure	
		Present Study	Sloan et al. (2005)	Present Study	Sloan et al. (2005)
Anxious Arousal	First	5.08	6.80	4.77	7.00
	Last	3.69	4.80	4.19	5.20
Unpleasant Affect	First	6.02	7.00	5.71	7.00
	Last	5.02	3.30	5.33	5.10

Note. The present study and the comparison study by Sloan, Marx, and Epstein (2005) each used three cognitive exposure sessions. In both studies, subjective emotion was measured using the Self-Assessment Manikin (SAM; Bradley & Lang, 1994).

According to the emotional processing account (Foa & Kozak, 1986), individuals engaging in varied and consistent exposure appear to have "activated" their fear structures during Session 1, as suggested by reports of increased subjective anxious arousal. The decrease in reports of anxious arousal from Session 1 to Session 3, which was more pronounced in the consistent exposure condition, might suggest "processing" of the activated fears. In other words, the decrease in anxious arousal reported across sessions may suggest that learning that the feared scenarios were less threatening than expected occurred across exposure sessions. The present findings suggest that more exposure to the same stimulus (consistent exposure) has a greater impact on reducing anxiety and unpleasant affect associated with a feared stimulus. This is consistent with theory underlying exposure therapy (e.g., Moscovitch, Antony, & Swinson, 2009). In the present study, individuals in the exposure conditions reported reductions in anxious arousal across sessions, but anxiety did not reduce within sessions. This is consistent with the revised emotional processing account (Foa et al., 2006) which states that across-session reductions in anxious arousal are possible in the absence of within-session reductions of anxious arousal.

Objective 3: Subjective Emotion during Written Exposure as a Predictor of Outcomes

Contrary to hypotheses, there was no association between anxious arousal or unpleasant affect during the initial writing session and improvements on outcome measures. Also contrary to hypotheses, there was generally no relationship between reductions in subjective emotion and improvements on GAD-related symptoms or cognitive processes. The exception to this was that there was a negative correlation between changes in cognitive avoidance and changes in unpleasant affect in participants who engaged in consistent exposure. Stated differently, individuals who reported less avoidance of feared mental imagery over time reported greater

unpleasant affect over the three exposure sessions. It seems that reducing the tendency to avoid fearful mental images resulted in more distress than continuing to engage in cognitive avoidance. This is consistent with the theoretical notion that individuals with GAD fear mental images of their worst case scenarios and engage in cognitive avoidance strategies because they find these images distressing (e.g., Borkovec, 2004). As discussed in a previous section, ratings of cognitive avoidance were not significantly different from pretest to follow-up. Thus, the present study did not find that changes in subjective emotion predicted significant improvements on any outcome measure.

The lack of association between anxious arousal and outcomes is in contrast to some aspects of emotional processing theory (Foa & Kozak, 1986). Specifically, this finding is contrary to the suggestions that high anxious arousal during initial exposure and reduced anxious arousal across exposure sessions indicate that a fear structure has been activated and processed. The lack of association between anxious arousal and outcomes is also inconsistent with the findings of Sloan and colleagues (2005), who found that higher anxious arousal during Session 1 of cognitive exposure, and greater reductions in anxious arousal across exposure sessions predicted improvements in PTSD symptoms. It is possible that cognitive exposure to a worst case scenario is not threatening enough to activate an adequate level of anxiety, which may be a necessary ingredient of effective exposure. Along these lines, cognitive exposure for trauma may be effective because of the emotional salience of images of past traumatic experiences. Alternatively, the fact that improvement on outcome measures and changes in anxious arousal occurred independently in the present study may suggest that initial anxious arousal and a reduction in anxious arousal across exposure sessions are not necessary for improvement in cognitive exposure for GAD. Perhaps participants in the present study who were less anxious

during cognitive exposure were more able to learn from the confrontation of feared mental imagery. Future research should aim to further investigate the mechanisms of change in cognitive exposure.

Objective 4: Exploratory Modified Behavioural Avoidance Tests

The present study's investigation of a modified behavioural avoidance test (BAT) to mental images was exploratory, so no a prior hypotheses were proposed. The modified BAT was used as a behavioural assessment of fear and avoidance in response to 30-second mental images of worst case scenarios. Responses to a BAT of the original worst case scenario were examined at pretest and follow-up. In addition, responses to three different BATs (original scenario, and two new scenarios) were compared at follow-up. Collapsing across conditions, on average participants reported reductions in fear ratings in response to a mental image of their original worst case scenario from pretest to follow-up. Participants who engaged in consistent exposure reported the greatest reduction in desire to avoid imagining their worst case scenario over time, and at follow-up reported lower avoidance ratings than participants who engaged in neutral writing (the difference approached statistical significance). The extra "practice" that the consistent exposure condition had imagining their worst case scenario may explain the greater improvement in avoidance of threatening mental imagery related to that specific scenario.

The three BATs at follow-up required participants to generate mental images of: (1) the original worst case scenario; (2) a new worst case scenario in the same domain as the original scenario; and (3) a new worst case scenario in a different domain than the original scenario. Across conditions, participants reported more fear in response to the two new worst case scenarios than they did in response to the original worst case scenario. Participants also reported a higher desire to avoid thinking about a new scenario in a different domain than the original

worst case scenario. Participants who engaged in consistent exposure reported a trend toward a lower desire to engage in scenario-specific cognitive avoidance (collapsed across BATs) than did participants in the varied exposure or neutral writing conditions. These findings suggest that imagining a scenario that is more remote from one imagined previously is associated with higher levels of fear and avoidance. Further, repeated exposure to a feared scenario seems to be beneficial in reducing the tendency to avoid thinking about that scenario.

The finding that participants in all writing conditions reported similar levels of fear in response to an image of the original worst case scenario at follow-up is similar to Rowe and Craske's (1998) finding that at follow-up participants who engaged in either varied or consistent spider exposure did not differ on most indices of fear (with the exception of anticipatory anxiety) in response to a spider they had seen before. It is also consistent with Lang & Craske's (2000) finding that participants who received varied or consistent exposure showed the same level of fear in response to BAT tasks at follow-up. The present finding that participants had lower fear and avoidance in response to the original worst case scenario compared to new scenarios at follow-up parallels Rowe and Craske's (1998) finding that individuals reported less fear in response to a spider that they had already seen compared to a novel spider at posttest and at follow-up. Overall the present findings do not support the theoretical notion that varied exposure should result in greater generalization of prior learning to new stimulus encounters than consistent exposure. However, the benefits of varied exposure should be investigated further using a greater number of encounters with each different feared stimulus to allow for full "processing" of each different stimulus.

Methodological Strengths

This study had several methodological strengths. First, it examined the impact of cognitive exposure on symptoms *and* on general and scenario-specific cognitive processes that are involved in GAD. Changes in general and scenario-specific cognitions have not been examined extensively in previous research on cognitive exposure for GAD. Assessing cognitive variables provides an understanding of the extent of the impact of cognitive exposure for GAD. In addition, using a modified behavioural avoidance test to assess the impact of cognitive exposure, and assessing subjective emotion within each writing session were unique aspects of the current study. The measurement of subjective emotion in the present study provided insight and direction for future research with regard to potential mechanisms of change in cognitive exposure for GAD. The present subjective emotion findings suggest that the emotional processing theory of change does not adequately account for the improvements observed in the present study (at least not independently). Another unique aspect of the present study is that the downward arrow technique was used to elicit core fears from participants before they engaged in cognitive exposure. This improved the ecological validity of the procedure, as it mirrors the procedure for conducting cognitive exposure in GAD treatment protocols – in which it is recommended that the clinician work with clients to develop the worst case scenario that the client will confront during exposure.

Limitations and Future Directions

Despite its methodological strengths, the current study had several limitations. First, there were significant pretest differences between conditions on the associated symptoms subscale of the *Worry and Anxiety Questionnaire* (WAQ-A). Although most of the findings that were reported in the current study were also significant when baseline differences on the WAQ-A

were covaried from analyses, a potential initial difference in GAD severity between conditions limits the conclusions that can be drawn from the present study about the impact of cognitive exposure. The present study was also limited by the relatively small sample size (n = 16 per condition). The small sample may have influenced the success of random assignment (i.e., the pretest differences on associated symptoms of GAD). Further, the small sample size may have provided inadequate power to detect true differences between conditions at follow-up. The issue of low power is highlighted by the fact that when baseline differences were covaried, the originally significant improvements reported by individuals who engaged in consistent exposure on intolerance of uncertainty and estimates of the cost of the worst case scenario coming true were no longer significant (although results approached significance).

Another important limitation of the current study was the length of the follow-up period. In the current study there was only a single follow-up one week after writing. One week may not have been a long enough follow-up to accurately assess the effects of varied or consistent cognitive exposure. In a meta-analysis of the factors related to written disclosure, Frattaroli (2006) reported that studies that had follow-up periods of less than one month had larger effect sizes (r = .11) than studies that had longer follow-up periods (r = .06). On the other hand, Goldman and colleagues (2007) found that people who engaged in cognitive exposure continued to improve over the follow-up period. Based on this, using a 1-week follow-up may over or under estimate the impact of written cognitive exposure on GAD symptoms and cognitions. Examining changes in GAD symptoms and processes over longer time periods (e.g., 2 months, 6 months) is an important future research direction. An additional limitation was that compared to the amount of time that would typically be allotted for introducing cognitive exposure in GAD treatment (including rationale and training in mental imagery), there was limited mental imagery

training and assistance with generating the worst case scenario in the present study. Future research should examine how the degree of therapist/experimenter involvement in cognitive exposure moderates improvement, and if mental imagery training or imagery ability (i.e., how good a person is at forming mental images) moderates improvement. In addition, the present study assessed the impact of varied exposure by having individuals imagine different scenarios on each of three days. Future research should compare whether varying certain features of a single scenario on each day of exposure may be a more effective way to conduct varied exposure than completely changing the exposure scenario each day. Lastly, the way in which varied cognitive exposure was conducted in the present study may have limited the impact of varied exposure. Ideally, participants assigned to varied exposure would have engaged in several sessions of cognitive exposure to each different worst case scenario. Due to the time constraints of the current study, participants imagined each different worst case scenario only once. This method may have limited the potential for varied exposure to have an impact on outcome measures because there were only 20 minutes to adapt to each scenario. Thus, the current study may underestimate the potential of varied cognitive exposure.

Implications and Conclusion

Taken together, this is the third known study on cognitive exposure for GAD. The findings indicate that consistent exposure to one feared hypothetical scenario may have specific and general effects on GAD; however the findings reported in this thesis require replication in light of the aforementioned methodological limitations. It is premature to make recommendations to clinicians based on the current findings. Given that this is a relatively new area of research, many questions need to be addressed. For example, can an adequate "dose" of cognitive exposure facilitate sustainable psychological improvements compared to no exposure, is cognitive exposure a necessary component of cognitive behavioural treatment for GAD, and what is the mechanism by which cognitive exposure produces change over time. The present study suggests that continued empirical investigation of cognitive exposure is important as consistent cognitive exposure appears to have a positive impact over time on GAD symptoms, intolerance of uncertainty, ambiguity bias, and scenario-specific biases. Further, consistent cognitive exposure improves avoidance of feared mental imagery confronted during exposure; this is important because avoidance of feared mental imagery has been proposed as a maintenance factor for GAD. These findings are intriguing, especially considering that cognitive exposure in the current study was very brief (only three sessions for 20 minutes each). Preliminary evidence suggests that cognitive exposure may be of benefit to people with GAD.

Appendix A – Informed Consent Form

Title of Study: Worry and Writing

You are being asked to participate in a research study. Before you give your consent to be a volunteer, it is important that you read the following information and ask as many questions as necessary to be sure you understand what you will be asked to do.

Investigators:
Katie Fracalanza, B.Comm., Graduate Student, Department of Psychology, Ryerson University
Naomi Koerner, Ph.D., Assistant Professor, Department of Psychology, Ryerson University
Martin M. Antony, Ph.D., Professor, Department of Psychology, Ryerson University

Purpose of the Study: The purpose of this study is to assess the relationship between worry and writing. Although research has shown that writing leads to positive health and psychological outcomes, the relationship between writing and worry has not been thoroughly investigated.

Description of the Study: The experiment will involve four visits to the Cognition and Psychopathology Lab at the Psychology Research and Training Centre at Ryerson University, located at 105 Bond Street. The total time commitment will be approximately 1 to 1.5 hours for visit 1. Visits 2, 3, and 4 will take approximately 30 minutes to 1 hour each to complete.

Visit 1. You will complete questionnaires about your emotional experiences. Following the questionnaires, you will go on to complete a paper-and-pencil writing task that will last approximately 20 minutes. Before and after the writing task you will be asked to think about a situation that is worrisome to you for approximately 30 seconds, and to rate your emotions in response to thoughts of this situation. While imagining the worrisome situation and during the writing task, heart rate and skin conductance (that is, sweat gland response) will be continuously monitored. Before you begin the tasks, we will need to establish a baseline level of heart rate and skin conductance. During this baseline measurement, you will be asked to take deep, slow breaths for a few minutes. Heart rate and skin conductance data will be collected using non-invasive equipment. We will ask you to apply two electrodes on your right and left upper chest, directly onto the skin. We will provide you with instructions for how to do this on your own and will give you privacy while you are applying the electrodes to your chest. You will wear your top directly over the electrodes. In addition, we will apply electrodes to the fingers of the non-dominant hand (that is, the hand that you do not use for writing). The electrodes will be applied with adhesives (like a bandaid). These electrodes should not cause any pain or discomfort. You will earn $20 for this visit.

Visits 2 and 3. You will be asked to return to the lab on two consecutive days following Visit 1. During each visit, you will be asked to complete a writing task similar to what you completed in Visit 1 and to imagine a worrisome situation before and after the writing task. Heart rate and skin conductance will be continuously monitored while you are imagining a worrisome situation and right before and throughout the writing task, as in Visit 1. You will also be given a Self-Monitoring Booklet to take home. You will be asked to use the booklet to answer questions about your level of worry on a daily basis over the 7 days that follow Visit 3. You will be asked

to return the Self-Monitoring Booklet at the end of the 7-day period, when you return for Visit 4. You will earn $20 at the end of the Visit 3.

Visit 4 (1-week after Visit 3). You will be asked to return to the lab to submit the Self-Monitoring Booklet and will complete questionnaires about your emotional experiences. You will also be asked to imagine three situations that worry you for 30 seconds each, and to rate your emotions and thoughts in response to these imaginary situations. Heart rate and skin conductance will be continuously monitored while you are imagining the worrisome situations. You will earn $15 for this visit.

Potential Risks or Discomforts: There is minimal risk involved if you agree to take part in this study. You understand that you may experience some negative emotions when completing the tasks. You have the right to refuse or discontinue participation at any time. If you decided to stop participating, you will still be entitled to compensation (as outlined above) for any items which you have begun to complete during a visit.

Potential Benefits of the Study To You or Others: I cannot guarantee that you will receive any benefits from participating in this study. You may derive benefit from the self-assessment as it may increase your awareness of your emotions and behaviours. You may also develop a better understanding of research methodology and will be providing researchers with valuable insight.

Confidentiality: Everything you disclose in this study will remain completely confidential; however, as part of this study, I am obligated to inform everyone that there are five cases in which I might need to break confidentiality:
(1) if you intend to harm yourself;
(2) if you intend on harming someone else;
(3) if there is reasonable suspicion that a child up to the age of 16 years is at risk of neglect or abuse, we are required by law to report this to the Children's Aid Society right away;
(4) if our files are subpoenaed by the courts (records can be opened by a specific court order); and
(5) if a regulated health professional has engaged in inappropriate sexual behavior toward you and you provide us with the name of this individual, we are obligated to report them to their regulatory body.

This informed consent agreement and all data that identifies you will be stored in a locked storage space in the Psychology Research and Training Centre. An ID number as opposed to your name will be used on all forms you complete, on the interviews that you take part in, and in all computer files that will contain the data you generate during the study. The data you generate while participating in this study will be kept in a locked file cabinet, separate from this consent agreement and any data that identifies you. Your consent form and all data will be kept for seven years after the publication of this research. Your confidentiality will be protected to the full extent allowed by law. Only group findings will be reported in publications and presentations arising from this research.

Compensation for Participation: You will earn up to $55 depending upon how many sessions you complete. You are asked to arrange to transport yourself to the Psychology Research and Training Centre at Ryerson University. You will not be paid for the telephone screen that you took part in to determine eligibility.

Voluntary Nature of Participation: Participation in this study is voluntary. Your choice of whether or not to participate will not influence your future relations with Ryerson University. If you decide to participate, you are free to withdraw your consent and to stop your participation at any time without penalty or loss of benefits to which you are allowed. Your right to withdraw your consent also applies to our use of your data. If you decide that you do not want us to keep or analyze data that you have provided during the course of your participation in this study, please feel free to notify us.

At any point in the study, you may refuse to answer any question or stop participation altogether.

Questions about the Study: If you have any questions about the research now, please ask. If you have questions later about the research, you may contact Katie Fracalanza, B.Comm., Graduate Student, Department of Psychology, Ryerson University, 416-979-5000 extension 2182. You may also contact Dr. Naomi Koerner, Ph.D., Department of Psychology, Ryerson University, 416-979-5000 extension 2151.

If you have questions regarding your rights as a participant in this study, you may contact Alex Karabanow at the Ryerson University Research Ethics Board for information.

Alexander Karabanow
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Agreement:
Your signature below indicates: (1) that you have read the information in this agreement and have had a chance to ask any questions you have about the Worry and Writing study; (2) that you agree that information collected from you during the telephone screen for the Worry and Writing study can be retained and analyzed and (3) that you agree to be in the Worry and Writing study (as described in this consent form) and have been told that you can change your mind and withdraw your consent to participate at any time. You have been given a copy of this agreement. You have been told that by signing this consent agreement you are not giving up any of your legal rights.

_____
Name of Participant (please print)

_____ _____
Signature of Participant Date

_____ _____
Signature of Experimenter Who Obtained Informed Consent Date

Appendix B – Modified Behavioural Avoidance Test (BAT) Protocol

Pre-BAT:

So based on this questionnaire, you indicated that you worry about __ domain the most. Is that correct?

In a moment, I will ask you to complete a task that requires you to generate a mental image. To make sure that it is clear what I mean by generating a mental image, I would like you to practice by imagining yourself cutting a lemon. Imagine the sights, sensations, sounds, scents, and taste if applicable. Please imagine this now.

(Wait about 15 – 30 seconds) How was that? Do you have any questions about generating mental images? Is it clear what I mean when I ask you to generate a mental image?

Now I would like you to tell me briefly, in a sentence or 2, the worst possible thing that could happen regarding ___ worry domain (use downward arrow technique).

_____

_____

_____

Now I would like you to generate a mental image of that scenario actually happening and to hold that image for 30 seconds. Tell me if you are having difficulty holding the image in mind. (Time 30 seconds)

Now I would like you to rate how much fear you felt when thinking about that image on a scale of 0 to 10, with 0 being no fear at all, and 10 being the most fear you have ever felt.

How much did you wish to avoid imagining your worst case scenario on a scale of 0 to 10?

How vivid was the image of your worst case scenario on a scale of 0 to 10?

Post-BAT:

Now I would like you to generate a mental image of the same scenario of (worry written down) actually happening and to hold that image for 30 seconds.

Now I would like you to rate how much fear you felt when thinking about that image on a scale of 0 to 10, with 0 being no fear at all, and 10 being the most fear you have ever felt.

How much did you wish to avoid imagining your worst case scenario on a scale of 0 to 10?

How vivid was the image of your worst case scenario on a scale of 0 to 10?

New BAT- same principal worry domain, different worry:

Now I would like you to generate a mental image of a different scenario than you imagined on any of your first 3 visits to the lab, but that is still related to _____ (primary worry domain). I want you to imagine that scenario actually happening and to hold the image for 30 seconds.

(Time 30 seconds)

Now I would like you to rate how much fear you felt when thinking about that image on a scale of 0 to 10, with 0 being no fear at all, and 10 being the most fear you have ever felt.

How much did you wish to avoid imagining your worst case scenario on a scale of 0 to 10?

How vivid was the image of your worst case scenario on a scale of 0 to 10?

New BAT- different principal worry domain, different worry:

Now I would like you to generate a mental image of a different scenario than you imagined on your first 3 visits to the lab or in the previous exercise. I would like this scenario to be related to a different worry domain than the scenarios you have imagined before. I want you to imagine that scenario actually happening and to hold the image for 30 seconds.

(Time 30 seconds)

Now I would like you to rate how much fear you felt when thinking about that image on a scale of 0 to 10, with 0 being no fear at all, and 10 being the most fear you have ever felt.

How much did you wish to avoid imagining your worst case scenario on a scale of 0 to 10?

How vivid was the image of your worst case scenario on a scale of 0 to 10?

Appendix C – General Writing Instructions

This study is a very important project looking at writing. Over the next three days, you will be asked to write about a topic for 20 minutes each day. Your instructions for writing will be located on the back of the front page of the booklet to be given to you at each writing session. You will complete your writing alone in a private room. After you finish reading your writing instructions for the day, I will leave the room and close the door. The closing of the door will be your signal to start writing. After 10 minutes, I will knock on your door to ask you to make a couple of ratings on two scales. Then I will leave the room again for the remaining 10 minutes. When the writing session is over, I will knock on your door to let you know that you are to stop writing. The only rule we have about writing is that you write continuously for the entire time. If you run out of things to say, just repeat what you have already written. In your writing, don't worry about grammar, spelling, or sentence structure. Just write.

Your writing is completely confidential. You are identified by an ID number, which is written on the front booklet. Please do not write your name or any other identifying information anywhere on your writing sample.

Appendix D – Instructions: Consistent Cognitive Exposure Condition

Day 1: For the next 3 days, I would like you to write about the scenario that worries you the most at this time. Please write a story about your worst fear coming true. In your writing, I want you to really let go and explore your very deepest emotions and thoughts. Do not worry about grammar, spelling or sentence structure. Write in first person, present tense, as if the situation is really happening in the here-and-now. Start by describing the circumstances that lead to the situation, then describe what happens during the situation, and finally the consequences of the situation. In other words, tell a story about what happens, how it turns out, and how it makes you think and feel. Include your physical sensations. For example, you may wish to describe how your body reacts or what you feel, touch, taste and smell. You may feel anxious when writing thoughts, feelings and sensations about your worst fear – this is normal.

Day 2: Today please continue to write about the same situation that you wrote about yesterday – your worst fear coming true. Remember to write in first person and in present tense, as if the situation is happening in the here-and-now. You may change your thoughts, feelings or description but make sure you are writing about the same worst fear coming true. Today we really want you to explore your very deepest thoughts and emotions.

Day 3: Today is the last writing session. Please continue to write about the same situation that you wrote about yesterday – your worst fear coming true. Remember to write in first person and in present tense, as if the situation is happening in the here-and-now. You may change your thoughts, feelings or description, but make sure you are writing about the same worst fear coming true. We again want you to explore your deepest thoughts and feelings about your worst fear coming true.

Appendix E – Instructions: Varied Cognitive Exposure Condition

Day 1: Today, please write a story about your worst fear coming true. In your writing, I want you to really let go and explore your very deepest emotions and thoughts. Do not worry about grammar, spelling or sentence structure. Write in first person, present tense, as if the situation is really happening in the here-and-now. Start by describing the circumstances that lead to the situation, then describe what happens during the situation, and finally the consequences of the situation. In other words, tell a story about what happens, how it turns out, and how it makes you think and feel. Include your physical sensations. For example, you may wish to describe how your body reacts or what you feel, touch, taste and smell. You may feel anxious when writing thoughts, feelings and sensations about your worst fear – this is normal.

Day 2: Today please write about another scenario that you fear might come true, that is a **different scenario** than you wrote about yesterday, in the **same worry domain** as yesterday. Remember to write in first person and in present tense, as if the situation is happening in the here-and-now. Just like yesterday, include your thoughts, feelings, and descriptions of the events. We really want you to explore your very deepest thoughts and emotions.

Day 3: Today is the last writing session. Please write about another scenario that you fear might come true, that is a **different scenario** than you wrote about on the first or second writing sessions. This new scenario is to be in the **same worry domain** that you have been writing about on the first and second writing sessions. Remember to write in first person and in present tense, as if the situation is happening in the here-and-now. Just like yesterday, include your thoughts, feelings, and descriptions of the events. We again want you to explore your very deepest thoughts and emotions.

Appendix F – Instructions: Neutral Writing Control Condition

Day 1: What you are to write about over the next 3 days is how you use your time. Each day you will be given a writing assignment on the way you spend your time. In your writing, be as objective as possible. Do not write about your emotions, thoughts, opinions, or reactions. Rather, try to be completely factual. Feel free to be as detailed as possible. In today's writing, describe what you would do with your day if you found out you had today off from school or work.

Day 2: Today, please describe what you would do with your day if you found out you had today off from school or work. Again, be as objective as possible, with no description of emotions, thoughts, opinions, or reactions.

Day 3: You have written now for two days and today is the last writing session. In your writing today, describe what you would do with your day if you found out you had today off from school or work. Again, be as objective as possible, with no description of emotions, thoughts, opinions, or reactions.

Appendix G – Debriefing Form

Background of the Study: People who worry a lot often worry about highly threatening, catastrophic situations. Studies have shown that writing about upsetting events from the past has a positive impact on mood. The current thinking is that writing about threatening future events may also have a positive impact on worry and anxiety.

Purpose of the Study: This study is investigating the effect of emotional writing on worry and anxiety. In this study, we want to determine two things: (1) whether writing about one's "worst case scenario" leads to immediate improvements in worry, anxiety, and factors that play a role in chronic worry and (2) whether people derive greater benefit from writing repeatedly about the same "worst case scenario" or writing about a variety of such scenarios. To address these questions, people taking part in this study are assigned to one of three conditions: (1) a condition in which people write about the same "worst case scenario" three days in a row; (2) a condition in which people write about a different "worst case scenario" on each writing day; and (3) a condition in which people write about a neutral topic. Your willingness to participate in this study is greatly appreciated. Your input will help advance our understanding of ways that chronic worry can be alleviated.

Resources: We provide everyone who completes this study with the same list of resources, in case they are interested in learning more about worry or anxiety. Our list of resources has titles of books on worry management, as well as referral sources (please turn over this page for the list).

Contact Information: If you have any questions or concerns about this experiment or your participation in this study you may contact:

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If you would like any information about the results of the study once it is completed, please contact Katie Fracalanza.

A note about disclosure: In order to maintain the integrity of this research, we ask that you not disclose the purpose of this experiment to others who may be interested in taking part in this study. When participants have too much prior knowledge about the purpose of an experiment, this can affect how they behave in the experiment and the data for that person may not be usable.

Thank you very much for participating in this study!

Self-Help Books for Worry

Gyoerkoe, K.L., & Wiegartz, P.S. (2006). 10 simple solutions to worry: How to calm your mind, relax your body, & reclaim your life. Oakland, CA: New Harbinger.

Hazlett-Stevens, H. (2005). Women who worry too much: How to stop worry and anxiety from ruining relationships, work, & fun. Oakland, CA: New Harbinger.

Greenberger, D., & Padesky, C. A. (1995). Mind Over Mood. New York, NY: Guilford Press.

Meares, K., & Freeston, M. (2008). Overcoming worry: A self-help guide using cognitive behavioral techniques. New York: Basic Books.

Other anxiety resources are available at:
http://www.martinantony.com/links-RecReadingsandVideos.html

Referrals in Toronto Area

OHIP-Covered and Sliding Scale Referrals

Adult Mental Health Program
Humber River Regional Hospital, Toronto
Contact: Heather Wheeler, Ph.D.
Tel: 416-658-2003

Anxiety Disorders Clinic
Centre for Addiction and Mental Health
250 College St., Toronto
Tel: 416-979-6819

Ryerson University Centre for Student Development and Counseling
(Available to Ryerson Students Only)
350 Victoria St., Room JOR-07C, Lower Ground Floor, Jorgenson Hall, Toronto
Tel: 416-979-5195

Private Psychology Referrals

CBT Associates of Toronto
100 Adelaide St. West, Suite 805, Toronto
Tel: 416-363-4228
Web: http://www.cbtassociates.net/
E-Mail: eilenna.denisoff@cbtassociates.net
or peter.farvolden@cbtassociates.net

Hank Frazer, Ph.D., C.Psych.
3852 Finch Ave., Unit 309, Scarborough
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References

Alexander, M. J., Haugland, G., Lin, S. P., Bertollo, D. N., & McCorry, F. A. (2008). Mental health screening in addiction, corrections and social service settings: Validating the MMS. *International Journal of Mental Health and Addiction, 6*, 105-119. doi:10.1007/s11469-007-9100-x

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: Author.

Angst, J. (1993). Comorbidity of anxiety, phobia, compulsion and depression. *International Clinical Psychopharmacology, 8*, 21-25.

Antony, M. M., & Swinson, R. P. (2008). *The shyness and social anxiety workbook: Proven, step-by-step techniques for overcoming your fear (2nd ed.)*. Oakland, CA: New Harbinger Publications.

Beck, A. T. (1976). *Cognitive therapy and the emotional disorders*. Oxford, UK: International Universities Press.

Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology, 56*, 893-897. doi:10.1037/0022-006X.56.6.893

Behar, E., Alcaine, O., Zuellig, A. R., & Borkovec, T. D. (2003). Screening for generalized anxiety disorder using the Penn State Worry Questionnaire: A receiver operating characteristic analysis. *Journal of Behavior Therapy and Experimental Psychiatry, 34*, 25-43. doi:10.1016/S0005-7916(03)00004-1

Berenbaum, H., Thompson, R. J., & Bredemeier, K. (2007). Perceived threat: Exploring its association with worry and its hypothesized antecedents. *Behaviour Research and Therapy, 45*, 2473-2482. doi:10.1016/j.brat.2007.03.015

Bjork, R. A., & Bjork, E. L. (1992). A new theory of disuse and an old theory of stimulus fluctuation. In A. F. Healy, S. M. Kosslyn & R. M. Shiffrin (Eds.), *Essays in honor of william K. estes, vol. 1: From learning theory to connectionist theory; vol. 2: From learning processes to cognitive processes.* (pp. 35-67). Mawah, NJ: Lawrence Erlbaum Associates.

Borkovec, T. D. (1972). Effects of expectancy on the outcome of systematic desensitization and implosive treatments for analogue anxiety. *Behavior Therapy, 3*, 29-40. doi:10.1016/S0005-7894(72)80049-2

Borkovec, T. D. (1974). Heart-rate process during systematic desensitization and implosive therapy for analog anxiety. *Behavior Therapy, 5*, 636-641. doi:10.1016/S0005-7894(74)80040-7

Borkovec, T. D. (1979). Extensions of two-factor theory: Cognitive avoidance and autonomic perception. In N. Birbaumer & H.D. Kimmel (Eds.), *Biofeedback and self-regulation* (pp. 139-148). Mawah, NJ: Lawrence Erlbaum Associates.

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

Borkovec, T. D., & Hu, S. (1990). The effect of worry on cardiovascular response to phobic imagery. *Behaviour Research and Therapy, 28*, 69-73. doi:10.1016/0005-7967(90)90056-O

Borkovec, T. D., & Inz, J. (1990). The nature of worry in generalized anxiety disorder: A predominance of thought activity. *Behaviour Research and Therapy, 28*, 153-158. doi:10.1016/0005-7967(90)90027-G

Borkovec, T. D., & Lyonfields, J. D. (1993). Worry: Thought suppression of emotional processing. In H. W. Krohne (Ed.), (pp. 101-118). Ashland, OH, US: Hogrefe & Huber Publishers.

Borkovec, T. D., Lyonfields, J. D., Wiser, S. L., & Deihl, L. (1993). The role of worrisome thinking in the suppression of cardiovascular response to phobic imagery. *Behaviour Research and Therapy, 31*, 321-324. doi:10.1016/0005-7967(93)90031-O

Borkovec, T. D., Ray, W. J., & Stöber, J. (1998). Worry: A cognitive phenomenon intimately linked to affective, physiological, and interpersonal behavioral processes. *Cognitive Therapy and Research, 22*, 561-576. doi:10.1023/A:1018790003416

Bradley, M. M., & Lang, P. J. (1994). Measuring emotion: The Self-Assessment Manikin and the semantic differential. *Journal of Behavior Therapy and Experimental Psychiatry, 25*, 49-59. doi:10.1016/0005-7916(94)90063-9

Buhr, K., & Dugas, M. J. (2002). The Intolerance of Uncertainty Scale: Psychometric properties of the English version. *Behaviour Research and Therapy, 40*, 931-946. doi:10.1016/S0005-7967(01)00092-4

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

Carter, W. R., Johnson, M. C., & Borkovec, T. D. (1986). Worry: An electrocortical analysis. *Advances in Behaviour Research and Therapy, 8*, 193-204. doi:10.1016/0146-6402(86)90004-4

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159. doi:10.1037/0033-2909.112.1.155

Covin, R., Ouimet, A. J., Seeds, P. M., & Dozois, D. J. A. (2008). A meta-analysis of CBT for pathological worry among clients with GAD. *Journal of Anxiety Disorders, 22*, 108-116. doi:10.1016/j.janxdis.2007.01.002

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

de Moor, C., Sterner, J., Hall, M., Warneke, C., Gilani, Z., Amato, R., & Cohen, L. (2002). A pilot study of the effects of expressive writing on psychological and behavioral adjustment in patients enrolled in a phase II trial of vaccine therapy for metastatic renal cell carcinoma. *Health Psychology, 21,* 615-619. doi:10.1037/0278-6133.21.6.615

Di Nardo, P. A., Brown, T. A., & Barlow, D. H. (1994). *Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV).* New York, NY: Oxford University Press.

Dugas, M. J., Freeston, M. H., Doucet, C., & Lachance, S. (1995). Structured versus free-recall measures: Effect on report of worry themes. *Personality and Individual Differences, 18*, 355-361. doi:10.1016/0191-8869(94)00151-H

Dugas, M. J., Freeston, M. H., Ladouceur, R., Rhéaume, J., Provencher, M., & Boisvert, J. (1998b). Worry themes in primary GAD, secondary GAD, and other anxiety disorders. *Journal of Anxiety Disorders, 12*, 253-261. doi:10.1016/S0887-6185(98)00013-9

Dugas, M. J., Freeston, M. H., Provencher, M. D., Lachance, S., Ladouceur, R., & Gosselin, P. (2001). Le Questionnaire sur L'inquiétude et L'anxiété. validation dans des échantillons non cliniques et cliniques. / The Worry and Anxiety Questionnaire: Validation in non-clinical and clinical samples. *Journal De Thérapie Comportementale Et Cognitive, 11*, 31-36.

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

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

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

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

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

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

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

Foa, E. B. (1996). *Posttraumatic Stress Diagnostic Scale.* Minneapolis, MN: National Computer Systems.

Foa, E. B., Huppert, J. D., & Cahill, S. P. (2006). Emotional processing theory: An update. In B. O. Rothbaum (Ed.), *Pathological anxiety: Emotional processing in etiology and treatment.* (pp. 3-24). New York, NY: Guilford Press.

Foa, E. B., & Kozak, M. J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin, 99,* 20-35. doi:10.1037/0033-2909.99.1.20

Forgas, J. P., & Bower, G. H. (1987). Mood effects on person-perception judgments. *Journal of Personality and Social Psychology, 53,* 53-60. doi:10.1037/0022-3514.53.1.53

Frattaroli, J. (2006). Experimental disclosure and its moderators: A meta-analysis. *Psychological Bulletin, 132,* 823-865. doi:10.1037/0033-2909.132.6.823

Freeston, M. H., Dugas, M. J., & Ladouceur, R. (1996). Thoughts, images, worry, and anxiety. *Cognitive Therapy and Research, 20,* 265-273. doi:10.1007/BF02229237

Fresco, D. M., Mennin, D. S., Heimberg, R. G., & Turk, C. L. (2003). Using the Penn State Worry Questionnaire to identify individuals with generalized anxiety disorder: A receiver operating characteristic analysis. *Journal of Behavior Therapy and Experimental Psychiatry, 34,* 283-291. doi:10.1016/j.jbtep.2003.09.001

Goldman, N., Dugas, M. J., Sexton, K. A., & Gervais, N. J. (2007). The impact of written exposure on worry: A preliminary investigation. *Behavior Modification, 31,* 512-538. doi:10.1177/0145445506298651

Gould, R. A., Safren, S. A., Washington, D. O., & Otto, M. W. (2004). A meta-analytic review of cognitive-behavioral treatments. In R. G. Heimberg, C. L. Turk & D. S. Mennin (Eds.), (pp. 248-264). New York, NY: Guilford Press.

Grayson, J. B., & Borkovec, T. D. (1978). The effects of expectancy and imagined response to phobic stimuli on fear reduction. *Cognitive Therapy and Research, 2*, 11-24. doi:10.1007/BF01172509

Grös, D. F., Antony, M. M., Simms, L. J., & McCabe, R. E. (2007). Psychometric properties of the State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA): Comparison to the State-Trait Anxiety Inventory (STAI). *Psychological Assessment, 19*, 369-381. doi:10.1037/1040-3590.19.4.369

Hsu, L. M. (1989). Reliable changes in psychotherapy: Taking into account regression toward the mean. *Behavioral Assessment, 11*, 459-467.

Jourard, S. M. (1971). *Self-disclosure: An experimental analysis of the transparent self*. Oxford, England: John Wiley.

Kessler, R. C., Birnbaum, H., Demler, O., Falloon, I. R. H., Gagnon, E., Guyer, M., Howes, M. J., Kendler, K. S., Shi, L., Walters, E., & Wu, E. Q. (2005). The prevalence and correlates of nonaffective psychosis in the national comorbidity survey replication (NCS-R). *Biological Psychiatry, 58,* 668-676. doi:10.1016/j.biopsych.2005.04.034

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

Kozak, M. J., Foa, E. B., & Steketee, G. (1988). Process and outcome of exposure treatment with obsessive-compulsives: Psychophysiological indicators of emotional processing. *Behavior Therapy, 19*, 157-169. doi:10.1016/S0005-7894(88)80039-X

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

Lang, A. J., & Craske, M. G. (2000). Manipulations of exposure-based therapy to reduce return of fear: A replication. *Behaviour Research and Therapy, 38*, 1-12. doi:10.1016/S0005-7967(99)00031-5

Lecrubier, Y., Sheehan, D. V., Weiller, E., Amorim, P., Bonora, I., Sheehan, K. H., Janavs, J., & Dunbar, G. C. (1997). The Mini International Neuropsychiatric Interview (MINI): A short diagnostic structured interview: Reliability and validity according to the CIDI. *European Psychiatry, 12*, 224-231. doi:10.1016/S0924-9338(97)83296-8

Lewinsohn, P. M., & Gotlib, I. H. (1995). Behavioral theory and treatment of depression. In E. E. Beckham, & W. R. Leber (Eds.), (pp. 352-375). New York, NY: Guilford Press.

Magill, R. A., & Hall, K. G. (1990). A review of the contextual interference effect in motor skill acquisition. *Human Movement Science.Special Issue: The Learning, Memory and Perception of Perceptual-Motor Skills, 9*, 241-289. doi:10.1016/0167-9457(90)90005-X

Metzger, R. L., Miller, M. L., Cohen, M., & Sofka, M. (1990). Worry changes decision making: The effect of negative thoughts on cognitive processing. *Journal of Clinical Psychology, 46*, 78-88. doi:10.1002/1097-4679(199001)46:1<78::AID-JCLP2270460113>3.0.CO;2-R

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

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

Moscovitch, D.A., Antony, M.M., & Swinson, R.P. (2009). Exposure-based treatments for anxiety disorders: Theory and process. In M.M. Antony & M.B. Stein (Eds.), *Oxford handbook of anxiety and related disorders* (pp. 461-475). New York, NY: Oxford University Press.

Newman, M. G. (2000). Recommendations for a cost-offset model of psychotherapy allocation using generalized anxiety disorder as an example. *Journal of Consulting and Clinical Psychology, 68*, 549-555. doi:10.1037/0022-006X.68.4.549

Páez, D., Velasco, C., & González, J. L. (1999). Expressive writing and the role of alexythimia as a dispositional deficit in self-disclosure and psychological health. *Journal of Personality and Social Psychology, 77*, 630-641. doi:10.1037/0022-3514.77.3.630

Pennebaker, J. W. (1989). Confession, inhibition, and disease. In L. Berkowitz (Ed.), *Advances in experimental social psychology, vol. 22.* (pp. 211-244). San Diego, CA: Academic Press. doi:10.1016/S0065-2601(08)60309-3

Pennebaker, J. W., & Beall, S. K. (1986). Confronting a traumatic event: Toward an understanding of inhibition and disease. *Journal of Abnormal Psychology, 95*, 274-281. doi:10.1037/0021-843X.95.3.274

Pennebaker, J. W., Booth R. J., & Francis M. E. (2007). *Linguistic Inquiry and Word Count (LIWC): LIWC2007*. Mahwah, NJ: Lawrence Erlbaum Associates.

Peasley-Miklus, C., & Vrana, S. R. (2000). Effect of worrisome and relaxing thinking on fearful emotional processing. *Behaviour Research and Therapy, 38*, 129-144. doi:10.1016/S0005-7967(99)00025-X

Provencher, M. D., Dugas, M. J., & Ladouceur, R. (2004). Efficacy of problem-solving training and cognitive exposure in the treatment of generalized anxiety disorder: A case replication series. *Cognitive and Behavioral Practice*, *11*, 404-414. doi:10.1016/S1077-7229(04)80057-9

Rachman, S. (1997). The evolution of cognitive behaviour therapy. In D. Clark, C.G. Fairburn, & M.G. Gelder (Eds.), *Science and practice of cognitive behaviour therapy* (pp. 1 – 26). Oxford, UK: Oxford University Press.

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*, 385-401. doi:10.1177/014662167700100306

Ree, M. J., French, D., MacLeod, C., & Locke, V. (2008). Distinguishing cognitive and somatic dimensions of state and trait anxiety: Development and validation of the State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA). *Behavioural and Cognitive Psychotherapy, 36*, 313-332. doi:10.1017/S1352465808004232

Richards, J. M., Beal, W. E., Seagal, J. D., & Pennebaker, J. W. (2000). Effects of disclosure of traumatic events on illness behavior among psychiatric prison inmates. *Journal of Abnormal Psychology, 109*, 156-160. doi:10.1037/0021-843X.109.1.156

Rowe, M. K., & Craske, M. G. (1998). Effects of varied-stimulus exposure training on fear reduction and return of fear. *Behaviour Research and Therapy, 36*, 719-734. doi:10.1016/S0005-7967(97)10017-1

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

Schmidt, R. A., & Bjork, R. A. (1992). New conceptualizations of practice: Common principles in three paradigms suggest new concepts for training. *Psychological Science*, *3*, 207-217. doi:10.1111/j.1467-9280.1992.tb00029.x

Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J., Weiller, E., Hergueta, T., Baker, R., & Dunbar, G. C. (1998). The Mini-International Neuropsychiatric Interview (M.I.N.I): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry*, *59*, 22-33.

Sibrava, N. J., & Borkovec, T. D. (2006). The cognitive avoidance theory of worry. In G. C. L. Davey, & A. Wells (Eds.), (pp. 239-256). Hoboken, NJ: John Wiley and Sons. doi:10.1002/9780470713143.ch14

Sloan, D. M., & Marx, B. P. (2004). Taking pen to hand: Evaluating theories underlying the written disclosure paradigm. *Clinical Psychology: Science and Practice, 11*, 121-137. doi:10.1093/clipsy/bph062

Sloan, D. M., Marx, B. P., & Epstein, E. M. (2005). Further examination of the exposure model underlying the efficacy of written emotional disclosure. *Journal of Consulting and Clinical Psychology, 73*, 549-554. doi:10.1037/0022-006X.73.3.549

Smith, T. W. (1992). Hostility and health: Current status of a psychosomatic hypothesis. *Health Psychology, 11*, 139-150. doi:10.1037/0278-6133.11.3.139

Smyth, J. M., Stone, A. A., Hurewitz, A., & Kaell, A. (1999). Effects of writing about stressful experiences on symptom reduction in patients with asthma or rheumatoid arthritis: A randomized trial. *Journal of the American Medical Association, 281*, 1304-1309. doi:10.1001/jama.281.14.1304

Smyth, J. M. (1998). Written emotional expression: Effect sizes, outcome types, and moderating variables. *Journal of Consulting and Clinical Psychology, 66*, 174-184. doi:10.1037/0022-006X.66.1.174

Spera, S. P., Buhrfeind, E. D., & Pennebaker, J. W. (1994). Expressive writing and coping with job loss. *Academy of Management Journal, 37*, 722-733. doi:10.2307/256708

Stöber, J. (1998). Worry, problem elaboration and suppression of imagery: The role of concreteness. *Behaviour Research and Therapy, 36*, 751-756. doi:10.1016/S0005-7967(98)00027-8

Stöber, J., & Borkovec, T. D. (2002). Reduced concreteness of worry in generalized anxiety disorder: Findings from a therapy study. *Cognitive Therapy and Research, 26*, 89-96. doi:10.1023/A:1013845821848

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

Vrana, S. R., Cuthbert, B. N., & Lang, P. J. (1986). Fear imagery and text processing. *Psychophysiology, 23*, 247-253. doi:10.1111/j.1469-8986.1986.tb00626.x

Walker, B. L., Nail, L. M., & Croyle, R. T. (1999). Does emotional expression make a difference in reactions to breast cancer? *Oncology Nursing Forum, 26,* 1025–1032.

Zinbarg, R.E., Barlow, D. H., & Craske, M. G. (2006). Mastery of Your Anxiety and Worry: Therapist Guide (2th ed.). New York, NY: Oxford University Press.