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Returning to Presence: The Effects of Mindfulness on Emotion Regulation Following Worry among Individuals with Analogue Generalized Anxiety Disorder

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RETURNING TO PRESENCE: THE EFFECTS OF MINDFULNESS ON EMOTION REGULATION FOLLOWING WORRY AMONG INDIVIDUALS WITH ANALOGUE GENERALIZED ANXIETY DISORDER

by

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ABSTRACT

Ways to reduce the impact of worry in generalized anxiety disorder (GAD) have received little experimental research attention. Previous research has found that those with GAD are vulnerable to negative emotionality immediately following periods of worry; emotion regulation strategies could be useful to mitigate reactivity following worry. One promising strategy is mindfulness, defined as sustained attention toward the present moment with an attitude of curiosity and acceptance. Experimental research has found that mindfulness reduces negative affect and improves emotion regulation. This strategy is likely more effective than thought suppression, a common strategy used in GAD.

This online study recruited 300 individuals with analogue GAD who completed several self-report measures of worry severity, emotion dysregulation, mindfulness, and experiential avoidance and underwent experimental inductions of worry (versus no-worry control) and regulation strategy (mindfulness versus thought suppression versus no-strategy control) before watching a sad film clip and reporting state affect and emotion dysregulation.

Contrary to hypotheses, the mindfulness manipulation did not have a buffering effect on the relation between worry and negative affect or emotion dysregulation. The only predicted significant finding indicated that the mindfulness manipulation had a main effect on negative affect, with visual trends indicating that this effect was driven by those who did not worry. An exploratory analysis indicated that a mindfulness manipulation increased positive affect following worry, however. Clinical implications and future directions are discussed.

INDEX WORDS: Worry, Emotion regulation, Mindfulness, Generalized anxiety disorder

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1 INTRODUCTION

1.1 Overview

Worry is the cardinal feature of generalized anxiety disorder (GAD). Those with GAD think excessively and uncontrollably about future events with possible negative outcomes, to the extent that worry becomes disabling (APA, 2013). In fact, those with GAD report more disability than those with any other anxiety disorder (Grant et al., 2005). Unfortunately, GAD is also difficult to treat, with an average response rate of only 47.0% in a recent meta-analysis (Loerinc et al., 2015). Experimental research on worry has shed much light on our theoretical understanding of GAD, aiding in treatment development. However, little is known at the experimental level about how to change the immediate impact of worry.

Previous research has found that those with GAD react to emotional stimuli with higher negative affect and worse emotion regulation immediately following a worry episode (McLaughlin, Mennin, & Farach, 2007). That is, if individuals with GAD worry, and then they are exposed to a stimulus evoking negative affect, they do not cope as well with that stimulus. Such findings have practical clinical significance, as it is possible that using emotion regulation strategies following worry periods could reduce reactivity. This clinical possibility can be examined experimentally and is the focus of the present study.

Specifically, mindfulness may be an effective emotion regulation strategy following worry periods, given that experimental research has found that mindfulness aids in the regulation of emotion (Arch & Craske, 2006; Feldman, Greeson, & Senville, 2010) and that treatment research indicates that mindfulness may be beneficial for those with GAD (Evans et al., 2008). Those with GAD often use thought suppression as an emotion regulation strategy (Becker, Rinck, Roth, & Margraf, 1998); mindfulness will likely be more effective than thought

suppression, which a large body of evidence has suggested is ineffective (e.g., Koster, Rassin, Crombez, & Näring, 2003; Wegner, Erber, & Zanakos, 1993).

My dissertation project is an experimental study which explores the effects of mindfulness for those with analogue GAD (i.e., GAD diagnosed with a standardized self-report) immediately following worry periods. Specifically, people with analogue GAD underwent an experimental procedure through an online portal. Following self-report baseline measures, they were randomly assigned to worry for five minutes, or think about a neutral stimulus for five minutes (Induction 1). Following this, they were assigned to a five-minute mindfulness meditation, a five-minute neutral-thinking condition, or a five-minute thought suppression condition (Induction 2). They then viewed a three-minute film clip to induce negative affect (i.e., sadness), and completed measures of state emotion dysregulation and negative affect.

The current manuscript begins with a review of GAD and theories for how GAD is caused and maintained. Emotion regulation is then defined, and research on emotion regulation in GAD to date is reviewed. I then discuss thought suppression in GAD, and propose mindfulness as a potentially effective emotion regulation strategy that is counter to thought suppression. Following this review, I discuss the experimental studies which led to the hypotheses generated in the present study. I then describe the design of the experiment, provide results for each hypothesis, and discuss the implications of my findings.

1.2 Generalized Anxiety Disorder

Worry is a primarily verbal-linguistic activity wherein an individual thinks, in an uncontrollable way, about uncertain future events with possible future negative outcomes (Borkovec & Inz, 1990; Borkovec, Robinson, Pruzinsky, & DePree, 1983). Generalized anxiety disorder (GAD) is a psychiatric disorder characterized by excessive, uncontrollable worry (APA,

2013). The specific topics of worry for individuals with GAD are similar to the worries of healthy controls (Diefenbach, Stanley, & Beck, 2001), such as worries about health, work performance, and interpersonal conflicts. Worry is a common experience; most adults experience transient periods of worry in a given week (Tallis, Davey, & Capuzzo, 1994). However, individuals with GAD worry about more topics than healthy controls, and they report more frequent, less controllable, and more distressing worry periods (Hoyer, Becker, & Roth, 2001).

GAD is a relatively common diagnosis, with a 12-month prevalence rate of 2.1% and a lifetime prevalence of 4.1% of the general population in the United States (Grant et al., 2005). Although GAD is serious and impairing without comorbidity, the vast majority of people with GAD also meet criteria for another psychiatric disorder. Lifetime comorbidity rates are estimated at 89.8% (Grant et al., 2005); common comorbid conditions include major depressive disorder (MDD), panic disorder, substance use disorders, and dependent personality disorder (Carter, Wittchen, Pfister, & Kessler, 2001; Grant et al., 2005). The high rates of comorbidity that are typical for GAD have led some researchers to question whether GAD is accurately categorized as an independent diagnosis (e.g., T. Brown, Chorpita, & Barlow, 1998). Many of the symptoms that are common in GAD, such as irritability, difficulty sleeping, and restlessness, overlap with the criteria for other disorders, like MDD and post-traumatic stress disorder (PTSD) (APA, 2013). Also, GAD and MDD have extremely high genetic correlations in addition to the high prevalence of comorbidity across the conditions (Kendler, Gardner, Gatz, & Pedersen, 2007).

Nevertheless, GAD and MDD differ in their course, with GAD presenting chronically while MDD more commonly presents episodically (Fergusson, Horwood, & Boden, 2006). They also differ in their environmental risk factors, with low socioeconomic status and childhood maltreatment uniquely predicting “pure” adulthood GAD and family history of depression and

low positive emotionality in childhood predicting "pure" MDD in a longitudinal study following 1,037 individuals over 32 years (Moffitt et al., 2007). In addition, GAD is impairing even when it occurs without comorbidity (Grant et al., 2005); thus, GAD remains an independent diagnostic category to date.

Unfortunately, GAD has only a 47% response rate to state-of-the-art treatment (Loerinc et al., 2015). Even after they receive the treatment with the strongest empirical support to date (i.e., cognitive behavioral therapy), most people with GAD do not show "high end-state functioning" (Waters & Craske, 2005). One hypothesized explanation for their poor response is that the nature of worry, the core feature of GAD, does not easily lend itself to exposure-based treatments (Borkovec, 2002). By nature, worry in GAD shifts constantly, as it focuses on multiple domains of ever-changing daily life, and the apprehension associated with worry often occurs without specific feared outcomes (Butler, 1994) and is thereby difficult to disprove. Thus, theoretical models of GAD, and laboratory component studies based on these theories, have sought to better explain the cardinal feature of the disorder: worry.

1.3 Theoretical Perspectives on GAD

1.3.1 Avoidance theory

Perhaps the most widely accepted theory of GAD is the avoidance theory of worry, developed by Borkovec, Alcaine, and Behar (2004). The avoidance theory posits that worry is a covert behavior which allows individuals to cognitively avoid feelings of threat, or perceive that they are avoiding real threat. That is, when people worry, they feel less physiological anxiety, and they believe they are preventing negative future outcomes (Borkovec et al., 2004). Behaviors which serve such avoidance functions have long been known to be maintained by negative reinforcement (Iwata, 1987). Worry persists by this mechanism.

Although it may be counterintuitive that worry serves avoidance functions, since worry itself involves thinking about aversive future outcomes, a growing body of evidence has supported the avoidance theory. First, experimental studies have repeatedly found that worry successfully reduces short-term autonomic arousal. Worrying prior to giving a speech reduced physiological arousal among female undergraduates with public speaking fears (Borkovec & Hu, 1990), and worrying after watching a film of a gruesome work accident was associated with less post-film anxiety than rehearsing imagery of the film (Wells & Papageorgiou, 1995). This effect has been attributed to language processes (Borkovec et al., 2004); worry is primarily verbal and is processed through language rather than imagery (Stöber, 1998b). Language-based processing is thought to produce less arousal than image-based processing because words take on fewer stimulus properties of a feared event than images, which may more vividly represent the fear (Borkovec et al., 2004). Verbalizing a feared situation is associated with less short-term physiological distress than imagining a scene where the feared event occurs (Vrana, Cuthbert, & Lang, 1986). Those with GAD show a predominance of language-based thoughts, rather than imagery, compared to healthy controls (Borkovec & Inz, 1990). Also, worry in GAD tends to consist of abstract, rather than concrete, language (Goldwin & Behar, 2011; Stöber & Borkovec, 2002), which is even less likely to evoke physiologically arousing imagery (Marschark & Cornoldi, 1991).

In addition to reducing autonomic arousal, worry may be perceived to reduce the likelihood of future catastrophe, thus serving an additional avoidance function. Worriers with and without GAD believe that worry is helpful for motivation to engage in goal-directed behavior, to prepare for negative future events, and to problem-solve to prevent or reduce the impact of negative future outcomes (Borkovec & Roemer, 1995). People with untreated GAD

have little evidence to suggest otherwise. When documented through daily monitoring, most of the outcomes people with GAD worry about do not actually occur, and they often cope better than they expected when these outcomes do occur (Borkovec, Hazlett-Stevens, & Diaz, 1999). People with GAD may attribute positive outcomes to their worry because worry is often an antecedent to these outcomes (Borkovec et al., 1999). The lack of concreteness of worry in GAD may actually prevent effective problem-solving (Stöber, 1998b), but without evidence to the contrary, those with GAD may believe that their worry is an effective problem-solving aid.

Although worry reduces short-term physiological arousal and is perceived to aid in problem-solving, in the long term, worry backfires on both counts. In a sample of healthy undergraduates, those who worried initially showed the lowest physiological arousal to a feared stimulus (i.e., imagining giving a speech to a large audience). However, they failed to habituate (i.e., experience less arousal over time exposed to a stimulus) to the stimulus over multiple trials, continuing to have heightened self-report anxiety and cardiovascular activation over time (Borkovec & Hu, 1990). In comparison, those instructed to engage in relaxed thinking showed significantly higher initial anxiety, but then showed reductions in both measures over multiple trials. When anxiety throughout all trials was summed and compared across groups, the worry group showed higher overall self-report and cardiovascular anxiety due to their failure to habituate.

Worry also backfires in effective problem-solving. Although problem elaboration (i.e., verbally describing the details and context of a current problem) can be an adaptive coping strategy (D'Zurilla & Goldfried, 1971; Schönpflug, 1989), worry interferes with the concreteness or clarity of problem elaborations (Stöber, Tepperwien, & Staak, 2000). Problem-solving attempts that lack concreteness prevent individuals from identifying effective strategies for

action, thereby preventing the resolution of worry (Stöber, 1998b). Worry and GAD are thought to be maintained by these processes.

1.3.2 Emotion regulation

Although the avoidance theory accounts for the maintenance of worry over time, some have argued that it may not fully account for the emotional experience that might prompt those with GAD to use worry as a rigid strategy (Mennin, Heimberg, Turk, & Fresco, 2006). Mennin et al. (2006) suggest that difficulties in emotion regulation might account for the excessive use of worry that characterizes this population.

Emotion regulation is defined as "the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (Gross, 1998). Emotion is defined as a brief form of affect, wherein an individual reacts to a personally relevant internal or external event with response tendencies which may include experiential, behavioral, and/or physiological responses (Rottenberg & Gross, 2007). At times, people influence this process, consciously or unconsciously. When their actions are aimed at influencing emotions, they are using emotion regulation. Emotion regulation may involve changing the situation (situation selection or situation modification), where one places attention within the situation (attentional deployment), appraisal of the situation (cognitive change), or one's behavioral response (response modulation; Gross & Thompson, 2007). For example, a person might not want to experience, or express, extremely high anxiety during upcoming job interviews. In order to regulate the experience or expression of anxiety, he might choose to apply for jobs he has already competently performed in the past (situation selection). He might also wear his nicest suit to boost his confidence (situation modification) or focus his attention on the interviewer rather than his anxiety (attentional deployment). He may remind himself that he is

actually an excellent candidate for the position (cognitive change) or try to avoid fidgeting (response modulation). Each of these chosen strategies may or may not successfully reduce his anxiety or anxious responding, but they are all emotion regulation attempts.

The processes of attempting to regulate emotion, here defined as emotion regulation, should not be equated with *adaptive* regulation of emotion. Emotion regulation may be adaptive in the long term, or not. For example, wearing one's nicest suit to an interview may aid in the regulation of emotion, and, assuming that the suit was the appropriate level of dress for the setting, will result in few negative consequences. However, those who engage in non-suicidal self-injury may use this behavior because it successfully reduces the intensity of negative affect (Franklin et al., 2010; Nock, 2009), but they experience social and health consequences because of their chosen strategy. Similarly, those with GAD use an immediately effective emotion regulation strategy, worry, which is an ineffective long-term regulatory strategy (Borkovec & Hu, 1990). That is, those who *use* emotion regulation may still experience difficulties in the process of emotion regulation, by failing to execute strategies in a way that successfully modulates emotion or increases goal-directed, adaptive behavior.

Gross' model of emotion regulation was developed for the purpose of conceptual clarity in the time-course of emotion regulation for experimental analysis (Gross, 2002); broad difficulties with the effective utilization of emotion regulation strategies have been captured in other definitions. Theories on difficulties with emotion regulation were integrated by Gratz and Roemer (2004) in order to develop a self-report measure that captured an individual's overall tendency toward emotion dysregulation. The conceptualizations they integrate suggest that:

1) emotions are functional and may not need modification for regulation (Cole, Michel, & Teti, 1994);

2) understanding and accepting emotion is part of regulation (Linehan, 1993);
3) monitoring and evaluating emotional experience may be as important in regulation as modifying the experience of emotion (Thompson & Calkins, 1996);
4) emotional suppression and excessive control are maladaptive and dysregulating (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996);
5) reacting to one's own emotion with negative affect is maladaptive (Cole et al., 1994; Paivio & Greenberg, 1998);
6) modulation, rather than elimination, of emotion, for the purpose of goal-directed behavior, may characterize effective emotion regulation (Linehan, 1993; Melnick & Hinshaw, 2000); and
7) emotion regulation is characterized by the effective and flexible use of strategies in the face of emotional experience (Cole et al., 1994; Thompson, 1994).

These existing conceptualizations expand the work of Gross and colleagues by adding the characterization of effective emotion regulation versus emotion dysregulation to Gross' time-process model of *how* this regulation occurs over time.

Integrating these conceptualizations, Gratz and Roemer (2004) define difficulties in emotion regulation, or emotion dysregulation, as the presence of problems across the following dimensions: acceptance of emotional experiences, completion of goal-directed behaviors in the face of emotion, inhibition of impulses, awareness of emotion, access to adaptive regulatory strategies, and clarity of emotional experience. In terms of Gross' process model of emotion regulation, emotion dysregulation is characterized by difficulty in choosing and appropriately utilizing effective emotion regulation strategies across the time-stages of the model. Gratz and Roemer's (2004) conceptualization of difficulties in emotion regulation has shed light of the

influence of emotion dysregulation on psychopathology. Emotion dysregulation has been implicated across a wide range of psychopathology, such as eating disorders (Treasure, Corfield, & Cardi, 2012), post-traumatic stress disorder (Boden et al., 2013), and alcohol dependence (Sher & Grekin, 2007). Increasing evidence has also suggested that emotion dysregulation characterizes GAD (Mennin, Heimberg, Turk, & Fresco, 2005).

Those with GAD may use worry because they have difficulties in understanding emotion, tolerating emotion, and choosing effective behavior while feeling intense emotion. That is, they have difficulties in emotion regulation. Mennin, Heimberg, Turk, and Fresco (2005) have argued that an emotion dysregulation model accounts for the development and maintenance of GAD. In a series of preliminary studies supporting this model, they found that those with GAD experience more intense emotions, are more reactive to their emotional experiences, have poorer understanding of their emotions, and have reduced ability to self-soothe in comparison to controls (Mennin et al., 2005). A composite emotion regulation score using these variables successfully classified 72.3% of individuals with GAD. Associations between GAD symptoms and emotion dysregulation have been replicated in many subsequent research studies, in healthy samples, analogue GAD samples, and samples of individuals with diagnosed GAD (e.g., Roemer et al., 2009; Salters-Pedneault, Roemer, Tull, Rucker, & Mennin, 2006; Turk, Heimberg, Luterek, Mennin, & Fresco, 2005). In addition, worry behavior may maintain emotion dysregulation in GAD. Participants with GAD who worried before being exposed to a sad film clip showed greater sadness and more emotion dysregulation in response to the clip than those with GAD who had not worried (McLaughlin et al., 2007). That is, for those with GAD, worrying immediately before exposure to an emotionally evocative stimulus increased the intensity of sadness and decreased their ability to respond effectively to sadness.

The evidence to date thus suggests that emotion dysregulation plays a role in the maintenance of GAD symptoms. Multiple aspects of emotion dysregulation have been linked to GAD symptoms and chronic worry over and above variance explained by negative affect (Salters-Pedneault et al., 2006), suggesting that emotion dysregulation in GAD is not simply the result of higher negative affect in this population. When accounting for overlap across social anxiety disorder, major depression, and MDD, heightened intensity of emotion and maladaptive management of emotion are uniquely associated with symptoms of GAD (Mennin, Holaway, Fresco, Moore, & Heimberg, 2007). GAD is specifically associated with emotion regulation deficits and the use of worry to downregulate the experience of anxiety. Thus, research that examines effective use of emotion regulation strategies in GAD is warranted.

1.4 The Role of Thought Suppression

One common, but ineffective, emotion regulation strategy for those with GAD is thought suppression (Borkovec & Lyonfields, 1993; de Bruin, Muris, & Rassin, 2007). Thought suppression can be defined as the attempt not to think certain thoughts, through active avoidance or elimination attempts (Wegner, Schneider, Carter, & White, 1987). More than inattention or inadvertent distraction, thought suppression requires that an individual both intend to suppress a thought and carry out their plan by suppressing cognition relevant to the original thought (Wegner et al., 1987). Thought suppression is considered a cognitive emotion regulation strategy – an attempt to alter the form, intensity, or frequency of an emotion through eliminating thoughts with emotional charge (Aldao & Nolen-Hoeksema, 2010).

Wegner and colleagues, the creators of the classic "white bear" experiments, have repeatedly demonstrated that thought suppression is ineffective in reducing or eliminating thoughts (e.g., Wegner & Erber, 1992; Wegner et al., 1987; Wegner, Shortt, Blake, & Page,

1990). Rather than decreasing the target thoughts as intended, thought suppression leads to a paradoxical *increase* in those thoughts (Wegner et al., 1987), as well as an increase in associated physiological arousal (Wegner et al., 1990). Overall, the suppression literature has found that suppression leads to an immediate increase in target thoughts during suppression, increased occurrence of target thoughts after suppression, and higher rates of intrusive thoughts during attempts to suppress thoughts or mood while under cognitive demand (see Wenzlaff & Wegner, 2000). Thus, although individuals use suppression as an emotion regulation strategy, attempting to reduce the frequency of an unwanted thought, suppression is not effective toward this end.

Suppression is currently considered a potential causal and maintenance factor in multiple forms of psychopathology (Magee, Harden, & Teachman, 2012; Purdon, 1999). In a sample of individuals with anxiety and mood disorders, including GAD, those instructed to suppress emotion had higher heart rate in reaction to a film clip which was designed to induce negative affect, and higher negative affect during a recovery period than those instructed to accept their emotions (Campbell-Sills, Barlow, Brown, & Hofmann, 2006). These experimental effects may persist for those who often use thought suppression as an emotion regulation strategy. Similarly, chronic thought suppression correlates with symptoms of depression, obsessional thinking, and anxiety (Wegner & Zanakos, 1994).

Thought suppression is common in GAD. Thought suppression is a unique predictor of GAD symptoms, over and above other meta-cognition (de Bruin et al., 2007), and those with GAD can be discriminated from controls by their high scores on a measure of thought suppression (Dugas, Gagnon, Ladouceur, & Freeston, 1998). Worry, the core feature of GAD, has been considered a thought suppression technique in itself (Borkovec & Lyonfields, 1993). Individuals with GAD, but not healthy controls, report that they often use worry to distract

themselves from other thoughts, indicating ongoing attempts to suppress cognition (Borkovec & Roemer, 1995).

Understanding why thought suppression is problematic may shed light on alternative emotion regulation strategies, which might be more effective. One possibility is that chronic suppression of emotionally charged thoughts might prevent habituation to emotionally evocative stimuli, increasing sensitivity to anxious and depressive thoughts and symptoms (Wegner & Zanakos, 1994; Wenzlaff & Wegner, 2000). Additionally, unwanted thoughts may become even more distressing when we are attempting to control them (Wegner et al., 1993).

While using effortful control to attempt to alter cognition, individuals often cognitively search for failures in this effortful control, thus priming thoughts which run contrary to control efforts for an "alarm" signal (see Lombardi, Higgins, & Bargh, 1987; Martin, 1990). Experiencing alarm and negative reactions to unwanted cognition and emotion is an important facet of emotion dysregulation (Gratz & Roemer, 2004). This may have particular relevance for those with GAD; they chronically use worry as a thought suppression technique (Borkovec & Lyonfields, 1993), but experience heightened emotion dysregulation after worry periods (McLaughlin et al., 2007). Emotion regulation strategies that allow individuals to habituate to unwanted thoughts, reducing this reactivity, might be more effective than thought suppression. Because habituation occurs through exposure, strategies that encourage attention and awareness of negative thoughts and feelings, while reducing control efforts, might be particularly fruitful.

1.5 Mindfulness

Mindful awareness may be an alternative to suppression and an avenue to combat the experiential avoidance and emotion dysregulation tendencies that characterize GAD. Although mindfulness has received a variety of definitions in the literature, the present study defines

mindfulness as attention and awareness directed toward the present moment, with an attitude of curiosity and acceptance toward the experience of the present (Bishop et al., 2006). Rather than attempting to alter the form, intensity, or frequency of negative thoughts and feelings, mindfulness encourages people to allow thoughts and feelings to rise and fall naturally – the opposite of suppression. This approach toward thoughts and emotions appears to have many benefits. Trait mindfulness, or a tendency to be mindful across situations and contexts, has been positively associated with a wide variety of markers of psychological health. These include, but not limited to, higher self-esteem, optimism, sense of autonomy, and life satisfaction (K. W. Brown & Ryan, 2003). Trait mindfulness is also found to be negatively associated with various forms of psychopathology, including symptoms of PTSD, depression, social anxiety, and substance abuse, among others (K. W. Brown & Ryan, 2003; Garland, Boettiger, Gaylord, Chanon, & Howard, 2012; Smith et al., 2011).

Mindfulness is, by nature, antithetical to the avoidance of internal experiences that characterizes GAD. People with GAD avoid their present-moment experiences, and they tend to judge, fear, and attempt to control their negative emotional reactions (Mennin et al., 2005; Wells, 2004). Mindfulness practice encourages individuals to experience the present moment, even if it is unpleasant, without judgment and without attempts to avoid the experience (Bishop et al., 2006). By encouraging nonjudgmental present-moment awareness, mindfulness meditation successfully reduces experiential avoidance over time (Sachse, Keville, & Feigenbaum, 2011). Because mindfulness reduces experiential avoidance, and GAD is thought to be maintained by avoidance processes (Borkovec et al., 2004), researchers have begun to examine mindfulness in this population. They have found that self-reported mindfulness uniquely predicts GAD symptom severity over and above broad anxiety and depressive symptoms (Roemer et al., 2009)

and that mindfulness-based treatments may be effective in reducing symptoms in GAD (Evans et al., 2008).

Perhaps, in part, through reducing avoidance, mindfulness may be an effective and adaptive emotion regulation strategy (A. M. Hayes & Feldman, 2004). Mindfulness is associated with adaptive problem-solving, including analysis of problems and rehearsal of plans to resolve the problem, and is not associated with maladaptive strategies, such as deliberation without effective action and fantasizing about desired outcomes (Feldman & Hayes, 2005). Increases in mindfulness over the course of psychological treatment are also associated with reductions in avoidance and rumination, both of which are maladaptive emotion regulation strategies (Kumar, Feldman, & Hayes, 2008). These and other findings have been taken to indicate that mindfulness aids in "decentering," or reducing the tendency to overly avoid or overly engage with emotionally relevant material, thus allowing for more adaptive emotion regulation (A. M. Hayes & Feldman, 2004).

1.6 Experimental Findings

Theories of GAD and the evidence to date suggest that GAD may be caused and maintained by avoidance of internal experiences and emotion dysregulation (Borkovec et al., 2004; Mennin et al., 2005). These models of GAD have been supported by laboratory component research demonstrating that worry operates by avoidance mechanisms, physiologically and cognitively (Borkovec & Hu, 1990; Wells & Papageorgiou, 1995), and that worry has emotion dysregulatory properties (McLaughlin et al., 2007; Mennin et al., 2005). Although laboratory-based experimental research has helped us to understand how GAD might be caused and maintained, it has focused less on the treatment of these underlying mechanisms to inform the treatment of this specific condition. Such questions are, instead, often answered through

mediational analyses of clinical trials (Kazdin, 2007). However, laboratory component studies may also be particularly useful in evaluating the impact of hypothesized treatment mechanisms (David & Montgomery, 2011). Such research allows for careful control and manipulation of possible confounding variables in a way that is difficult to achieve in clinical trials (Hayes, Levin, Plumb-Vilardaga, Villatte, & Pistorello, 2013).

McLaughlin et al. (2007) examined the effects of worry on emotion generation and dysregulation in a sample of 49 individuals with clinically diagnosed GAD and 44 healthy controls recruited from an introductory psychology college course. All participants completed a battery of questionnaires before being assigned to worry, relaxation, or control conditions. Those in the worry condition wrote down three topics they worried most about and were then asked to worry about these topics for five minutes. Those in relaxation wrote down three of the most pleasant events in their lives and were instructed to relax while thinking of these things. Finally, those in the neutral condition were asked to think about what they did over the past weekend. Subsequently, participants watched a sad film clip (i.e., sadness mood induction), and then completed measures of current emotion intensity and emotion dysregulation. Results revealed that those with GAD who worried showed greater negative affect than those with GAD in the other conditions (i.e., relaxation and neutral thinking). In addition, those with GAD who were assigned to worry showed increased emotion dysregulation (as measured with a state version of the Difficulties in Emotion Regulation Scale) following the film clip compared to controls assigned to worry. This research indicates that those with GAD are vulnerable to negative affect following worry periods, and they are less able to use effective regulation strategies in the face of this emotion.

When people with GAD are vulnerable to negative emotion, they may be tempted to use a familiar regulation strategy (de Bruin et al., 2007): thought suppression. This strategy is unlikely to be effective. A recent meta-analysis of experimental research on emotion regulation strategies found that suppression of thoughts relevant to a negative emotion led to the opposite of desired emotional outcomes (Webb, Miles, & Sheeran, 2012). For example, Koster, Rassin, Crombez, and Näring (2003) found that undergraduates assigned to suppress thoughts about an upcoming painful stimulus reported lower frequency and duration of threat-related thoughts than those assigned to a control condition while they were suppressing thoughts. However, following suppression, they reported higher frequency and duration of these thoughts as well as higher self-report anxiety than controls. In another study, undergraduates were assigned either to suppress or not to suppress positive, unwanted, or neutral thoughts (Purdon & Clark, 2001). Suppressing unwanted thoughts was associated with greater discomfort and worse mood than suppression of other thoughts and the non-suppression control conditions.

Conversely, experimental research on mindfulness meditation suggests that it is an effective emotion regulation strategy, unlike thought suppression. Healthy adults guided through a mindfulness meditation involving focused breathing showed lower negative affect, lower emotional volatility, and greater willingness to view negative slides than those who were instructed to worry and those who were instructed in unfocused attention (Arch & Craske, 2006). Individuals randomly assigned to a mindful breathing meditation, more than other forms of relaxation (i.e., progressive muscle relaxation and loving kindness meditation) showed weaker associations between frequency of negative thoughts and negative reactions to these thoughts (Feldman et al., 2010). This suggests that mindful breathing reduces reactivity to distress.

Mindfulness meditation has also consistently increased heart rate variability in experimental research (e.g., Ditto, Eclache, & Goldman, 2006; Krygier et al., 2013; Wu & Lo, 2008); heart rate variability is considered a physiological index of emotion regulation, with greater variability indicative of more effective regulation (Appelhans & Luecken, 2006). Last, Erisman and Roemer (2011) examined the effects of induced mindfulness versus control on emotion reactivity to film clips in a sample of 30 individuals with elevated scores on a measure of emotion dysregulation. Those assigned to mindfulness reported significantly more positive affect in response to a positive film clip, and they reported significantly lower negative affect and marginally significant increased adaptive regulation compared to controls in response to an affectively mixed film clip. Although Erisman and Roemer (2011) found no differences across groups in response to a distressing film clip, the authors discuss that the film clip, which depicted combat violence, may have been too emotionally evocative to detect effects of mindfulness.

Overall, the experimental research suggests that worry has emotion dysregulating effects among those with GAD, and that different regulation strategies have different effects on one's ability to cope with distressing stimuli. Individuals with GAD often utilize thought suppression, a strategy that has been shown to have dysregulating effects in experimental research. It is possible that mindfulness may be taught as an alternative regulation strategy for those with GAD. The use of this strategy may be clinically useful at times that those with GAD are more vulnerable to distress, immediately following worry periods. The present study aims to examine this clinical possibility in an experimental design.

1.7 Summary of the Evidence Supporting the Present Study

Generalized anxiety disorder (GAD) was previously named the "confusing stepchild among the anxiety disorders" (Barlow & Wincze, 1998, p. 23). Treatments based on the best-

supported theories of GAD have yielded only 50% response rates in terms of high end-state functioning (Waters & Craske, 2005), results which are inconsistent with treatment response among other anxiety disorders (T. Brown, Barlow, & Liebowitz, 1994). Newer, promising theories of GAD suggest that emotion regulation is in need of further study in this population (Mennin et al., 2006).

Those with GAD experience a broad array of emotion regulation difficulties, more than those with other anxiety disorders (Turk et al., 2005), to the extent that an emotion regulation model might account for the symptoms of GAD (Mennin et al., 2005). The primary symptom of GAD, worry, itself increases emotion dysregulation. In a laboratory component study, those with GAD who worried prior to being exposed to a sad film clip showed more negative affect and more emotion dysregulation than those who did not worry (McLaughlin et al., 2007).

The effect of worry on negative affect and emotion dysregulation provides an opportunity to examine the role of mindfulness as an emotion regulation strategy among those with analogue GAD. Because mindfulness is found to aid in "decentering" from emotionally relevant material, preventing both avoidance and over-engagement with emotion (A. M. Hayes & Feldman, 2004), mindfulness should reduce negative affect and emotion dysregulation in response to emotionally evocative material. Relevant to the present study, it may be that mindfulness reduces the effect of worry on emotional reactivity and emotion dysregulation when people with GAD are exposed to such a stimulus.

In other laboratory studies, mindfulness meditation has reduced emotion dysregulation both by self-report (e.g., Arch & Craske, 2006) and physiological measures (e.g., Ditto et al., 2006). However, the effects of mindfulness on emotion dysregulation have not yet been observed among *those with analogue GAD* in an experimental study. The evidence to date on the effects of

mindfulness suggests that it should aid in emotion regulation. In contrast, a regulation strategy of choice for those with GAD, thought suppression (Dugas et al., 1998), should have the opposite effect, given the paradoxical effects of thought suppression on cognition (Wegner & Erber, 1992) and emotion (Campbell-Sills et al., 2006).

1.8 Objectives

Using an online-based experimental method, the present study examined the interaction between worry and regulation strategy in a sample of individuals with analogue GAD. Specifically, the study examined whether mindfulness reduces the impact of worry on negative affect and emotion dysregulation in response to an emotionally evocative film, and whether thought suppression increases the impact of worry on negative affect and emotion dysregulation.

Methodologically, I first ran a pilot study and examined whether a mindfulness manipulation successfully manipulated the process of mindfulness in the context of an online study. Then, I examined the effects of regulation strategy on negative affect and emotion dysregulation, specifically examining whether a brief mindfulness manipulation decreases, and thought suppression increases, negative affect and emotion dysregulation, in comparison to a neutral-thinking control condition. Finally, I examined the interaction between the induction of worry and regulation strategy, examining whether the effect of worry on negative affect and emotion dysregulation is moderated by regulation strategy.

1.9 Hypotheses

1.9.1 Hypothesis 1

There would be a main effect of worry; those assigned to the worry group would report higher negative affect and higher emotion dysregulation in response to the film than a no-worry control group.

1.9.2 Hypothesis 2

There would be a main effect of regulation strategy. Those assigned to the mindfulness group would report lower negative affect and lower emotion dysregulation in response to the film than both a thought suppression group and a no-strategy control group. The thought suppression group would show the highest negative affect and emotion dysregulation among the three groups.

1.9.3 Hypothesis 3

There would be an interaction between worry and regulation strategy. The worry group was predicted to have higher negative affect and emotion dysregulation than the no-worry control group only for no-strategy control and thought suppression conditions, and not for the mindfulness condition. That is, it was predicted that the mindfulness manipulation would reduce the impact of worry on negative affect and emotion dysregulation, allowing those who worry to resemble those who did not worry before mindfulness.

2 METHOD

2.1 Participants

2.1.1 Recruitment

Potential participants for the pilot trial and those for the final experiment were recruited from the Amazon Mechanical Turk service, located at http://www.mturk.com. Mechanical Turk (MTurk) is a website, which allows users to complete various tasks, called Human Intelligence Tasks (HITs), for pay. Requesters can post HITs involving virtually any computer-based task, such as surveys, writing, keyword tagging, and audio transcription; workers are paid at the successful completion of each task. MTurk workers tend to be paid very little for their work (e.g., 5 to 10 cents for a 10-minute task), but preliminary analyses of worker motivation indicate that although most workers are motivated by pay, US workers complete the tasks primarily because they enjoy them (Buhrmester, Kwang, & Gosling, 2011).

MTurk workers produce high-quality data. Whether workers are asked to complete audio transcriptions (Marge, Banerjee, & Rudnicky, 2010), to rate the similarity of musical pieces (Urbano & Morato, 2010), or to complete language processing tasks (Snow, O'Connor, Jurafsky, & Ng, 2008), MTurk workers perform similarly to experts in completing computer-based tasks; high agreement between MTurk workers and experts was achieved in each of these studies. Internal consistencies and test-retest stability for surveys hosted on MTurk closely resemble those of traditional samples (Buhrmester et al., 2011). Experimental behavioral research using MTurk samples yields equivalent results to those gleaned from laboratory-based experiments (Horton, Rand, & Zeckhauser, 2011; S. Wang, Huang, Yao, & Chan, 2015). In addition, the low pay typically provided to MTurk workers does not reduce data quality (Buhrmester et al., 2011).

The present survey was be listed on Mechanical Turk using the following bylines: 1) *Pilot trial* - "Participate in a study on ways of thinking and how they affect emotion" or 2) *Final experiment:* "Do you worry a lot? Participate in a study for chronic worriers." Those who accept the HIT were first screened for inclusion and exclusion criteria; those who met criteria were enrolled in the study.

2.1.2 Inclusion and exclusion criteria

All participants met all inclusion and no exclusion criteria. Inclusion criteria for the pilot trial included 1) ages 18 through 65, and 2) English-speaking. Exclusion criteria included 1) an IP address outside of the United States of America (non-US IP addresses did not see the survey listed) and 2) unwillingness to engage in the procedures of the study, which were described in the consent process. Inclusion criteria for the final experiment included 1) ages 18 through 65, 2) English-speaking, and 3) receiving a score above the clinical cutoff of 5.7 on the GAD-Q-IV. Exclusion criteria included 1) an IP address outside of the United States of America (non-US IP addresses did not see the survey listed) and 2) unwillingness to engage in the procedures of the study, which were described in the consent process.

2.2 Measures

Participants in the pilot trial and the final experiment completed the following measures in addition to a demographic questionnaire, which was administered at the end of all study procedures (see Appendix A to view a copy of all study measures). Demographic information collected included age, gender, race, ethnicity, sexual orientation, and history of mindfulness practice. See Results section for descriptive statistics of participant demographic characteristics.

2.2.1 Generalized Anxiety Disorder Questionnaire-IV (GAD-Q-IV)

The GAD-Q-IV (Newman et al., 2002) is a 9-item screening measure assessing the presence of Generalized Anxiety Disorder. Analogue GAD may be identified using this measure. Items vary in their format. Some items are rated dichotomously (e.g., "Do you experience excessive worry?"), whereas other items are symptom counts (e.g., "Please place a check next to each symptom you have had more days than not"). Yet another set of items in the scale are Likert-based (e.g., "How much do worry and physical symptoms interfere with your life, work, social activities, family, etc?"), which are rated on an 8-point scale. A total score of 5.7 on the GAD-Q-IV correctly classified 88% of individuals with GAD diagnosed by clinical interview, with a sensitivity of 83% and specificity of 89% in an ROC analysis (Newman et al., 2002). The GAD-Q-IV correlated more strongly with a measure of worry than with measures of post-traumatic stress symptoms, panic disorder symptoms, depression, and social anxiety, demonstrating convergent and discriminant validity. The GAD-Q-IV also showed good test-retest stability, with 92% of cases classified remaining in their classification group (i.e., GAD versus no GAD) after a two-week waiting period, and with a Kappa agreement of 0.64 (Newman et al., 2002).

2.2.2 Penn State Worry Questionnaire (PSWQ).

The PSWQ (Meyer, Miller, Metzger, & Borkovec, 1990) is a 16-item, uni-factorial self-report measure of pathological worry. The PSWQ was initially derived from a factor analysis of 161 items related to worry; one factor arose with items that specifically reflected the frequency and intensity of worry and was chosen for the PSWQ (Molina & Borkovec, 1994). Each item is rated on a Likert scale from 1 ("Not at all typical") to 5 ("Very typical"), with five reverse-scored items; scores range from 16 to 80. The PSWQ has high internal consistency in clinical

and non-clinical populations, with alpha coefficients ranging from 0.88 to 0.95 (Borkovec, 1994; G. C. Davey, 1993; Molina & Borkovec, 1994; Stöber, 1998a; van Rijsoort, Emmelkamp, & Vervaeke, 1999). It also demonstrated good test-retest stability over 2-week and 10-week intervals (r = 0.74-0.92) (Meyer et al., 1990; Molina & Borkovec, 1994; Stöber, 1998a). The PSWQ successfully distinguishes GAD patients from those with social anxiety disorder (Fresco, Mennin, Heimberg, & Turk, 2003) and non-anxious controls (Behar, Alcaine, Zuellig, & Borkovec, 2003). In the present study, the PSWQ showed acceptable internal consistency in the pilot sample ($\alpha = 0.76$) and good internal consistency in the final experiment sample ($\alpha = 0.89$).

2.2.3 Difficulties in Emotion Regulation Scale (DERS)

The DERS (Gratz & Roemer, 2004) is a 36-item self-report measure of tendencies toward emotion dysregulation across multiple dimensions. This measure was developed specifically to assess difficulties with emotion regulation when distressed; thus, most items begin with "When I'm upset" before referring to an aspect of emotion dysregulation. Participants are asked to rate each item for how often it applies to them in general; items are rated from 1 ("almost never – 0-10%") to 5 ("almost always – 91-100%"). The six subscales of the DERS are as follows: 1) Nonacceptance (i.e., nonacceptance of emotional responses), 2) Goals (i.e., difficulties engaging in goal-directed behavior), 3) Impulse (i.e., impulse control difficulties), 4) Awareness (i.e., lack of emotional awareness), 5) Strategies (i.e., limited access to emotion regulation strategies), and 6) Clarity (i.e., lack of emotional clarity). Internal consistencies for all six subscales are good, ranging from $\alpha = 0.80$ to 0.89, and the total scale internal consistency is excellent ($\alpha = 0.93$) (Gratz & Roemer, 2004).

The subscales and total score of the DERS correlate as expected with another psychometrically sound measure of emotion (i.e., the Generalized Expectancy for Negative

Mood Regulation; Catanzaro & Mearns, 1990) and with deliberate self-harm and abuse perpetration behaviors (Gratz & Roemer, 2004). In the present study, the original DERS was administered before the two inductions, among other self-report measures, to assess dispositional emotion dysregulation. The DERS showed excellent internal consistency in both the pilot (α = 0.92) and final experiment samples (α = 0.95) of the present study.

2.2.4 State Difficulties in Emotion Regulation Scale (S-DERS).

The S-DERS (Lavender, Tull, Dilillo, Messman-moore, & Gratz, 2015) is a 21-item self-report measure of current experience of emotion dysregulation, with subscales of 1) Nonacceptance – lack of acceptance of current emotions, 2) Modulate – difficulty modulating current emotion and behavioral response, 3) Awareness – lack of awareness of current emotion, and 4) Clarity – lack of clarity regarding current emotions. The S-DERS has been validated in a laboratory setting following a stress induction; it correlated with a scale of emotional reactivity following the induction of a stressful stimulus, after controlling for trait emotion dysregulation (Lavender et al., 2015). It correlates positively with affect intensity, trait emotion dysregulation, and substance abuse, and the total scale has shown good internal consistency (α = 0.86) (Lavender et al., 2015). In the present study, the S-DERS showed excellent internal consistency in the pilot sample (α = 0.94) and acceptable internal consistency in the final experiment sample (α = 0.71).

2.2.5 Five Facet Mindfulness Questionnaire (FFMQ)

The FFMQ (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) is a 39-item self-report measure of five different aspects of mindfulness, including 1) observing, 2) describing, 3) acting with awareness, 4) nonjudging of internal experience, and 5) nonreactivity to internal experience. This measure was developed from a factor analysis of the items from widely-used mindfulness

measures. These measures were the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003), the Freiberg Mindfulness Questionnaire (FMI; Walach, Buchheld, Buttenmüller, Kleinknecht, & Schmidt, 2006), the Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Smith, & Allen, 2004), the Cognitive and Affective Mindfulness Scale (CAMS; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2006), and the Mindfulness Questionnaire (later renamed the Southampton Mindfulness Questionnaire; Chadwick et al., 2008).

Exploratory factor analyses revealed a five-factor solution for these items, which became the five subscales of the FFMQ. Each of the 39 items of the FFMQ is rated on a 5-point Likert scale from 1 (never or very rarely true) to 5 (very often or always true); items are summed to create five subscale scores and a total score of overall mindfulness. The FFMQ shows good internal consistency, with acceptable to excellent internal consistencies reported for the subscales (α = .75-.91; Baer et al., 2006). The FFMQ scales correlate as expected with a number of personality and mental health variables, including neuroticism, difficulties in emotion regulation, dissociation, and self-compassion, among others (Baer et al., 2006). Those with meditation experience tend to have higher scores across the five subscales than non-meditators (Baer et al., 2008), and FFMQ scores increase following mindfulness-based treatment (Carmody, Baer, L B Lykins, & Olendzki, 2009). In the present study, the FFMQ showed good internal consistency in the pilot sample (α = 0.83) and excellent internal consistency in the final experiment sample (α = 0.92).

2.2.6 Acceptance and Action Questionnaire – II (AAQ-II)

The AAQ-II (Bond, Hayes, & Baer, 2011) is a seven-item, unifactorial measure of experiential avoidance. Each item is rated on a Likert scale from 1 (never true) to 7 (always true), with higher scores indicating greater avoidance. The AAQ-II has shown good

psychometric properties, such as good test-retest reliability (3-month reliability: $r = 0.81$; 12-month reliability: $r = 0.79$), adequate to good internal consistency ($\alpha = 0.78$ to 0.88), and high correlations with the original version of the AAQ ($r = 0.97$; Bond et al., 2011). Convergent validity for the AAQ-II has also been established through strong correlations with the White Bear Suppression Inventory, another measure of avoidance, in multiple samples. In addition, as expected, the AAQ-II correlates with a wide array of measures of psychopathology, such as the Beck Depression Inventory and the Symptom Checklist – 90. Divergent validity is evidenced by low associations between the AAQ-II and demographic variables and no association between the AAQ-II and a measure of social desirability (Bond et al., 2011). In the present study, the AAQ-II showed excellent internal consistency in both the pilot ($\alpha = 0.95$) and final experiment samples ($\alpha = 0.92$).

2.2.7 Positive and Negative Affect Schedule – Negative Affect (PANAS-NA)

The PANAS (Watson, Clark, & Tellegen, 1988) is a widely used 20-item self-report measure of positive affect (PA) and negative affect (NA). Twenty emotions are listed (ten positive emotions and ten negative emotions), and each emotion is rated on a Likert scale from 1 (Very Slightly or Not at All) to 5 (Extremely). The ratings for each positive emotion are summed for the PA subscale, and the negative emotion ratings are summed for the NA subscale. Items can be answered with regard to current state emotion or with regard to the extent to which each emotion was felt over the past week; the former instructions were used in the present study. The PANAS has shown good psychometric properties, with good internal consistencies for both the PA ($\alpha = 0.89$) and the NA ($\alpha = 0.85$) subscales and strong model fit for a two-factor solution (Crawford & Henry, 2004). In addition, expected correlations have been shown between the PANAS and measures of anxiety and depression. PA correlates negatively, and NA correlates

positively, with depression, anxiety, and stress (as measured by the Depression Anxiety Stress Scales and the Hospital Anxiety and Depression Scales; Crawford & Henry, 2004). The present study utilized the NA subscale as a measure of state negative affect. In the present study, the NA subscale showed excellent internal consistency in both the pilot ($\alpha = 0.94$) and final experiment samples ($\alpha = 0.90$).

2.2.8 Toronto Mindfulness Scale (TMS)

The TMS (Lau et al., 2006) is a 13-item self-report measure of state mindfulness, administered in the present study as a manipulation check to ensure that the online mindfulness audio clip affected state mindfulness. The TMS correlates highly with other measures of mindfulness, and both the Curiosity ($\alpha = 0.89$) and the Decentering ($\alpha = 0.85$) subscales of the TMS have good internal consistency (Lau et al., 2006). Additionally, the TMS is sensitive to treatment effects; those undergoing mindfulness-based stress reduction have significantly higher scores on the TMS following treatment (Lau et al., 2006). In the present study, the TMS showed good internal consistency in the pilot sample ($\alpha = 0.88$) and excellent internal consistency in the final experiment sample ($\alpha = 0.90$).

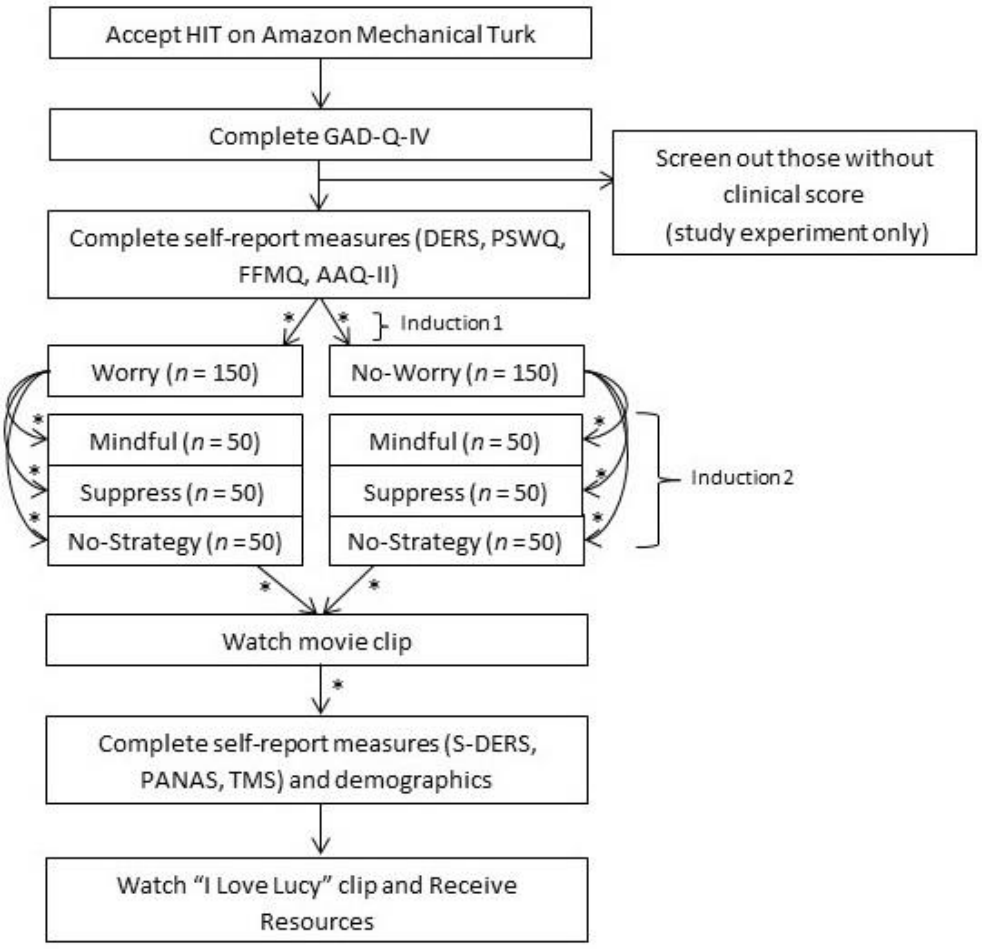
2.2.9 Worry Visual Analogue Scale (WVAS)

Participants created a WVAS, a scale of current worry state rated on a scale from 0 to 100. Consistent with McLaughlin, Mennin, and Farach (2007), participants were asked anchor the scale by generating a topic they are not worried about at all (anchor for a WVAS score of 0), a topic they are mildly worried about (anchor for a score of 25), a topic they are moderately worried about (anchor for a score of 50), a topic they are very worried about (anchor for a score of 75), and a topic they are currently the most worried about in their lives (anchor for a score of

100). They were asked to rate their current worry state at several times throughout the experimental procedure. The WVAS served as a manipulation check.

2.3 Procedure

The following description of the study procedure applies to both the pilot trial and the final experiment. The experimental procedure was identical for these samples. The pilot trial differed from the final experiment in only two ways: 1) 50 participants were recruited for the pilot, whereas 300 were recruited for the final experiment, and 2) pilot samples were not screened out based on scores on the GAD-Q-IV. All study procedures were conducted online through the Amazon Mechanical Turk and Qualtrics websites. The summary of study procedures for the pilot trial and final experiment is presented in Figure 1 and is described in the following section.



Note: asterisks indicate administration of the WVAS.

Figure 1. Summary of experimental procedure.

2.3.1 Experimental procedure

Individuals first reviewed basic information about the study before they clicked a button to "accept the HIT." They were then directed to a survey hosted on Qualtrics. The first page of this survey was a consent document; if they consented to the study, they were given the GAD-Q-IV. For those in the final experiment, but not for those in the pilot study, Qualtrics automatically scored the GAD-Q-IV and excluded participants who did not meet the clinical cutoff. For those in the pilot trial, all procedures continued regardless of scores on the GAD-Q-IV.

As only those with GAD showed increased emotion dysregulation following a worry period in a previous study (McLaughlin et al., 2007), the final experiment included only individuals who met the criteria of analogue GAD. "Analogue GAD" is a widely used term referring to the samples of individuals whose scores on a standardized self-report measure indicate high likelihood of the presence of clinical GAD. This term is commonly used in the experimental literature in GAD (e.g., Farach, Mennin, Smith, & Mandelbaum, 2008; Salters-Pedneault et al., 2006).

Following consent and completion of the GAD-Q-IV, participants were asked to *anchor* their WVAS (see description of this measure). The WVAS served as a manipulation check throughout study procedures. Participants then completed other relevant self-report measures, including the DERS, PSWQ, FFMQ, and the AAQ-II. Just prior to randomization, all participants rated their current WVAS. Participants were then randomized to either worry for five minutes, or think about a neutral topic (i.e., no-worry control) for five minutes (Induction 1). Block randomization automized through Qualtrics was utilized to ensure that the groups were equivalent in size. Consistent with McLaughlin et al. (2007), those in the worry condition wrote three topics they are the most worried about, and then they listened to an audio file which instructed them to worry about these topics for the next five minutes. Those in the no-worry condition first wrote three things they did last weekend, and then they listened to an audio file instructing them to think about these topics for the next five minutes. Participants were not permitted to move on to the next part of the survey without listening to the entire five-minute audio file, although they were permitted to drop out of the survey at any time. At the end of the audio file, they were told that they can move on to the next part of the survey. See Appendix B for the scripts that will be delivered to participants in these two conditions, which are nearly

identical to the scripts from McLaughlin et al. (2007), with language changed to reflect the online nature of this study.

Before the next induction, participants were asked to rate their WVAS as a manipulation check, and they were asked, "To what extent did you think about your assigned topics for the last five minutes?" with the option to provide a percentage score as an adherence check. Then, participants were randomized to one of three regulation strategy groups: mindfulness, thought suppression, and no-strategy control (Induction 2). The mindfulness group listened to a five-minute mindfulness exercise involving instructions to notice breathing and encouraging nonjudgmental awareness of any thoughts or emotions that arise in the process of breathing. The script for this mindfulness exercise is based on the sitting meditation described by Kabat-Zinn (1990), which has been used in previous research examining the influence of mindfulness on emotion regulation (Arch & Craske, 2006; Feldman et al., 2010). The thought suppression group was instructed to list three topics that they would rather not think about, and then were asked to spend the next five minutes trying not to think about these topics. The script for the thought suppression condition was adapted from Marcks and Woods (2005). The no-strategy control group was asked to first list the last three movies they watched, and then to spend the next five minutes thinking about these movies. See Appendix C for the mindfulness, thought suppression, and no-strategy control scripts.

Following the second induction phase, participants rated their WVAS. Then, all participants watched a 3-minute video clip from the 1931 film *The Champ*, in which the title character dies with his friends and inconsolable son watching. This clip is part of a standardized set of stimuli used to induce emotion in laboratory settings; it reliably elicits self-reported

sadness without eliciting other emotions (Gross & Levenson, 1995). This clip has previously been used to elicit sadness in participants with GAD (McLaughlin et al., 2007).

Last, after viewing the film clip, participants rated their WVAS. Then they will complete the PANAS, to assess emotional reactions to the film clip; the DERS state version, to assess current emotion dysregulation; and the TMS, to assess state mindfulness as a manipulation check. Participants provided demographic information following the completion of all self-report measures. Finally, as an adherence check to Induction 2, they were given descriptions of the mindfulness, thought suppression, and control condition scripts, and they were asked to choose which of these describes what they did just before they watched the video clip. Then, after being told that they would still be paid if they did not follow instructions, they were asked, "To what extent did you follow the instructions you listened to before watching the video clip?" with the option to provide a percentage score. These adherence checks were given at the end of the survey to prevent participant exposure to alternate conditions.

Following the experimental procedure, all participants then viewed a video clip from *I Love Lucy* (i.e., the "Job Switching" scene) which was previously used to induce happiness in experimental research (L. Wang, LaBar, & McCarthy, 2006). This was to counteract the emotional effects of viewing the sad film clip. Participants were then provided a list of resources to access mental health treatment.

2.3.2 Validity checks

Online data collection methods may activate the online disinhibition effect among participants (Suler, 2004). Online disinhibition can be a boon to data collection of personal, sensitive information, such as mental health symptoms and problematic behaviors; participants are more likely to disclose such information honestly when they are anonymously entering data

into a computer (e.g., Lessler, Caspar, Penne, & Barker, 2000; Turner, 1998). However, such anonymity also may decrease prosocial behavior (e.g., Burnham, 2003; Haley & Fessler, 2005). Thus, it is possible that participants are more likely to act in self-interest in this online format, showing behaviors such as non-compliance with induction procedures or quickly completing questionnaires without careful review. To reduce this possibility, the present procedure also included a number of validity checks.

First, the entire experimental procedure was estimated to take close to 45 minutes when questionnaires were completed with relative speed and accuracy. Qualtrics collected data regarding the time to completion for each survey; those spending less than 25 minutes or more than 90 minutes were excluded from data analysis. Second, to ensure that participants read every item in the questionnaires, one validity item was added to each measure; these items asked participants to rate the item at a particular value (e.g., "Please respond 'sometimes true' to this item'"). Participants with more than one error on these validity items were excluded from data analysis.

2.4 Data Analytic Plan

2.4.1 Analysis of covariance

First, the assumptions of ANCOVA were tested. Specifically, assumptions of normality and homogeneity of variance were assessed by examining normal Q-Q plots and histograms for both dependent variables (i.e., S-DERS and PANAS-NA). ANCOVA's additional assumptions – 1) linearity of relationships between covariates and dependent variables, and 2) homogeneity of regression slopes of covariates on dependent variables will also be tested. Then, two 2x3 factorial ANCOVAs were conducted to determine the effects of the two inductions – Induction 1) worry versus control and Induction 2) mindfulness versus thought suppression versus control

– on emotionality (PANAS) and emotion dysregulation (S-DERS) following the film clip, controlling for differences in pre-induction measures (i.e., PSWQ, FFMQ, DERS, and AAQ-II). A Bonferroni correction sets alpha at 0.025. Main effects and interactions between Induction 1 and Induction 2 will be reported for both dependent variables.

2.4.2 Sample size estimation

A power analysis for these tests was conducted using G*Power 3 (see Faul, Erdfelder, Lang, & Buchner, 2007). Although large effects have been found for the impact of worry on these dependent variables previously (McLaughlin et al., 2007), the effect of mindfulness following a worry induction on these variables is unknown; therefore, a medium effect size was predicted, $f = 0.25$. Power $(1 - \beta)$ was set at 0.80, and Bonferroni-corrected $\alpha = .025$. When set to detect interaction effects, the recommended total sample size with these parameters was 188 (n = 31.3 per cell); a sample size of 188 detects main effects at 88% and 80% power for Inductions 1 and 2, respectively. Because approximately 20% of cases are expected to be lost to attrition, and the extensive validity checks for MTurk data may exclude an unknown number of cases, the sample size for the present study was set conservatively at 300.

3 RESULTS

3.1 Pilot Trial

Before completing the final experiment, a pilot trial was conducted with 50 participants to examine whether the present mindfulness condition in fact had greater effects on mindfulness relative to the comparison conditions in an online sample. As noted above, pilot participants received an identical experimental procedure to those in the final study, except that they were not excluded based on the clinical cutoff on the GAD-Q-IV.

3.1.1 Demographics and Descriptive Statistics

The pilot group was mostly female (54.0%, *n* = 27), with 46.0% (*n* = 23) identifying as male. Participants ranged in age from 20 to 65, with an average age of 35.34 (*SD* = 11.23). With regard to race and ethnicity, 84.0% (*n* = 42) of participants identified as White or European American, 4.0% (*n* = 2) identified as Black or African American, 4.0% (*n* = 2) identified as Asian or Pacific Islander, 4.0% (*n* = 2) identified as biracial or multiracial, 2.0% (*n* = 1) identified as Hispanic or Latino/a, and 2.0% (*n* = 1) identified as Native American. Most participants identified their sexual orientation as heterosexual (94.0%, *n* = 47), with 4.0% (*n* = 2) identifying as bisexual, and 2.0% (*n* = 1) identifying as "Other: asexual." The majority of pilot participants reported current full-time employment (60.0%, *n* = 30), with 20.0% (*n* = 10) reporting part-time employment and 20.0% (*n* = 10) reporting no current employment. With regard to marital status, 42.0% (*n* = 21) reported that they were single, 34.0% (*n* = 17) reported that they were married, 14.0% (*n* = 7) reported that they were currently cohabitating with a partner, and 10.0% (*n* = 5) reported that they were divorced. With regard to educational level, 34.0% (*n* = 17) reported that they had attended some college but not obtained a degree, 34.0% (*n* = 17) reported that they had obtained a 4-year college degree, 12.0% (*n* = 6) reported that they

had obtained a high school diploma, 10.0% (n = 5) reported that they had obtained a vocational or technical degree, 4.0% (n = 2) reported that they had obtained a master's degree, 4.0% (n = 2) reported that they had obtained a doctoral degree, and 2.0% (n = 1) reported that they had obtained a professional degree such as a JD or MD. Finally, 36% of participants reported that they had previously practiced mindfulness "a few times" (n = 18), followed by 28.0% (n = 14) reporting no history of previous mindfulness practice, 16.0% (n = 8) reporting that they had practiced mindfulness "just once", and 20.0% (n = 10) reporting that they had practiced mindfulness "many times".

With regard to scores on the GAD-Q-IV, 74.0% (n = 37) of pilot participants met the clinical cutoff above 5.7. Scores on the GAD-Q-IV ranged from 0.00 to 15.73, with an average rating of 8.81 (SD = 4.33). Self-report measures generally correlated as expected (see Table 1). However, the TMS (post-experiment state mindfulness) did not correlate as expected with any measure. Specifically, state mindfulness did not correlate with self-report worry severity (PSWQ; r = .25, p > .05), trait emotion dysregulation (DERS; r = .24, p > .05), trait mindfulness (FFMQ; r = -.08, p > .05) or post-experiment negative affect (PANAS-NA; r = .26, p > .05). It correlated positively, and unexpectedly, with experiential avoidance (AAQ-II; r = .33, p < .05) and with state post-experiment emotion dysregulation (S-DERS; r = .34, p < .05).

3.1.2 Manipulation Checks

With randomization programming set to distribute participants equally across conditions, 8 participants were assigned to worry/mindfulness, 10 were assigned to worry/thought suppression, 9 were assigned to worry/no-strategy, 5 were assigned to no-worry/mindfulness, 8 were assigned to no-worry/thought suppression, and 10 were assigned to no-worry/no-strategy. WVAS ratings before and after the worry condition were compared to detect if the worry

condition was a successful manipulation in the pilot sample. Specifically, change scores on the WVAS before and after Induction 1 (i.e., the induction of worry or a no-worry control condition) were computed, and then the two groups (i.e., worry versus no-worry) were compared in an independent samples t-test. The worry condition WVAS scores increased significantly more (M = 20.07, SD = 22.15) than the no-worry condition WVAS scores, which decreased on average after Induction 1 (M = -12.09, SD = 18.98), t (48) = 5.46, $p < .001$. This indicates that those in the worry condition increased more in state worry than those in the no-worry condition, as expected.

Scores on the TMS were compared for participants who were and were not in the mindfulness condition during Induction 2 (i.e., the induction of regulation strategies including mindfulness, thought suppression, and no-strategy control). Given the small sample size of the pilot group, the six experimental groups were collapsed into two groups for comparisons; those who received mindfulness, and those who did not. Participants undergoing mindfulness as an induction reported significantly higher subsequent state mindfulness than those in other conditions by an average 8.21 points, $t(48) = 2.99$, $p < .01$. Thus, the mindfulness condition appeared to successfully manipulate state mindfulness in the pilot sample (see Table 2 for means and standard deviations of mindfulness across the six study conditions in the pilot sample).

Finally, WVAS ratings before and after the sad video were compared for all pilot participants with a paired-samples t-test to detect increased distress following the manipulation. As expected, participants reported significantly higher WVAS ratings following the sad video, indicating increased distress, by an average of 10.12 points, t (49) = 3.27, $p <.01$.

Overall, all manipulations operated as expected in the pilot sample. Thus, the final experiment sample used an identical procedure to evaluate study hypotheses.

3.2 Final Experiment

Five hundred and sixty-eight mTurk workers took the screening GAD-Q-IV at the beginning of the study survey; 300 participants received scores above the clinical cutoff of 5.7 and were enrolled in the main experimental study. All enrolled participants completed the survey in its entirety.

3.2.1 Data Cleaning and Validity Checks

Validity checks were performed to exclude participants with potentially invalid data. First, participants were excluded from the analyses if they presented with more than one error on the six validity items administered in the questionnaires; errors indicate participants were not reading every item in the self-report measures. Multiple errors on validity items excluded 19 participants. Second, participants were excluded from the analysis if they incorrectly identified what condition they received in Induction 2, indicating that they did not pay attention during this task; this excluded 31 participants. Third, they were excluded if they reported less than 75% compliance with Inductions 1 or 2; this excluded an additional 38 participants. Finally, participants were excluded if they spent less than 25 minutes or more than 90 minutes on the survey. This excluded 12 and 3 participants, respectively, excluding a total of 15 participants for survey timing reasons. In total, these validity checks excluded 103 participants, leaving a final sample of 197 participants for data analysis. See Figure 2 for a visualization of participant exclusion.

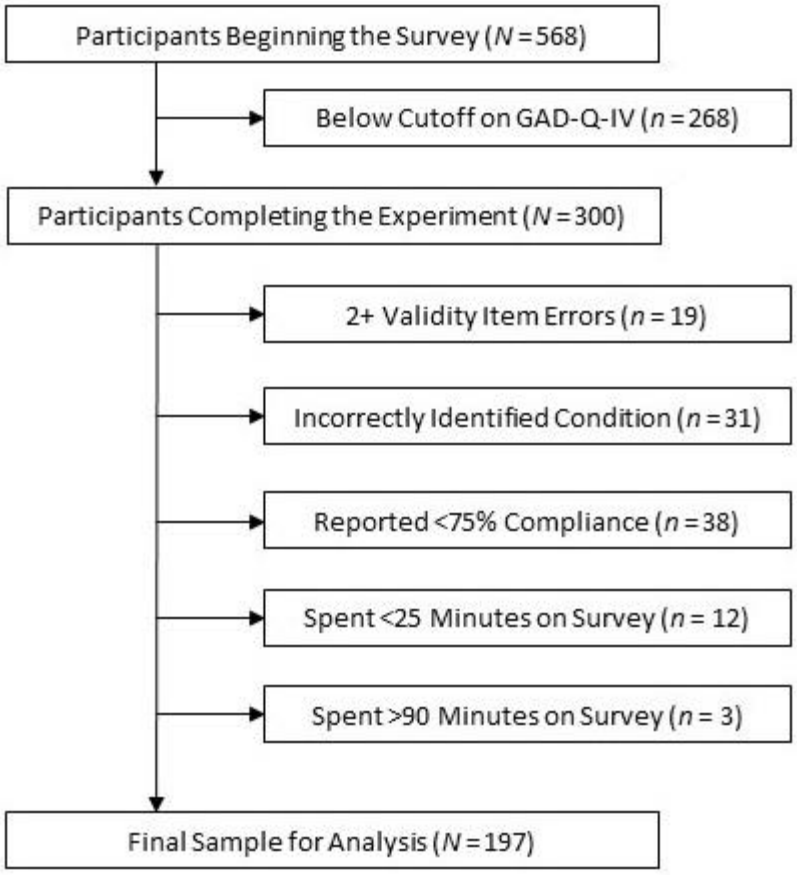


Figure 2. Exclusion of participants.

No additional data cleaning procedures were necessary. All participants provided complete data with no missing items.

3.2.2 Demographics and Descriptive Statistics

The final sample mostly self-identified as female (63.5%, *n* = 125), with 36.0% (*n* = 71) identifying as male and 0.5% (*n* = 1) identifying as "Other: bigender." Participants ranged in age from 19 to 76, with an average age of 36.6 (*SD* = 13.0). With regard to race and ethnicity, 71.1% (*n* = 140) of participants identified as White or European American, 11.2% (*n* = 22) identified as Black or African American, 6.6% (*n* = 13) identified as Hispanic or Latino/a, 5.0% (*n* = 10) identified as Asian or Pacific Islander, 2.5% (*n* = 5) identified as biracial or multiracial, 1.5% (*n*

= 3) identified as Native American, 1.0% (*n* = 2) identified as Indian, 0.5% (*n* = 1) identified as Middle Eastern, and 0.5% (*n* = 1) identified as "Other: Central Asian." Most participants identified their sexual orientation as heterosexual (86.3%, *n* = 170), with 7.6% (*n* = 15) identifying as bisexual, 3.6% (*n* = 7) identifying as lesbian, 1.5% (*n* = 3) identifying as gay, and 1.0% (*n* = 2) identifying as "Other: asexual."

Most participants reported current full-time employment (54.8%, *n* = 108), with 21.8% (*n* = 43) reporting part-time employment and 23.4% (*n* = 46) reporting no current employment. With regard to marital status, 37.1% (*n* = 73) reported that they were married, 35.5% (*n* = 70) reported that they were single, 12.7% (*n* = 25) reported that they were currently cohabitating with a partner, 9.6% (*n* = 19) reported that they were divorced, 3.0% (*n* = 6) reported that they were currently separated from a partner, and 2.0% (*n* = 4) reported that they were widowed. Most participants reported that they had attended some college but not obtained a degree (38.1%, *n* = 75), with remaining participants reporting that they had obtained a 4-year college degree (34.0%, *n* = 67), a master's degree (10.7%, *n* = 21), a high school diploma (10.2%, *n* = 20), a vocational or technical degree (5.6%, *n* = 11), a doctoral degree (0.5%, *n* = 1), a professional degree such as a JD or MD (0.5%, *n* = 1), or did not complete high school (0.5%, *n* = 1). Finally, most participants reported no history of previous mindfulness practice (40.1%, *n* = 79), with remaining participants reporting that they had practiced mindfulness "just once" (14.7%, *n* = 29), "a few times" (34.0%, *n* = 67), or "many times" (11.2%, *n* = 22). Of the participants who reported a history of mindfulness practice, 20 participants (10.2% of total sample) reported that they currently had an ongoing, regular (i.e., at least weekly) mindfulness practice.

With regard to scores on the GAD-Q-IV, all participants enrolled met the clinical cutoff above 5.7. Scores on the GAD-Q-IV ranged from 6.24 to 16.98, with an average rating of 13.75

(*SD* = 2.36). Differences in compliance with study instructions across the six conditions were compared using a one-way ANOVA; there was no significant difference in compliance with instructions across study conditions (F (5, 191) = 1.84, $p > .05$). See Table 3. Self-report measures generally correlated as expected (see Table 4). However, the TMS (post-experiment state mindfulness) did not correlate as expected with some measures. Specifically, state mindfulness did not correlate with self-report worry severity (PSWQ; $r = .04$, $p > .05$), experiential avoidance (AAQ-II; $r = .132$, $p > .05$), trait emotion dysregulation (DERS; $r = .01$, $p > .05$), or post-experiment negative affect (PANAS-NA; $r = -.02$, $p > .05$). It correlated positively, and unexpectedly, with state post-experiment emotion dysregulation (S-DERS; $r = .16$, $p < .05$). State mindfulness correlated as expected with only trait mindfulness (FFMQ; $r = .15$, $p < .05$). There were no differences across the six conditions in the covariates when examined in a series of one-way ANOVAs; there was no difference in trait worry (F (5, 191) = .57, $p > .05$), trait mindfulness (F (5, 191) = .67, $p > .05$), experiential avoidance (F (5, 191) = 1.08, $p > .05$), or trait emotion dysregulation (F (5, 191) = .989, $p > .05$) across the six conditions.

3.2.3 Assumption Checks

3.2.3.1 Normality of dependent variables

ANCOVA assumes that dependent variables are normally distributed; the S-DERS and PANAS-NA were both examined for skewness and kurtosis using normal Q-Q plots and histograms. Visual inspection indicated that both variables deviated from normality on normal Q-Q plots, and histograms of these variables indicated that both variables had acceptable kurtosis but were positively skewed. The S-DERS showed a skewness of .922 (*SE* = .173) and the PANAS-NA showed a skewness of .948 (*SE* = .173), both of which are outside the range of

acceptable normality. Specifically, dividing the skewness statistic by the standard error should yield a result less than +/-1.96, indicating 95% confidence that the skewness is not significantly different than zero. Both variables were far outside this range (S-DERS = 5.32; PANAS-NA = 5.48). Thus, both dependent variables were transformed using a negative reciprocal transformation (-1/x), which was used to preserve directionality of effects, multiplied by 1000 for ease of reporting. This transformation yielded acceptable skewness for both dependent variables (S-DERS skewness = .138, *SE* = .173; PANAS-NA skewness = -.299, *SE* = .173). Both variables were within the range of acceptable skewness after this transformation (S-DERS = 0.79; PANAS-NA = -1.72) with normal Q-Q plots and histograms resembling a normal distribution.

3.2.3.2 Homogeneity of variance

ANCOVA also assumes homogeneity of variance in dependent variables across groups. Levene's test was not significant for the S-DERS (F (5, 191) = .43, p = .83) nor the PANAS-NA (F (5, 191) = 1.09, p = .37), indicating acceptable homogeneity of variance for both dependent variables.

3.2.3.3 Linearity of relationships

Scatterplots for the relationships between each covariate and each dependent variable were examined for linearity. Specifically, Loess lines were examined for curvature and compared to linear lines superimposed over scatterplots. There was no evidence for polynomial relationships between covariates and dependent variables; all relationships appeared linear.

3.2.3.4 Homogeneity of regression slopes

ANCOVA assumes that all covariates have similar regression slopes on dependent variables across levels of the independent variables. Homogeneity of regression slopes was tested by testing interactions between each independent variable (i.e., conditions for inductions 1 and 2) and the covariate in preliminary ANCOVAs. In the first ANCOVA on the emotion dysregulation dependent variable, there was one significant interaction between Induction 2 and the PSWQ covariate (F (2, 187) = 5.50, p <.01), indicating that the relationship between worry severity and state emotion dysregulation was significantly different across levels of Induction 2. Thus, the PSWQ could not be used as a covariate in the ANCOVA on state emotion dysregulation. There were no other significant interactions on state emotion dysregulation. There were no significant interactions between covariates and independent variables in the second ANCOVA with state negative affect as the dependent variable, indicating that all covariates can be included in that analysis.

3.2.4 Manipulation Checks

3.2.4.1 Worry Condition Manipulation

WVAS ratings before and after Induction 1 were compared to detect if the worry condition was a successful manipulation. Specifically, change scores on the WVAS before and after Induction 1 were computed, and then the two groups (i.e., worry versus no-worry) were compared in an independent samples t-test. The worry condition WVAS scores increased significantly more (M = 12.3, SD = 20.3) than the no-worry condition WVAS scores, which decreased on average after Induction 1 (M = -8.96, SD = 17.0), t (195) = 7.98, p < .001. This indicates that those in the worry condition increased more in state worry than those in the no-worry condition, as expected.

3.2.4.2 Mindfulness Condition Manipulation

TMS scores were compared with an independent samples t-test for those who were and who were not in the mindfulness condition for Induction 2. Contrary to expectations, those in the mindfulness condition did not report higher state mindfulness than those in the other conditions, t (195) = .538, $p > .05$. Neither the Curiosity (t (195) = .512, $p > .05$) nor the Decentering (t (195) = .715, $p > .05$) subscales were significantly different for those in the mindfulness condition. This indicates that the mindfulness condition did not successfully manipulate state mindfulness in the final experiment, despite successfully manipulating it in the pilot study (see Table 5 for means and standard deviations of mindfulness across the six study conditions).

3.2.4.3 Sadness Manipulation

WVAS ratings before and after the sad video were compared for all participants with a paired-samples t-test to detect increased distress following the manipulation. As expected, participants reported significantly higher WVAS ratings following the sad video, indicating increased distress, by an average of 9.66 points, t (196) = 5.86, $p < .001$.

3.2.5 Analysis of Covariance

The first 2 X 3 factorial ANCOVA was run to determine the main effects of worry (versus the no-worry control condition; Induction 1) and regulation strategy (mindfulness versus thought suppression versus no-strategy control; Induction 2) and their interaction on state emotion dysregulation, controlling for trait mindfulness, trait emotion dysregulation, and experiential avoidance (see Figure 3). Contrary to hypotheses, there was no main effect of worry induction (F (1, 188) = .183, p = .67, $_{\text{partial}}\eta^2$ = .004), no main effect of regulation strategy (F (2, 188) = .699, p = .50, $_{\text{partial}}\eta^2$ = .007), and no interaction (F (2, 188) = 2.14, p = .12, $_{\text{partial}}\eta^2$ = .022) in this analysis, indicating no experimental effect on state emotion dysregulation (see Table 6for

descriptive statistics of state emotion dysregulation across groups and Table 7 for a summary of ANCOVA results).

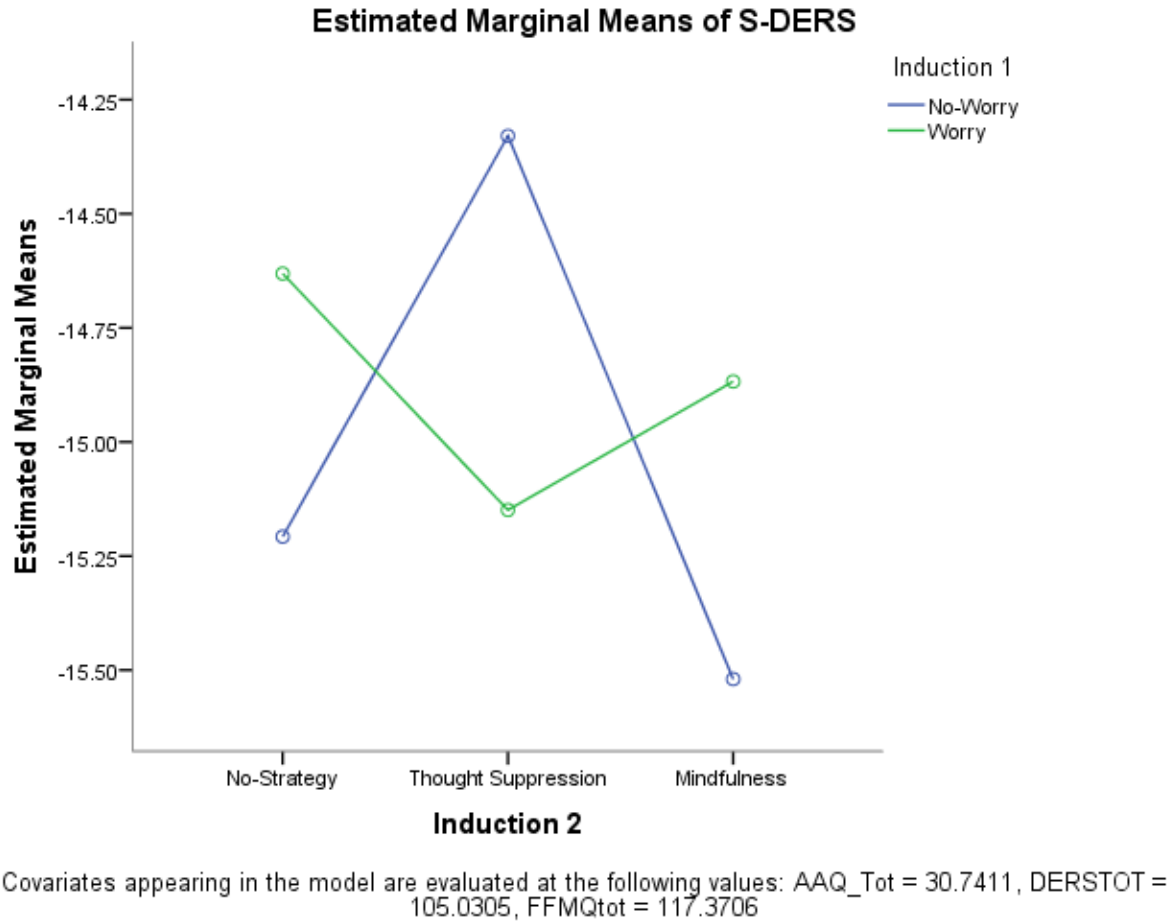


Figure 3. Effect of experimental procedure on state emotion dysregulation

The second 2X3 factorial ANCOVA was run to determine the main effects of worry (versus no-worry control; Induction 1) and regulation strategy (mindfulness versus thought suppression versus no-strategy control; Induction 2) and their interaction on state negative affect, controlling for worry severity, trait mindfulness, trait emotion dysregulation, and experiential avoidance. With Bonferroni-corrected alpha set at 0.025, contrary to hypotheses, there was no main effect of worry induction (F (1, 187) = .718, p = .42, $_{\text{partial}}\eta^2$ = .004), no main effect of

regulation strategy (F (2, 187) = 3.12, p = .046, $_{partial}\eta^2$ = .032), and no interaction (F (2, 187) = 1.38, p = .26, $_{partial}\eta^2$ = .015).

Given that an uncorrected alpha level of 0.05 would have found the main effect of regulation strategy (i.e., Induction 2) significant, the contrasts between conditions in their effect on negative affect were explored. There was no significant difference in negative affect between the no-strategy control and thought suppression conditions (M difference = -2.62, 95% CI = -4.21 to 9.54, SE = 3.46, p = .450), and there was no significant difference between the no-strategy control and mindfulness conditions (M difference = 5.48, 95% CI = -.857 to 11.82, SE = 3.21, p = .09). However, there was a significant difference between the thought suppression and mindfulness conditions (see Figure 4). More specifically, those in the mindfulness condition showed significantly lower negative affect in response to the film clip than those in the thought suppression condition (M difference = 8.11, 95% CI = 1.44 to 14.77, SE = 3.38, p = .017). Table 8 presents means and standard deviations across experimental groups on the PANAS-NA, and Table 9 shows a summary of ANCOVA results.

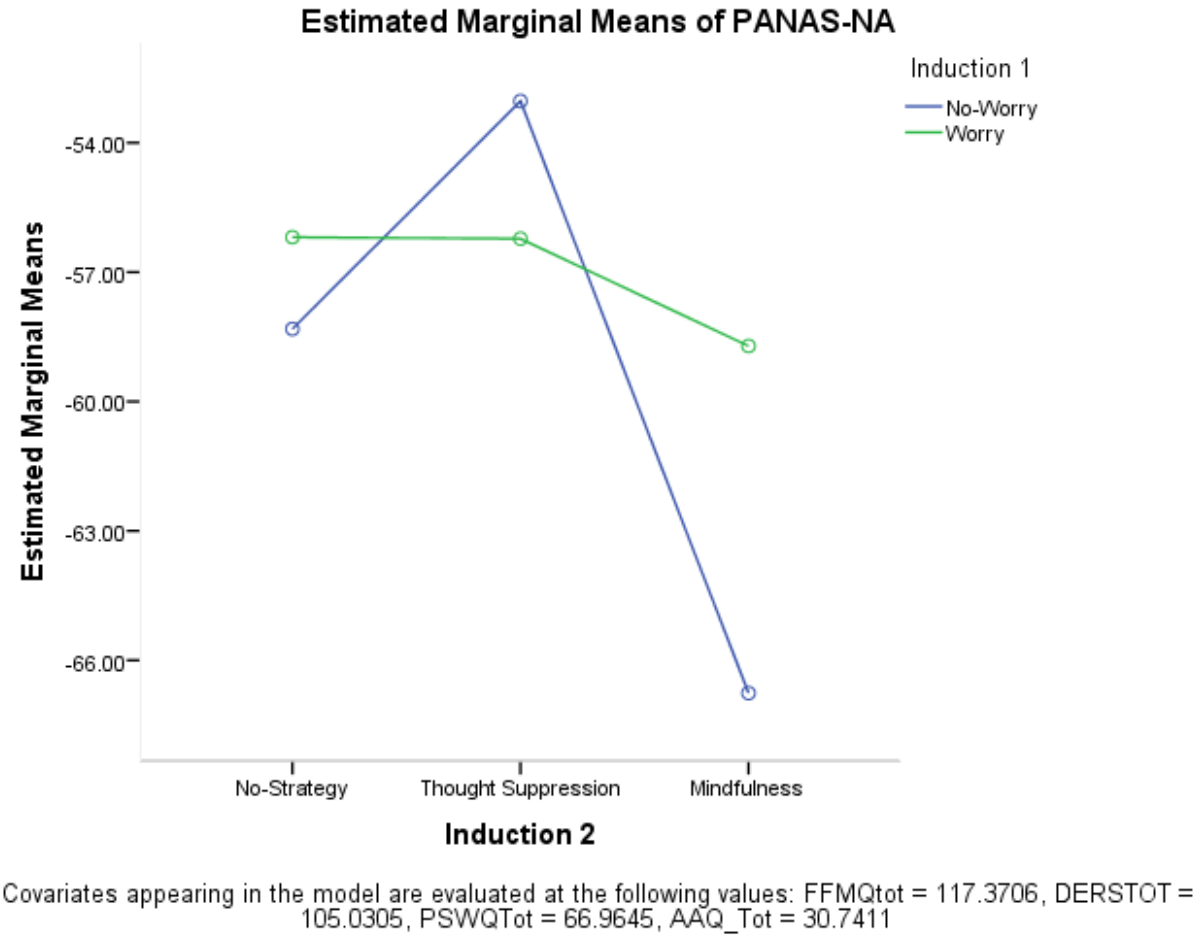


Figure 4. Effect of experimental procedure on negative affect

3.2.6 Exploratory Analysis

Although the negative affect subscale of the PANAS was a primary dependent variable of the final experiment, the entire PANAS was administered, including the positive affect (PANAS-PA) subscale. Positive affect has received relatively less attention than negative affect both in the literature on GAD and the mindfulness literature. However, a recent longitudinal study suggests that low levels of positive affect predict GAD over time (Kendall et al., 2015), and people with GAD tend to dampen positive emotion (Eisner, Johnson, & Carver, 2009) and report high rates of fear of positive emotional experience (Roemer, Salters, Raffa, & Orsillo, 2005; Turk et al.,

2005). Some extant literature suggests that mindfulness may increase positive emotional experience. A brief experimental induction of mindfulness has increased self-reported optimism and improved classification of positive stimuli (Kiken & Shook, 2011); experimental induction of mindfulness also increases food enjoyment (Arch et al., 2016). Those undergoing mindfulness meditation training also reported higher rates of daily positive emotional experience collected through experience sampling. (Geschwind, Peeters, Drukker, Van Os, & Wichers, 2011).Thus, an exploratory analysis was conducted to examine the effects of the experiment on positive affect. First, assumptions of ANCOVA were tested for the additional dependent variable.

3.2.6.1 Normality of dependent variables

The PANAS-PA was first examined for skewness and kurtosis using a normal Q-Q plot and histogram. Visual inspection indicated that the PANAS-PA did not deviate from normality on the normal Q-Q plot, and a histogram of this variable indicated acceptable skewness and kurtosis, with data conforming closely to a normal curve. Moreover, skewness was .304 (*SE* = .173); the skewness statistic divided by standard error was 1.74, within the acceptable range of +/- 1.96.

3.2.6.2 Homogeneity of variance

Levene's test was not significant for the PANAS-PA (F (5, 191) = 2.02, p = .08). This finding indicated acceptable homogeneity of variance in this subscale.

3.2.6.3 Linearity of relationships

Scatterplots for the relationships between each covariate and the PANAS-PA were examined for linearity. Specifically, Loess lines were examined for curvature and compared to linear lines superimposed over scatterplots. Two relationships appeared polynomial in nature.

Specifically, the relationships between experiential avoidance (AAQ-II) and positive affect, as well as trait emotion dysregulation (DERS) and positive affect, appeared curvilinear in nature, and a quadratic curve superimposed over the scatterplots fit the Loess lines better than the linear relationships for both variables. Thus, product terms of the AAQ-II and the DERS were included in the ANCOVA analysis as additional covariates. There was no evidence for polynomial relationships between the other covariates (i.e., FFMQ and PSWQ) and positive affect; these relationships appeared linear.

3.2.6.4 Homogeneity of regression slopes

Homogeneity of regression slopes was tested by testing interactions between each independent variable (i.e., conditions for inductions 1 and 2) and the covariate on positive affect in a preliminary ANCOVA. There were no significant interactions between covariates and independent variables, indicating that all covariates can be included in the analysis.

3.2.6.5 Analysis of covariance

This exploratory 2 X 3 factorial ANCOVA was run to determine the main effects of worry induction (worry versus no-worry control; Induction 1) and regulation strategy (mindfulness versus thought suppression versus no-strategy control; Induction 2) and their interaction on positive affect, controlling for trait mindfulness, trait emotion dysregulation, and experiential avoidance. For this analysis, alpha was set at 0.05 in order to detect exploratory effects in a relatively unknown research area. As shown in Table 11, there was no main effect of worry (F (1, 185) = 1.34, p = .25, $_{\text{partial}}\eta^2$ = .007), no main effect of regulation strategy (F (2, 185) = .22, p = .80, $_{\text{partial}}\eta^2$ = .002), but there was a significant interaction (F (2, 185) = 3.53, p = .03, $_{\text{partial}}\eta^2$ = .037). Although these results would not have been significant with a Bonferroni correction, which would have set alpha at 0.017, they were significant with the exploratory alpha

of 0.05. As Table 12 shows, post hoc pairwise comparisons demonstrated that there was a significant difference between thought suppression and mindfulness in the worry group (i.e., those who were instructed to worry in induction 1), such that those who had been worrying reported more positive affect after a mindfulness exercise than they did after thought suppression (*M* difference = 4.19, *SE* = 1.98, *p* = .035, 95% CI = .296 to 8.09). There were no other significant pairwise comparisons. However, those completing a mindfulness exercise were marginally better than those assigned to the no-strategy condition for the worry group (*M* difference = 3.46, *SE* = 1.93, *p* = .075, 95% CI = -.353 to 7.27), and those completing a thought suppression task were marginally worse for the worry group than the no-worry group (*M* difference = -3.79, *SE* = 2.11, *p* = .074, 95% CI = -7.95 to .376). See Table 10 for descriptive statistics of positive affect across experimental groups. See Table 11 for a summary of ANCOVA results. See Table 12 for all pairwise comparisons probing interaction effects. A visualization of these ANCOVA results is presented in Figure 5

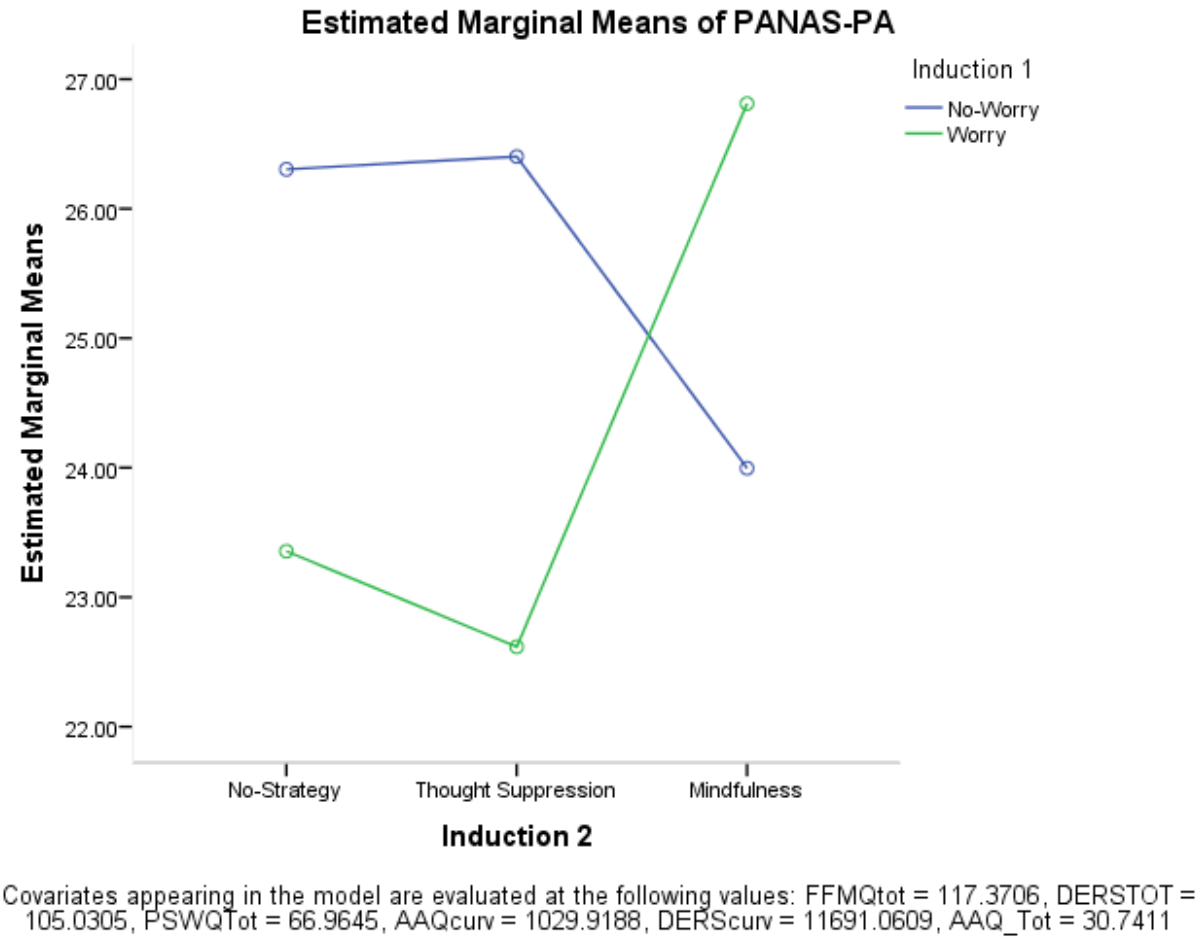


Figure 5. Effect of experimental procedure on positive affect

4 DISCUSSION

The purpose of the present study was to evaluate whether a brief mindfulness manipulation reduces the impact of worry on negative affect and emotion dysregulation in response to an emotionally evocative film, and whether a brief thought suppression period increases the impact of worry on negative affect and emotion dysregulation. Specifically, hypotheses were that 1) those in the worry group, relative to those in a no-worry control condition (i.e., Induction 1), would have higher overall negative affect and emotion dysregulation in response to a sad film; 2) those in the mindfulness group, relative to the no-strategy control group (Induction 2) would respond with lower negative affect and emotion

dysregulation, and those in the thought suppression group, relative to the no-strategy control group (Induction 2) would show higher negative affect and emotion dysregulation than the no-strategy control; and 3) those in the worry condition would experience higher negative affect and emotion dysregulation in response to a sad film clip than those in the no-worry control condition, only if they were in the thought suppression or no-strategy control groups in Induction 2. That is, it was predicted that the worry condition and no-worry control condition groups (Induction 1) would not differ in key outcome variables if they experienced mindfulness in Induction 2, but the worry group would be higher in other Induction 2 conditions.

4.1 Summary of Results

The hypotheses of the present study were not supported. Using a Bonferroni-corrected alpha estimate, there were no main effects and no interactions between the effects of worry or regulation strategy conditions on negative affect and emotion dysregulation in response to the sad film clip. Using a less conservative alpha estimate (i.e., $p < .05$), one significant effect emerged from the planned analyses. There was a significant main effect of Induction 2 (mindfulness versus thought suppression versus no-strategy control) on negative affect following the sad film. Post-hoc comparisons indicated that those in the mindfulness condition reported significantly less negative affect than those in the thought suppression condition, but not significantly less than those in the no-strategy control condition. Visual inspection of the data suggests that this effect was driven primarily by those who were in the no-worry condition for Induction 1, indicating that those in the no-worry condition may have benefitted somewhat more from a mindfulness manipulation than those who worried. However, this visual trend was not corroborated by a significant interaction between inductions.

Subsequent to finding null results for all hypotheses, exploratory analyses were conducted to examine the effects of experimental condition and their interactions on positive affect. With exploratory alpha set to $p < .05$, there were no main effects of either induction, but there was a significant interaction, such that a mindfulness exercise was followed by higher positive affect than thought suppression only for those who worried. That is, those who worried at Induction 1 and then underwent a mindfulness manipulation at Induction 2 experienced more positive affect after the film clip than those who worried at Induction 1 and then suppressed their thoughts at Induction 2, but those who were in the no-worry condition at Induction 1 did not show such group differences. Visual trends suggest that those in the no-worry control group at Induction 1 actually experienced somewhat *less* positive affect if they received the brief mindfulness instruction at Induction 2 than if they received thought suppression or no-strategy control instructions, but this difference was not significant.

4.2 Lack of Effect of Worry

The lack of a main effect of the worry condition (i.e., Induction 1) on negative affect and emotion dysregulation is contrary to prior research by McLaughlin et al. (2007), which showed a main effect of worry induction on negative affect and emotion dysregulation. Specifically, their team found that those with GAD experience higher negative affect in response to a sad film clip following a period of worry. In the present study, those who worried did not report higher negative affect or emotion dysregulation in response to the film clip than those in the no-worry control condition. This lack of effect does not appear to be due to lack of manipulation of worry; those who worried reported significantly higher worry ratings following Induction 1 than those in the no-worry condition.

Multiple factors might explain the lack of effect of the worry induction on negative affect and emotion dysregulation. First, the primary methodological difference between the present study (the final experiment) and the study conducted by McLaughlin et al. (2007) was the second induction. That is, the present study added the consideration of differing regulation strategies (thought suppression, mindfulness, and a no-strategy control condition; Induction 2) and examined how they might impact emotional reactivity following worry. The design of the study added an additional independent variable which might have impacted the two dependent variables; there was a main effect of the second induction on negative affect. Visual inspections indicate that potential interactions may have been found in a larger sample (see Interactions section); thought suppression appeared to increase emotion dysregulation for those in the no-worry control condition at Induction 1, but not those in the worry condition. Although the interaction was not significant, those in the no-worry control condition may have been more dysregulated by the thought suppression condition than those in the worry-induction condition. This may explain the lack of group differences on outcome variables for Induction 1 (worry vs. no-worry control).

It is also possible that the effect of worry induction on negative affect and emotion dysregulation found by McLaughlin et al. (2007) is a relatively brief, transient effect. In their study, the film clip was shown to participants directly after the worry period, but in the present study, the film clip was administered to participants following the second induction, which was five minutes long. It may be that simple passage of time following a worry period could reduce the impact of worry on negative affect and emotion dysregulation. Although the present study used a neutral condition as a control, it did not control for the simple passage of time. Emotion

is, by definition, a relatively brief experience (Rottenberg & Gross, 2007), and it is unknown if worry impacts emotional experience for longer than a few minutes at a time.

Yet another possibility is that the effect found by McLaughlin et al. (2007) was specific to a diagnosed, clinical sample of those with GAD. In their study, they compared those with GAD to non-clinical controls, and found that worry only increased negative affect for those with GAD. Worry had no such effect on control participants. Given that the GAD-Q-IV correctly classifies 89% of those with GAD (Newman et al., 2002), it is likely that at least 11% of the present sample would not have been diagnosed with GAD by a structured diagnostic interview. Thus, some of the impact of worry may have been mitigated by the inclusion of a subset of participants who would not have met full clinical criteria.

4.3 Mindfulness and Thought Suppression

One main effect for regulation strategy (i.e., Induction 2) emerged from analyses in the final experiment; there was an effect of regulation strategy on negative affect when using an uncorrected alpha of $p < .05$. Post-hoc comparisons indicated that the mindfulness manipulation was associated with less negative affective responding than the thought suppression condition, but not less than the no-strategy control condition. There was a non-significant trend toward a difference between the mindfulness and no-strategy control conditions ($p = .09$), but no such trend for differences between the thought suppression and no-strategy control conditions ($p = .45$). There was no main effect of regulation strategy (i.e., Induction 2) on emotion dysregulation.

The effects of mindfulness on negative affect and emotion regulation have been previously reported by Arch and Craske (2006). They found that healthy control participants who received a mindfulness meditation instruction reported less negative affect in response to evocative picture slides than those who engaged in a worry induction. However, they found no

reported differences between the mindfulness condition and their control condition, "unfocused attention", on negative affect. These findings may be consistent with those found in the present study. Specifically, their study found a difference between mindfulness and worry, but no difference between the mindfulness and control conditions. In the present study, mindfulness was compared to thought suppression rather than worry; however, worry has been considered a form of thought suppression in itself (Borkovec & Lyonfields, 1993). The present study found a difference between mindfulness and thought suppression, but no difference between mindfulness and no-strategy control, in its impact on negative affect. There was, however, a trend toward a difference from the control condition. Overall, mindfulness was a better strategy for downregulating negative affect than a common strategy for people with GAD, thought suppression.

Although the lack of difference between mindfulness and control conditions in negative affect is consistent with Arch and Craske's (2006) findings, there was a trend toward a difference between them. Such a difference may have emerged for a more neutral control condition. That is, it is possible that the Induction 2 no-strategy control condition had an effect and did not operate as a true control condition, thus reducing the comparative effect of mindfulness. In fact, for Induction 1, the no-worry condition reported lower worry ratings over time in response to the induction, whereas the worry condition increased in worry ratings as expected (see Manipulation Checks). It is possible that the present experimental control conditions may have operated as distraction. Distraction involves intentional deployment of attention toward a stimulus other than that which is currently emotionally salient (Thiruchselvam, Blechert, Sheppes, Rydstrom, & Gross, 2011). Although the no-strategy control was nearly identical to the control condition in McLaughlin et al. (2007), the condition involved thinking for five minutes about the last three

movies participants had seen, which may have operated to distract participants from distress. In previous literature, distraction has reduced the intensity of emotion (Urry, 2010), reduced the unpleasantness of painful stimuli (Bantick et al., 2002; Valet et al., 2004), and attenuated dysphoric mood (Lyubomirsky & Nolen-Hoeksema, 1993). Although the no-strategy condition was not significantly different than thought suppression, it is possible that an experimental control condition that was less distracting, such as allowing the passage of time, may have been significantly different than mindfulness.

Mindfulness was not related to less state emotion dysregulation following the film clip. In fact, there was no main effect of regulation strategy (i.e., Induction 2) overall on state emotion dysregulation. This is contrary to Arch and Craske (2006), who found that mindfulness improved emotion regulation, more than worry and more than their "unfocused attention" control. However, they operationalized emotion regulation as willingness to view more negative slides, and they did not measure state emotion dysregulation by self-report. It is possible that their behavioral measure indicating emotion regulation measures a different aspect of the construct. The self-report measure used in the present study measures four dimensions of state emotion dysregulation: nonacceptance of emotion, difficulty modulating emotion, poor awareness of emotion, and lack of clarity of emotion. Willingness to view more negative slides may be related to nonacceptance, as acceptance of emotion and willingness to experience emotion have been considered similar constructs, often used interchangeably (Gratz & Gunderson, 2006; Twohig, Hayes, & Masuda, 2006; Twohig, Hayes, Plumb, Pruitt, & Collins, 2011). Willingness, however, may not be as closely related to the global state emotion dysregulation that was measured in the present study. It is possible that, in its immediate effects, mindfulness only influences some

aspects of emotion regulation. Future studies could examine the dimensions of emotion regulation which are affected by mindfulness meditation.

It is also possible that a single five-minute mindfulness manipulation is not sufficient to affect state mindfulness in people with GAD to the extent required for emotion regulation. In the present study, those in the mindfulness condition did not report higher state mindfulness than those in the other conditions; the mindfulness condition failed to successfully manipulate mindfulness (see Limitations section). The mindfulness condition did affect state mindfulness in the pilot sample, but the pilot study included participants without analogue GAD. It is possible that those with probable GAD need more practice to receive the full benefits of mindfulness. Previous research has found benefits for mindfulness among people with GAD (Evans et al., 2008; Hoge et al., 2014), but these studies were clinical trials where participants benefited from much practice in mindfulness meditation. No known study has examined the immediate effects of a single mindfulness exercise among people with clinical or analogue GAD, nor has a dose-response study been conducted to date for mindfulness meditation in this population.

It should be noted that there are varying forms and definitions of mindfulness in the current literature. To induce mindfulness, the present study used a focused breathing meditation based on a sitting meditation by Kabat-Zinn (1990) which has been used previously in experimental studies on mindfulness meditation (Arch & Craske, 2006; Feldman et al., 2010). It may be that the type of mindfulness that is induced with this meditation for people with GAD is not fully captured in the measure of state mindfulness used in the present study. One of the most widely accepted definitions of mindfulness posits that mindfulness is a process which arises from mindfulness training, consisting of two components: 1) “self-regulation of attention so that it is maintained on immediate experience,” and 2) “an orientation that is characterized by curiosity,

openness, and acceptance" (Bishop et al., 2006; p. 232). However, the state mindfulness measure in the present study, the Toronto Mindfulness Scale (TMS), has a two-factor structure inconsistent with that suggested by Bishop et al. (2006). Their measure yields two factors of mindfulness – Curiosity and Decentering (Lau et al., 2006) – neither of which capture the first component of mindfulness in Bishop et al.'s (2006) definition, involving the self-regulation of attention. Although it is possible that mindfulness was not successfully manipulated in the final experiment, it is also possible that participants' self-regulation of attention increased; this change would not have been captured by the TMS.

There is also evidence to suggest that mindfulness might operate differently with more experience. Mindfulness has been documented to impact emotional processing differently for experienced versus inexperienced meditators. Taylor et al. (2011) found that although both novice and experienced meditators reported lower reactivity in response to emotional images during mindfulness, these effects operated by different neural pathways. Novice meditators down-regulated activity in the left amygdala during mindfulness, indicating lower emotional processing while meditating. Experienced meditators, on the other hand, had no decrease in activity in emotional reactivity areas during mindfulness, but showed decreased activity in medial prefrontal and posterior cingulate cortices, indicating they allowed themselves to fully experience their emotional reactions to the pictures, and still reported less reactivity in response to them (Taylor et al., 2011). It is plausible that greater experience practicing mindfulness has a different effect on affective responding. However, it is unknown how much experience is required. Taylor et al. (2011) compared experienced meditators with over 1000 hours of practice to those who were experiencing mindfulness for the first time. It is possible that mindfulness is most helpful with over 1000 hours of practice, but the effect of mindfulness at varying doses has

yet to be examined empirically. Dose-response research for mindfulness meditation could provide direction for future research on the impact of mindfulness on emotion regulation.

The impact of thought suppression in the present study is somewhat contrary to prior research. Results indicate that, as a main effect, thought suppression was not different from the no-strategy condition in its effects on negative affect and emotion dysregulation. This is contrary to previous studies which have found that those who suppress their thoughts have higher physiological arousal (Wegner et al., 1990), higher anxiety (Koster et al., 2003), and worse mood (Wegner et al., 1993) than experimental controls. However, experimental studies on thought suppression are primarily conducted on healthy control participants. There is only one known analogue experiment which investigated thought suppression in participants with clinical GAD (i.e., a clinical sample of those with mood and anxiety disorders) (Campbell-Sills et al., 2006). The thought suppression condition was related to higher negative affect than an acceptance condition following an emotionally evocative film. The present findings on thought suppression may be consistent with these findings; in our study, thought suppression was worse than a mindfulness condition which emphasized acceptance of experience. Campbell-Sills et al. (2006) did not include an experimental control condition, however. It may be that thought suppression is no worse than a control condition, at least in the short term, for people with GAD.

The absence of difference between thought suppression condition and no-strategy condition in the present study may also be explained by the possible frequent use of thought suppression in the present analogue GAD sample. Thought suppression is already a regulation strategy of choice among people with GAD (Borkovec & Lyonfields, 1993), to the extent that participants with GAD can be distinguished from healthy controls based on their responses on a measure of thought suppression (Dugas et al., 1998). Thus, it is possible that the present

participants with analogue GAD engaged in thought suppression regardless of assigned emotion regulation strategy (i.e., Induction 2). Keeping participants with GAD from engaging in thought suppression in an experiment may be extremely challenging. However, a future study could add a measure of thought suppression to pre-induction measures, in order to control for overall tendencies to suppress thoughts and thus measure the additive effect of a thought suppression condition.

4.4 Interactions

There were no significant interactions for the planned analyses of the present study. That is, worry (Induction 1) and regulation strategy (Induction 2) did not interact in their effects on negative affect or emotion dysregulation, contrary to study hypotheses. However, visual inspection indicated trends toward possible interactions inconsistent with study hypotheses (see Figures 3 and 4). Consideration of these unexpected trends should be discussed and interpreted cautiously as these interactions were not statistically significant. However, the following discussion is warranted for future investigations.

First, as Figure 3 shows, there was a possible small trend toward an interaction effect on emotion dysregulation ($p = .12$) with a small effect size ($_{\text{partial}}\eta^2 = .022$). Visually, Induction 2 appeared to operate as expected for those in the no-worry group, such that they reported the lowest dysregulation in the mindfulness condition, followed by the experimental control condition. The thought suppression condition demonstrated the highest dysregulation within the no-worry group. However, those in the worry group showed a different pattern of results. In the worry group, the no-strategy condition demonstrated the highest emotion dysregulation, followed by mindfulness. Contrary to hypotheses, the thought suppression group showed the *lowest* dysregulation within the worry group.

Thought suppression is consistently linked to ironic effects in the literature, such that people who suppress their thoughts tend to experience paradoxical increases in the target thoughts (Wegner et al., 1987), as well as lower mood (Purdon & Clark, 2001) and higher anxiety (Koster et al., 2003), following a period of suppression of affect-related thoughts. Whereas the pattern of results for the no-worry group is consistent with this prior literature, the pattern for the worry group is not. Although the interacting effects of worry and subsequent thought suppression have yet to be examined in the literature, it is possible that thought suppression operates differently under different circumstances (e.g., following worry).

One possibility is that worry enhanced the effect of thought suppression as a successful emotion regulation strategy, at least temporarily. Extant literature shows that participants who worry before encountering an anxiety-provoking stimulus experience lower physiological arousal and report lower initial distress in response to that stimulus (Borkovec & Hu, 1990; Wells & Papageorgiou, 1995). However, this effect is short-lived; worry is associated with lower habituation to those stimuli and higher intrusive thoughts about the stimulus in the following week (Borkovec & Hu, 1990; Wells & Papageorgiou, 1995). That is, worry appears to have a "rebound effect" on emotional experience. A similar "rebound effect" has also been documented in the thought suppression literature. A 2001 meta-analysis on the effects of thought suppression showed that the strongest effect of thought suppression was a subsequent "rebound" in the frequency of target thoughts (Abramowitz, Tolin, & Street, 2001). Their meta-analysis found that, on average, thought suppression did not *immediately* enhance unwanted thoughts, and that participants *are* able to successfully suppress thoughts over the short term. However, thought suppression was related to increased frequency of those thoughts over a delay. As such, it is possible that thought suppression is briefly effective under distress, but ineffective over time. It

is also possible that the 3-minute sad video was an insufficient delay to detect the rebound effect of thought suppression. From this perspective, the present findings may be consistent with the literature indicating that thought suppression is effective in the short term.

With regard to the effects of conditions on negative affect, the interaction was also not significant, with little to no trend toward an interaction effect (p = .26). Patterns of overall response to the three conditions were similar across groups, with both worry and no-worry groups (i.e., Induction 1) reporting the highest negative affect in the thought suppression condition, somewhat lower negative affect in the no-strategy condition, and the lowest negative affect in the mindfulness condition. These patterns are consistent with the statistically significant main effect difference between the mindfulness and thought suppression conditions on negative affect. However, visual inspection indicates that mindfulness may have been somewhat less effective for those in the worry group than those in the no-worry group. That is, visually, the effect of mindfulness appeared to be driven by its effect on those who were in the no-worry control group (see Figure 4).

The effects of mindfulness have never previously been examined immediately following a worry induction. These results indicate that following worry, mindfulness might not be as effective as it is following a period of neutral thinking. It is possible that the effects of the worry period contaminated the mindfulness period, because it may have been difficult for participants to switch from worrying to a mindfulness exercise. GAD is marked by uncontrollable worry; when clinically diagnosed, worry must be experienced as uncontrollable in order for a person to meet clinical criteria for GAD (APA, 2013). The very instruction in the mindfulness script that participants “switch from a mode of doing to a mode of nondoing” (see Appendix C) may be

exceptionally challenging for people with GAD immediately after they are instructed to actively worry.

Although little research has documented that mindfulness is challenging during distress, this has been discussed theoretically. Hayes and Feldman (2004) discuss that mindfulness may have distressing, destabilizing effects because meditation may lead participants to become more aware of their own difficult emotions. In fact, mindfulness has been conceptualized as a form of exposure to internal experience (Roemer & Orsillo, 2002), and exposure-based treatments sometimes lead to a temporary worsening of symptoms (e.g., Gilboa-Schechtman & Foa, 2001; Nishith, Resick, & Griffin, 2002). Mindfulness may not actually operate to reduce short-term distress or increase regulation of emotions under distress. It is unknown if there are specific emotion regulation strategies can influence these processes under distress; a comparison of different strategies following worry could be a direction for future research. Additionally, if mindfulness operates similarly to exposure treatment, it may be most effective with practice. As discussed in the previous section, it is possible that mindfulness is most helpful with more experience; in this vein, future research could also examine optimal dosing of mindfulness.

4.5 Exploratory Analysis: Effects on Positive Affect

An exploratory analysis of the effects of mindfulness on positive affect found that, for those who worried, mindfulness was related to higher positive affect than thought suppression, and was marginally better than the no-strategy control condition ($p = .075$). Mindfulness did not increase positive affect in the no-worry group; on the contrary, positive affect was somewhat lower for this group. Unlike other results in the present study which found that mindfulness was, potentially, more helpful following the no-worry condition, the exploratory analysis found a benefit of mindfulness specifically following the worry period.

In the tripartite model of anxiety and depression, high negative affect, high autonomic arousal, and low positive affect are predicted to combine to influence emotional disorders (Clark & Watson, 1991). Low levels of positive affect tend to uniquely predict major depression, more than they predict anxiety disorders (T. Brown et al., 1998; Watson et al., 1995). However, low levels of positive affect also predict the development of GAD in longitudinal research (Kendall et al., 2015). Tendencies to dampen positive affect predict symptoms of every anxiety disorder other than agoraphobia, including GAD, after controlling for depressive symptoms (Eisner et al., 2009). Additionally, GAD symptoms correlate with higher fear of positive emotions (Roemer et al., 2005), and those with clinical GAD tend to report more fears of experiencing positive emotion than controls (Turk et al., 2005). Although positive emotion is not as well-understood in the anxiety literature as it is in depression, it is deserving of further exploration.

Mindfulness may increase positive affect. Theoretically, mindfulness is predicted to aid in "decentering," or cultivating emotional balance (A. M. Hayes & Feldman, 2004) by promoting an attitude of acceptance of internal experiences. This approach is predicted to allow people to "return to baseline" following distress; thus, people are able to recover from negative emotional experience, making way for positive emotional experiences as they arise. In an RCT of mindfulness-based cognitive therapy for adults at risk for depression, those receiving the mindfulness treatment reported more daily positive emotions and higher pleasantness of activities than the waitlist control when monitored by experience sampling (Geschwind et al., 2011). Another RCT using healthy controls examined brain activation across those experiencing an 8-week mindfulness meditation training program and those on waitlist control; they found higher left-side anterior activation in the mindfulness group, an area that is associated with positive emotion (Davidson et al., 2003). Mindfulness correlated with positive affect in a meta-

analysis of 29 studies examining associations between mindfulness and trait affect (Giluk, 2009), and frequent meditators report higher positive affect than non-meditators (Beauchamp-Turner & Levinson, 1992).

The exploratory analysis of the present study indicates that mindfulness is uniquely helpful for positive affect following a worry period, but not following a no-worry control period. This supports the "decentering" theory of mindfulness. That is, mindfulness may make way for the full range of affective experience following a period of distress, allowing for the full experience of both positive and negative emotions. Although mindfulness does not decrease negative affect as strongly following worry, it may allow worriers to experience positive affect while they are still also experiencing negative affect.

4.6 Limitations

4.6.1 Manipulation of Mindfulness

Although state mindfulness was successfully manipulated in the pilot sample, the experimental sample did not report higher state mindfulness when they were in the mindfulness condition. That is, receiving mindfulness instructions failed to manipulate state mindfulness, at least the one defined by the TMS, in the main experiment. This reduces the degree to which the effects of the mindfulness condition can be interpreted. For example, it is difficult to determine whether the null effects of the mindfulness manipulation on emotion dysregulation are due to lack of manipulation of mindfulness, or a true lack of effect of mindfulness on emotion dysregulation.

It is possible that the online data collection method interfered with the manipulation of mindfulness. When participants complete surveys in their own environments, factors that might be controlled in a laboratory setting (e.g., presence of others in their environment, availability of

distracting stimuli) cannot be controlled. However, other manipulation checks found that the worry condition and the sad video worked as intended in the present study. Multiple validity checks were included to ensure that participants were attending to the survey (see Data Cleaning and Validity Checks section). It is, however, still possible that participants did not sufficiently engage with the mindfulness manipulation in the main experiment.

It is also possible that mindfulness was not successfully manipulated because the measure of state mindfulness was administered after the sad video and after measures of affect and emotion dysregulation. State mindfulness was measured several minutes after the mindfulness manipulation was complete. However, this was an intentional design choice, aimed at preventing the other conditions from being exposed to mindfulness-related concepts. Questions about mindfulness before the dependent variables may also have introduced demand characteristics, altering how participants responded to self-reports of negative affect and emotion dysregulation. With an identical design, including the same administration order of self-reports and inductions, the pilot trial did find an effect of the mindfulness condition on state mindfulness. Thus, it may be that other characteristics of the main experimental study influenced this lack of effect of the manipulation.

Specifically, the only methodological difference between the pilot and main experiment is that the main experimental study screened out participants who did not meet criteria for analogue GAD. Thus, on average, they had more severe anxiety symptoms than pilot participants. It may be that state mindfulness is difficult to manipulate for those with GAD. After all, the process of mindfulness, involving attention to the present moment with an attitude of openness and acceptance (Bishop et al., 2006) may be challenging for people who tend to avoid, judge, fear, and attempt to control their own emotional reactions (Mennin et al., 2005; Wells,

2004). However, the pilot sample did not have sufficient power to determine differences of the effect of the mindfulness condition on state mindfulness across those who did and did not meet criteria for analogue GAD. It is also possible that the successful manipulation in the pilot sample was a Type I error. Regardless, future research on the effects of mindfulness on GAD may require stronger doses of mindfulness in order to successfully manipulate state mindfulness (see Implications and Future Directions).

4.6.2 Analogue Generalized Anxiety Disorder

The present study used a sample of participants with analogue GAD. The measure used to screen out participants, the GAD-Q-IV, has 83% sensitivity and 89% specificity in detecting clinical GAD (Newman et al., 2002), indicating that it is likely that at least a subset of participants did not have GAD. Additionally, people on Amazon Turk may have been motivated to endorse GAD symptoms on the screening measure due to the description of the study and consent form, which discussed that it was a study for people who worry. However, the GAD-Q-IV screened out nearly half of those who took the screening form (47%, n = 268, see Data Cleaning and Validity Checks). This indicates that a larger subset of screeners did not meet criteria for the study than would have met criteria in the pilot sample; 74% (n = 37) of pilot participants would have screened positive in the pilot sample. It is also notable that the pilot study was not advertised as a study for people who worry; rather, the description of the study referred to "ways of thinking and how they affect emotion." It is still likely, however, that at least some participants in the main experiment did not have clinical GAD.

The effects of worry on negative affect and emotion dysregulation have been found to be specific to those with GAD; worry does not increase negative affective responding or emotion dysregulation among healthy controls (McLaughlin et al., 2007). It is possible that some of the

null findings in the present study are due to the inclusion of some non-clinical individuals. Analogue samples are often used in basic laboratory studies of clinical phenomena (e.g., Fresco, Mennin, Moore, Heimberg, & Hambrick, 2014; Holaway, Heimberg, & Coles, 2006; Salters-Pedneault et al., 2006), but it is always possible that the results of analogue samples will not be consistent with findings from diagnosed clinical samples. The lengthy diagnostic procedures, level of expertise required for assessment, and cost of recruitment can make basic laboratory research using clinical populations challenging. However, a future study on a similar phenomenon could include participants who do not meet analogue criteria, in order to detect if effects are specific to those who likely would meet criteria for a diagnosis; the present study only included participants who met analogue criteria. Establishment of an effect in an analogue sample that is not present in healthy controls could justify the resources required to recruit a clinical sample of people with GAD in a future study.

4.6.3 Measurement

It is possible that the self-report surveys used in the present study did not adequately measure the target dependent variables. It is also possible that the measure of state mindfulness did not adequately assess mindfulness in the current study.

The negative affect scale of the PANAS is intended to measure negative affect broadly. This scale asks participants to rate the intensity they feel a number of negative emotions in the present moment, with ratings given for emotions such as “ashamed,” “afraid,” and “distressed.” However, this subscale does not allow for the examination of effects of the experiment on specific emotions, such as sadness or fear. The extended version of the PANAS, the PANAS-X (Watson & Clark, 1999), has subscales for specific emotions. However, broad increases in negative affect were expected in the present study; thus, the shorter version of the PANAS with

positive and negative affect scales was administered. However, the administration of multiple subscales of the PANAS-X, such as the sadness and fear scales, may have shed insight into processes of emotion which may have been impacted by the conditions of the present study. A future study would benefit from the assessment of more emotions following experimental inductions.

The measure of state emotion dysregulation used in the current study is a validated measure of current emotion dysregulation (Lavender et al., 2015), but it may not have captured all facets of dysregulation that may have been impacted by the experiment. Specifically, mindfulness has been shown to increase emotional tolerance by behavioral measures of willingness to encounter aversive stimuli (Arch & Craske, 2006). Including multimodal assessment of emotion dysregulation may have allowed for exploration of multiple emotion regulation processes that are targeted by mindfulness. There are also physiological indicators of emotion regulation, such as heart rate variability (Appelhans & Luecken, 2006), as well as reductions in heart rate over time, indicating the "return to baseline" which is considered essential in theories of emotion regulation (Linehan, 1993). Although behavioral and physiological measures are difficult to administer and validate in online samples, an in-person laboratory experiment could add these metrics to examine the effects of worry, thought suppression, and mindfulness on multiple metrics of dysregulation.

The measure of state mindfulness used in the present study, the Toronto Mindfulness Scale (TMS), did not correlate as expected with the other state measures administered after the induction period. In the main experiment, it did not correlate with negative affect or emotion dysregulation. The only measure it correlated with as expected was the trait mindfulness measure; this correlation was weak (r = .15) and was not present in the pilot. In the pilot sample,

the TMS correlated *positively* with state emotion dysregulation, and its only other significant correlation in the pilot was a *positive* relationship with experiential avoidance. This raises questions regarding the validity of the TMS as a measure of state mindfulness in this sample; it correlated with measures that are inconsistent with theory on the effects of mindfulness (A. M. Hayes & Feldman, 2004). The TMS has been validated as a measure of state mindfulness (Lau et al., 2006), and to date, there is no alternative measure of state mindfulness that has been validated in the literature. However, their validation was conducted with individuals with relatively extensive meditation experience, involving at least two months of regular meditation (2-360 months, M = 6 months; Lau et al., 2006). It may be that this self-report measures the effects of mindfulness for experienced meditators, but not for people who are relatively naïve to meditation. Additionally, the construct of state mindfulness may behave differently for people who are inexperienced with mindfulness; higher induced state mindfulness may not be linked to lower psychopathology, distress, or dysregulation for naïve practitioners.

4.6.4 Online Data Collection

The use of online data collection presents multiple limitations in the present study. First, the environments where participants completed the experiment could not be controlled, introducing potential confounds. Participants may be completing these surveys in a room with other people, while caring for children at home, while watching television, and so on. While completing surveys and undergoing inductions, they may have become distracted and inattentive due to uncontrolled factors in their home environments. Such variables could have been more easily controlled in a laboratory setting. The validity checks used in the present study were intended to exclude participants who were inattentive to surveys and/or disengaged with inductions. A large portion of the original sample was lost to these validity checks (34.3%, n =

103), indicating that many participants were not fully attending to survey tasks. Optimistically, these validity checks may have excluded most participants who were insufficiently attentive, and remaining issues with inattention should have affected participants equally across conditions due to random assignment. However, it is possible that the present experiment may have insufficiently accounted for poor attention; results may have been different in a controlled laboratory setting.

It is also difficult to administer some measures online that could have aided in multimodal assessment of dependent variables in the present study, as discussed in the previous section. Specifically, physiological and behavioral indicators of negative affect and emotion dysregulation may be difficult to deliver online. Interestingly, advancements in technology for analyzing digital video recordings have led to a procedure for measuring heart rate, respiration, and heart rate variability through webcam (Poh, McDuff, & Picard, 2011). This may have been difficult to gather using MTurk, as the procedure requires ambient sunlight and participant ability to record and send video with a webcam, but it indicates that future online studies could gather physiological indicators of the dependent variables in the present study.

There are also specific limitations associated with using the Amazon Mechanical Turk (MTurk) platform for online data collection. MTurk has increasingly been used for behavioral experiments, and the typical MTurk worker has completed at least two experiments online (Chandler, Mueller, & Paolacci, 2014). However, some MTurk workers spend hours every day completing tasks on the website (Ipeirotis, 2010), such that MTurk becomes similar to a full- or part-time job. The most productive 1% of MTurk workers are responsible for completing as much as 11% of available tasks on the site (Chandler et al., 2014). Additionally, participants on MTurk may participate in communities online where they discuss their experiences with studies

on the website (e.g., mturkforum.com, turkernation.com). This has raised questions regarding participant "nonnaïvete" to the procedures of behavioral research on MTurk (Paolacci, Chandler, & Stern, 2010). Knowledge of the purpose of an experiment or of the intended effects of a manipulation may have unpredictable effects on participant responses (e.g., Edlund, Sagarin, Skowronski, Johnson, & Kutter, 2009; Rosnow & Aiken, 1973). For example, it is possible that participants in the present study had previously been exposed to the sad video used in the present study, as it is a validated stimulus for inducing sadness (Gross & Levenson, 1995). It is unknown if participants in the present study had previously been exposed to the experimental manipulations; a future study using an MTurk sample should ask participants about their prior knowledge of the experimental manipulations.

Online data collection was used in part in the present study due to the need for a large sample to detect potential interaction effects; power analyses indicated that 188 participants were required for analysis. Recruiting such a large sample of those with analogue GAD may be challenging and time-consuming in a laboratory environment, and there is reason to believe that concerns about online data collection can be mitigated by potential benefits. Samples collected using MTurk, particularly, tend to be more diverse in age and socioeconomic status than university samples (Berinsky, Huber, & Lenz, 2012), and because the subject pool of MTurk is large (i.e., 500,000 workers) (Shank, 2016), MTurk may allow for easier access to specific population subgroups, such as those with analogue GAD. Experimenter bias and social desirability may also be mitigated for participants in online samples, where the experimenter is not present (Paolacci et al., 2010). Additionally, concerns about inattention may be unfounded for MTurk samples, as at least one study has shown that MTurk workers are less likely to fail attention checks than participants in the laboratory (Paolacci et al., 2010). Research on constructs

related to those examined in the present study has been conducted on MTurk previously, including studies on mindfulness (Hanley, Warner, & Garland, 2015; Jackson, Weinstein, & Balota, 2013), experiential avoidance (Bardeen & Fergus, 2015), and generalized anxiety (Lebowitz, Pyun, & Ahn, 2014; Price & Van Stolk-Cooke, 2015). However, it remains difficult to determine if factors specific to online data collection influenced the results of the present study.

4.7 Implications and Future Directions

Despite these limitations, results from the present study may have implications for future research on mindfulness and thought suppression among people with GAD. The primary aim of the present study was to detect if a brief mindfulness manipulation reduces the impact of worry on subsequent negative affect and emotion dysregulation. The present study indicates that a single, brief mindfulness manipulation may not have this hypothesized "buffering" effect for people with analogue GAD when they have been worrying. Brief mindfulness instructions may not actually operate to aid in emotion regulation under distress, in the immediate sense. Indeed, theoretically, mindfulness meditation may even be distressing and destabilizing in the early stages of practice (A. M. Hayes & Feldman, 2004). However, it could increase access to the full range of affective experience for those who have recently been worrying, allowing for increased positive affect, even though negative affect does not decrease substantially if worry is followed by mindfulness. The mindfulness manipulation did appear to reduce negative affective responding, but this effect appeared driven by participants who were not induced to worry. This indicates that there may be specific circumstances under which a brief mindfulness manipulation is an immediately effective tool for coping with aversive stimuli. It is possible that a mindfulness manipulation may be most helpful for downregulating negative affect when people with GAD

have not recently been worrying, whereas it may allow for both positive and negative affect to arise following worry.

However, this possibility should be examined using a larger dose of mindfulness. In the present study, the five-minute mindfulness manipulation was not sufficient to affect state mindfulness in participants. This lack of effect on state mindfulness may have reduced the potential regulatory properties of the mindfulness manipulation. It is possible that simply increasing the length of time of the manipulation would have yielded effects on state mindfulness, but it may also be that people with GAD need to practice mindfulness multiple times in order to achieve benefits. This indicates that a dose-response study of mindfulness for GAD may be a necessary next step to guide further experimental research on the effects of a mindfulness manipulation in this population.

The results of the present study also suggest that there may be specific circumstances where thought suppression, in the brief and immediate sense, is effective for emotion regulation. Interaction effects were not significant, but unexpected trends emerged from the data. Following worry, thought suppression appeared to *decrease* emotion dysregulation in response to the film, whereas thought suppression increased emotion dysregulation as hypothesized following a no-worry control condition. These trends are surprising, and they indicate that those with GAD may be motivated to use thought suppression because it could aid in emotion regulation, at least temporarily. People with GAD likely use worry for a similar reason; in the short term, worry reduces negative affective responding and blunts physiological responding to stressful stimuli (Borkovec & Hu, 1990). If thought suppression reduces dysregulated responding to aversive stimuli following worry, its use may be maintained by negative reinforcement. For people with GAD in particular, a strategy that is useful following a worry episode may be strongly reinforced

due to the frequency of worry in this population. It is unknown if thought suppression would have had rebound effects over time; the present study did not include a follow-up to examine the longer-term effects of the experimental conditions. However, these results indicate that thought suppression in GAD is deserving of further exploration.

First, an identical design to the present study, but without the comparison to mindfulness, may have increased power to detect significant results of potential interactions. The trends of the present study indicate that with increased power, interaction effects may have emerged regarding the effects of thought suppression on emotion dysregulation. However, indicating that thought suppression is helpful for short-term emotion dysregulation may be misleading without a follow-up period, because it may not capture the longer-term rebound effects of thought suppression that have been reported in the literature (Abramowitz et al., 2001). Thus, future research should examine the effects of thought suppression following worry using a follow-up period to examine potential rebound effects on negative affect and emotion dysregulation.

Future researchers may also consider adding multimodal assessment of the dependent variables used in the present study. Specifically, there are physiological measures of both negative affect (i.e., cardiac reactivity) and emotion dysregulation (i.e., heart rate variability; Appelhans & Luecken, 2006). Additionally, there are behavioral indicators of emotion dysregulation, such as willingness to tolerate an aversive stimulus, which may indicate increased emotional tolerance, an important facet of emotion regulation. Arch and Craske (2006) found that mindfulness did alter behavior on an emotional tolerance task, more than their "unfocused attention" control, even with a brief mindfulness exercise with inexperienced meditators. It may be that there are particular facets of emotion regulation that can be most effectively targeted by mindfulness in the immediate sense. Multimodal assessment of negative affect and emotion

dysregulation may help to rule out potential measurement issues, and would help to identify specific processes that may be targeted by mindfulness.

4.8 Conclusion

Findings from the present study indicate that mindfulness and thought suppression may operate differently than predicted on participants with analogue GAD following a worry episode. Mindfulness reduced negative affective responding to a sad stimulus as a main effect, but this effect appeared driven primarily by participants who were first in a no-worry control condition before the mindfulness condition. Mindfulness may be helpful for regulating negative affective responding in GAD, but it appears less useful immediately following worry. However, mindfulness was more effective at increasing positive affect following worry than it was following the no-worry control condition. This indicates that following worry, mindfulness allows for both positive and negative affect to arise in response to a stimulus. Following a neutral thinking period, mindfulness might downregulate negative affect and may also result in a small decrease in positive affect in response to a stimulus. These findings should be replicated with more rigor in a future study. Specifically, a future study should increase the dose of mindfulness in order to more effectively induce state mindfulness among participants.

Trends on the effects of thought suppression were somewhat surprising. First, none of the effects of thought suppression were significant compared to control, indicating that thought suppression was no worse than a neutral thinking control condition for increasing negative affect, increasing emotion dysregulation, or decreasing positive affect among participants with analogue GAD. In fact, following worry, thought suppression appeared to somewhat reduce emotion dysregulation for participants. It may be that the delay following the thought suppression condition was not sufficient to detect the deleterious effects of suppression that have been

reported in prior research. Future research should examine the effects of thought suppression following worry using a paradigm that allows for the detection of rebound effects and longer-term follow-up effects. It may be that participants with GAD use thought suppression because it is effective under some circumstances, despite the problematic results of chronic thought suppression that have been documented in the literature.

Table 1. *Correlations among Measures in Pilot Sample*

	1	2	3	4	5	6	7
1. Worry Severity (PSWQ)	1.00						
2. Emotion Dysregulation (DERS)	.770**	1.00					
3. Trait Mindfulness (FFMQ)	-.652**	-.861**	1.00				
4. Experiential avoidance (AAQ-II)	.756**	.855**	-.734**	1.00			
5. State Mindfulness (TMS)	.251	.239	-.079	.327*	1.00		
6. State Negative Affect (PANAS-NA)	.431**	.708**	-.545**	.663**	.264	1.00	
7. State Emotion Dysregulation (S-DERS)	.382*	.594**	-.416**	.647**	.340*	.865**	1.00
M	50.90	88.20	129.94	23.62	25.92	17.66	64.36
SD	16.22	26.03	21.07	10.76	9.19	8.33	14.20

Note. *p<.05, **p<.01, PSWQ = Penn State Worry Questionnaire, DERS = Difficulties in Emotion Regulation Scale, FFMQ = Five Facet Mindfulness Questionnaire, AAQ-II = Acceptance and Action Questionnaire – II, TMS = Toronto Mindfulness Scale, PANAS-NA = Positive and Negative Affect Scales – Negative Affect Subscale, S-DERS = Difficulties in Emotion Regulation Scale, State Version

Table 2. *Descriptive Statistics of State Mindfulness (TMS) across Experimental Conditions in Pilot Sample*

		Induction 2		
		No-Strategy	Thought Suppression	Mindfulness
Induction 1	No-Worry	*M* = 27.90 *SD* = 8.28 *n* = 10	*M* = 22.50 *SD* = 9.06 *n* = 8	*M* = 32.00 *SD* = 12.14 *n* = 5
	Worry	*M* = 24.67 *SD* = 5.55 *n* = 9	*M* = 19.90 *SD* = 10.75 *n* = 10	*M* = 32.00 *SD* = 9.09 *n* = 8
	Total	*M* = 26.37 *SD* = 7.12 *n* = 19	*M* = 21.06 *SD* = 8.84 *n* = 18	*M* = 32.00 *SD* = 7.48 *n* = 13

Note. TMS = Toronto Mindfulness Scale.Table 3. *Descriptive Statistics of Compliance with Induction 2 across Experimental Conditions*

		Induction 2		
		No-Strategy	Thought Suppression	Mindfulness
Induction 1	No-Worry	*M* = 90.64 *SD* = 7.87 *n* = 36	*M* = 95.18 *SD* = 6.62 *n* = 28	*M* = 94.84 *SD* = 6.26 *n* = 39
	Worry	*M* = 92.27 *SD* = 8.11 *n* = 30	*M* = 92.52 *SD* = 8.39 *n* = 29	*M* = 93.83 *SD* = 7.18 *n* = 35
	Total	*M* = 91.38 *SD* = 7.96 *n* = 66	*M* = 93.82 *SD* = 7.63 *n* = 57	*M* = 94.36 *SD* = 6.69 *n* = 74

Table 4. *Correlations among Measures in Final Experiment Sample*

	1	2	3	4	5	6	7
1. Worry Severity (PSWQ)	1.00						
2. Emotion Dysregulation (DERS)	.398**	1.00					
3. Trait Mindfulness (FFMQ)	-.357**	-.785**	1.00				
4. Experiential avoidance (AAQ-II)	.456**	.766**	-.580**	1.00			
5. State Mindfulness (TMS)	.035	.005	.152*	.132	1.00		
6. State Negative Affect (PANAS-NA)	.225**	.581**	-.448**	.563**	-.019	1.00	
7. State Emotion Dysregulation (S-DERS)	.160*	.568**	-.337**	.520**	.162*	.721**	1.00
M	67.0	105.0	117.4	30.7	27.7	20.5	69.2
SD	89.2	25.7	20.4	9.24	9.87	9.37	14.0

Note. *$p<.05$, **$p<.01$, PSWQ = Penn State Worry Questionnaire, DERS = Difficulties in Emotion Regulation Scale, FFMQ = Five Facet Mindfulness Questionnaire, AAQ-II = Acceptance and Action Questionnaire – II, TMS = Toronto Mindfulness Scale, PANAS-NA = Positive and Negative Affect Scales – Negative Affect Subscale, S-DERS = Difficulties in Emotion Regulation Scale, State Version

Table 5. *Descriptive Statistics of State Mindfulness (TMS) across Experimental Conditions in Final Experiment Sample*

		Induction 2		
		No-Strategy	Thought Suppression	Mindfulness
Induction 1	No-Worry	*M* = 26.53 *SD* = 9.52 *n* = 36	*M* = 26.43 *SD* = 10.22 *n* = 28	*M* = 24.87 *SD* = 11.25 *n* = 39
	Worry	*M* = 30.07 *SD* = 9.02 *n* = 30	*M* = 26.52 *SD* = 7.79 *n* = 29	*M* = 31.80 *SD* = 9.42 *n* = 35
	Total	*M* = 28.14 *SD* = 9.40 *n* = 66	*M* = 26.47 *SD* = 8.99 *n* = 57	*M* = 28.15 *SD* = 10.93 *n* = 74

Note. TMS = Toronto Mindfulness Scale.

Table 6. *Descriptive Statistics of State Emotion Dysregulation (S-DERS) across Experimental Conditions*

		Induction 2		
		No-Strategy	Thought Suppression	Mindfulness
Induction 1	No-Worry	*M* = 69.17 *SD* = 12.94 *n* = 36	*M* = 75.43 *SD* = 16.62 *n* = 28	*M* = 66.21 *SD* = 12.14 *n* = 39
	Worry	*M* = 69.97 *SD* = 14.25 *n* = 30	*M* = 66.07 *SD* = 11.99 *n* = 29	*M* = 69.62 *SD* = 15.15 *n* = 35
	Total	*M* = 69.53 *SD* = 13.45 *n* = 66	*M* = 70.66 *SD* = 15.08 *n* = 57	*M* = 67.82 *SD* = 13.66 *n* = 74

Note. S-DERS = Difficulties in Emotion Regulation Scale – State Version. Reported means and standard deviations use raw scores on this measure; ANCOVA analyses used a negative reciprocal transformation.

Table 7. *Results of ANCOVA Analysis of Effects of Experimental Conditions on State Emotion Dysregulation (S-DERS)*

	F	*p*	η_p^2
Main Effects			
Induction 1	.183	.669	.001
Induction 2	.699	.499	.007
Interaction			
Induction 1 x Induction 2	2.14	.121	.022
Covariates			
Trait Mindfulness (FFMQ)	7.62	.006	.039
Experiential Avoidance (AAQ-II)	5.33	.022	.028
Trait Emotion Dysregulation (DERS)	25.98	.000	.121

Note. Induction 1 = Worry versus Neutral. Induction 2 = Worry versus Neutral versus Thought Suppression. S-DERS = Difficulties in Emotion Regulation Scale, State Version. FFMQ = Five Facet Mindfulness Questionnaire. AAQ-II = Acceptance and Action Questionnaire – II. DERS = Difficulties in Emotion Regulation Scale.

Table 8. *Descriptive Statistics of State Negative Affect (PANAS-NA) across Experimental Conditions*

		Induction 2		
		No-Strategy	Thought Suppression	Mindfulness
Induction 1	No-Worry	*M* = 20.83 *SD* = 9.18 *n* = 36	*M* = 25.04 *SD* = 11.41 *n* = 28	*M* = 17.46 *SD* = 7.38 *n* = 39
	Worry	*M* = 21.40 *SD* = 10.45 *n* = 30	*M* = 19.45 *SD* = 8.48 *n* = 29	*M* = 20.17 *SD* = 8.54 *n* = 35
	Total	*M* = 21.09 *SD* = 9.70 *n* = 66	*M* = 22.19 *SD* = 10.33 *n* = 57	*M* = 18.74 *SD* = 8.01 *n* = 74

Note. PANAS-NA = Positive and Negative Affect Scale – Negative Affect. Reported means and standard deviations use raw scores on this measure; ANCOVA analyses used a negative reciprocal transformation.

Table 9. *Results of ANCOVA Analysis of Effects of Experimental Conditions on Negative Affect (PANAS-NA)*

	F	*p*	η_p^2
Main Effects			
Induction 1	.718	.398	.004
Induction 2	3.12	.046	.032
Interaction			
Induction 1 x Induction 2	1.38	.255	.015
Covariates			
Trait Mindfulness (FFMQ)	.537	.465	.003
Experiential Avoidance (AAQ-II)	14.29	.000	.071
Trait Emotion Dysregulation (DERS)	5.21	.024	.027
Worry Severity (PSWQ)	.459	.499	.002

Note. Induction 1 = Worry versus Neutral. Induction 2 = Worry versus Neutral versus Thought Suppression. PANAS-NA = Positive and Negative Affect Scale – Negative Affect. FFMQ = Five Facet Mindfulness Questionnaire. AAQ-II = Acceptance and Action Questionnaire – II. DERS = Difficulties in Emotion Regulation Scale. PSWQ = Penn State Worry Questionnaire.

Table 10. *Descriptive Statistics of State Positive Affect (PANAS-PA) across Experimental Conditions*

		Induction 2		
		No-Strategy	Thought Suppression	Mindfulness
Induction 1	No-Worry	*M* = 25.89 *SD* = 8.81 *n* = 36	*M* = 26.43 *SD* = 8.06 *n* = 28	*M* = 23.49 *SD* = 10.14 *n* = 39
	Worry	*M* = 23.83 *SD* = 8.04 *n* = 30	*M* = 23.27 *SD* = 6.56 *n* = 29	*M* = 26.82 *SD* = 7.76 *n* = 35
	Total	*M* = 24.95 *SD* = 8.47 *n* = 66	*M* = 24.82 *SD* = 7.44 *n* = 57	*M* = 25.07 *SD* = 9.19 *n* = 74

Note. PANAS-PA = Positive and Negative Affect Scale – Positive Affect.

Table 11. *Results of ANCOVA Analysis of Effects of Experimental Conditions on Positive Affect (PANAS-PA)*

	F	*p*	η_p^2
Main Effects			
Induction 1	1.34	.248	.007
Induction 2	.221	.802	.002
Interaction			
Induction 1 x Induction 2	3.53	.031	.037
Covariates			
Trait Mindfulness (FFMQ)	7.09	.008	.037
Experiential Avoidance (AAQ-II)	.497	.482	.003
Product Term of Experiential Avoidance (AAQ-II)	.353	.553	.002
Trait Emotion Dysregulation (DERS)	.688	.408	.004
Product Term of Trait Emotion Dysregulation (DERS)	.869	.352	.005
Worry Severity (PSWQ)	2.30	.131	.012

Note. Induction 1 = Worry versus Neutral. Induction 2 = Worry versus Neutral versus Thought Suppression. PANAS-PA = Positive and Negative Affect Scale – Positive Affect. FFMQ = Five Facet Mindfulness Questionnaire. AAQ-II = Acceptance and Action Questionnaire – II. DERS = Difficulties in Emotion Regulation Scale. PSWQ = Penn State Worry Questionnaire.

Table 12. *Pairwise Comparisons of Interaction Effects on Positive Affect*

	M Difference	Standard Error	*p*
No-Worry (Induction 1)			
MF vs. TS	-2.41	1.98	.225
MF vs. No-Strategy	-2.31	1.81	.203
TS vs. No-Strategy	.099	1.99	.961
Worry (Induction 1)			
MF vs. TS	4.20	1.98	.035
MF vs. No-Strategy	3.46	1.93	.075
TS vs. No-Strategy	-.739	2.05	.719
Mindfulness (Induction 2)			
Worry vs. No-Worry	2.82	1.81	.123
Thought Suppression (Induction 2)			
Worry vs. No-Worry	-3.79	2.11	.074
Neutral (Induction 2)			
Worry vs. No-Worry	-2.95	1.94	.130

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APPENDICES

Appendix A

GAD-Q-IV

1. Do you experience excessive worry? __Yes __No

2. Is your worry excessive in intensity, frequency, or amount of distress it causes? __Yes__ No

3. Do you find it difficult to control your worry (or stop worrying) once it starts? __Yes __No

4. Do you worry excessively and uncontrollably about minor things such as being late for an appointment, minor repairs, homework, etc.? __Yes __No

5. Please list the most frequent topics about which you worry excessively and uncontrollably:

A. _____ B. _____ C. _____

D. _____ E. _____ F. _____

6. During the last six months, have you been bothered by excessive and uncontrollable worries more days than not? __Yes __No

IF YES, CONTINUE. IF NO, SKIP REMAINING QUESTIONS.

7. During the past six months, have you often been bothered by any of the following symptoms? Place a check next to each symptom that you have had more days than not:

__ Restlessness or feeling keyed up or on edge __ Difficulty falling/staying asleep or restless/unsatisfying sleep

__ Difficulty concentrating or mind going blank __ Irritability

__ Being easily fatigued __ Muscle tension

8. How much do worry and physical symptoms interfere with your life, work, social activities, family, etc.? Circle one number:

0	1	2	3	4	5	6	7	8
None		Mildly		Moderately		Severely		Very Severely

9. How much are you bothered by worry and physical symptoms (how much distress does it cause you)? Circle one number:

0	1	2	3	4	5	6	7	8
No Distress		Mild Distress		Moderate Distress		Severe Distress		Very Severe Distress

The Penn State Worry Questionnaire (PSWQ)

Instructions: Rate each of the following statements on a scale of 1 ("not at all typical of me") to 5 ("very typical of me"). Please do not leave any items blank.

	Not at all typical of me				Very typical of me
1. If I do not have enough time to do everything, I do not worry about it.	1	2	3	4	5
2. My worries overwhelm me.	1	2	3	4	5
3. I do not tend to worry about things.	1	2	3	4	5
4. Many situations make me worry.	1	2	3	4	5
5. I know I should not worry about things, but I just cannot help it.	1	2	3	4	5
6. When I am under pressure I worry a lot.	1	2	3	4	5
7. I am always worrying about something.	1	2	3	4	5
8. I find it easy to dismiss worrisome thoughts.	1	2	3	4	5
9. As soon as I finish one task, I start to worry about everything else I have to do.	1	2	3	4	5
10. I never worry about anything.	1	2	3	4	5
11. When there is nothing more I can do about a concern, I do not worry about it any more.	1	2	3	4	5
12. I have been a worrier all my life.	1	2	3	4	5
13. I notice that I have been worrying about things.	1	2	3	4	5
14. Once I start worrying, I cannot stop.	1	2	3	4	5
15. I worry all the time.	1	2	3	4	5
16. I worry about projects until they are all done.	1	2	3	4	5

DERS

Please indicate how often the following 36 statements apply to you by writing the appropriate number from the scale below (1 – 5) on the line alongside each item.

Response categories:

1 Almost never (0-10%)
2 Sometimes (11-35%)
3 About half the time (36-65%)
4 Most of the time (66 – 90%)
5 Almost always (91-100%)

___ 1. I am clear about my feelings.
___ 2. I pay attention to how I feel.
___ 3. I experience my emotions as overwhelming and out of control.
___ 4. I have no idea how I am feeling.
___ 5. I have difficulty making sense out of my feelings.
___ 6. I am attentive to my feelings.
___ 7. I know exactly how I am feeling.
___ 8. I care about what I am feeling.
___ 9. I am confused about how I feel.
___ 10. When I'm upset, I acknowledge my emotions.
___ 11. When I'm upset, I become angry with myself for feeling that way.
___ 12. When I'm upset, I become embarrassed for feeling that way.
___ 13. When I'm upset, I have difficulty getting work done.
___ 14. When I'm upset, I become out of control.
___ 15. When I'm upset, I believe that I will remain that way for a long time.
___ 16. When I'm upset, I believe that I'll end up feeling very depressed.
___ 17. When I'm upset, I believe that my feelings are valid and important.
___ 18. When I'm upset, I have difficulty focusing on other things.
___ 19. When I'm upset, I feel out of control.
___ 20. When I'm upset, I can still get things done.
___ 21. When I'm upset, I feel ashamed with myself for feeling that way.
___ 22. When I'm upset, I know that I can find a way to eventually feel better.
___ 23. When I'm upset, I feel like I am weak.
___ 24. When I'm upset, I feel like I can remain in control of my behaviors.
___ 25. When I'm upset, I feel guilty for feeling that way.
___ 26. When I'm upset, I have difficulty concentrating.
___ 27. When I'm upset, I have difficulty controlling my behaviors.
___ 28. When I'm upset, I believe there is nothing I can do to make myself feel better.
___ 29. When I'm upset, I become irritated with myself for feeling that way.
___ 30. When I'm upset, I start to feel very bad about myself.
___ 31. When I'm upset, I believe that wallowing in it is all I can do.
___ 32. When I'm upset, I lose control over my behaviors.
___ 33. When I'm upset, I have difficulty thinking about anything else.
___ 34. When I'm upset, I take time to figure out what I'm really feeling.
___ 35. When I'm upset, it takes me a long time to feel better.
___ 36. When I'm upset, my emotions feel overwhelming.

TMS

We are interested in what you just experienced. Below is a list of things that people sometimes experience. Fill in a numbered bubble next to each statement according to the following scale: **0** = Not at all; **1** = A little; **2** = Moderately; **3** = Quite a bit; **4** = Very Much.

	Not at all	**A little**	**Moderately**	**Quite a bit**	**Very much**
1. I experienced myself as separate from my changing thoughts and feelings	0	①	②	③	④
2. I was more concerned with being open to my experiences than controlling or changing them.	0	①	②	③	④
3. I was curious about what I might learn about myself by taking notice of how I react to certain thoughts, feelings or sensations.	0	①	②	③	④
4. I experienced my thoughts more as events in my mind than as a necessarily accurate reflection of the way things 'really' are.	0	①	②	③	④
5. I was curious to see what my mind was up to from moment to moment.	0	①	②	③	④
6. I was curious about each of the thoughts and feelings that I was having.	0	①	②	③	④
7. I was receptive to observing unpleasant thoughts and feelings without interfering with them	0	①	②	③	④
8. I was more invested in just watching my experiences as they arose, than in figuring out what they could mean.	0	①	②	③	④
9. I approached each experience by trying to accept it, no matter whether it was pleasant or unpleasant.	0	①	②	③	④
10. I remained curious about the nature of each experience as it arose.	0	①	②	③	④
11. I was aware of my thoughts and feelings without overidentifying with them.	0	①	②	③	④
12. I was curious about my reactions to things.	0	①	②	③	④
13. I was curious about what I might learn about myself by just taking notice of what my attention gets drawn to.	0	①	②	③	④

S-DERS

Please read each statement and indicate how much it applies to you **RIGHT NOW**. Fill in a numbered bubble next to each statement according to the following scale: **1** = Not at all; **2** = Somewhat; **3** = Moderately; **4** = Very Much; **5** = Completely.

	Not at all	**Some-what**	**Moderately**	**Very Much**	● Completely
1. I feel guilty for feeling this way.	①	②	③	④	⑤
2. I am paying attention to how I feel.	①	②	③	④	⑤
3. I feel out of control.	①	②	③	④	⑤
4. I am embarrassed for feeling this way.	①	②	③	④	⑤
5. I am feeling very bad about myself.	①	②	③	④	⑤
6. I am acknowledging my emotions.	①	②	③	④	⑤
7. I have no idea how I am feeling.	①	②	③	④	⑤
8. I feel ashamed with myself for feeling this way.	①	②	③	④	⑤
9. I am having difficulty doing the things I need to do right now.	①	②	③	④	⑤
10. I believe that I will continue feeling this way for a long time.	①	②	③	④	⑤
11. I care about what I am feeling.	①	②	③	④	⑤
12. I am angry with myself for feeling this way.	①	②	③	④	⑤
13. I am having difficulty controlling my behaviors.	①	②	③	④	⑤

14 . I am confused about how I feel.	①	②	③	④	⑤
15. I believe that I am going to end up feeling very depressed.	①	②	③	④	⑤
16. I am taking time to figure out what I am really feeling.	①	②	③	④	⑤
17. My emotions feel out of control.	①	②	③	④	⑤
18. I am irritated with myself for feeling this way.	①	②	③	④	⑤
19. I believe that my feelings are valid and important.	①	②	③	④	⑤
20. I feel like I'm a weak person for feeling this way.	①	②	③	④	⑤
21. My emotions feel overwhelming.	①	②	③	④	⑤

FFMQ

Please rate each of the following statements using the scale provided. Write the number in the blank that best describes <u>your own opinion</u> of what is <u>generally true for you</u>.

1	2	3	4	5
never or very rarely true	**rarely true**	**sometimes true**	**often true**	**very often or always true**

_____ 1. When I'm walking, I deliberately notice the sensations of my body moving.

_____ 2. I'm good at finding words to describe my feelings.

_____ 3. I criticize myself for having irrational or inappropriate emotions.

_____ 4. I perceive my feelings and emotions without having to react to them.

_____ 5. When I do things, my mind wanders off and I'm easily distracted.

_____ 6. When I take a shower or bath, I stay alert to the sensations of water on my body.

_____ 7. I can easily put my beliefs, opinions, and expectations into words.

_____ 8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.

_____ 9. I watch my feelings without getting lost in them.

_____ 10. I tell myself I shouldn't be feeling the way I'm feeling.

_____ 11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.

_____ 12. It's hard for me to find the words to describe what I'm thinking.

_____ 13. I am easily distracted.

_____ 14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.

_____ 15. I pay attention to sensations, such as the wind in my hair or sun on my face.

_____ 16. I have trouble thinking of the right words to express how I feel about things

_____ 17. I make judgments about whether my thoughts are good or bad.

_____ 18. I find it difficult to stay focused on what's happening in the present.

_____ 19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.

_____ 20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.

_____ 21. In difficult situations, I can pause without immediately reacting.

_____ 22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.

PLEASE TURN OVER □

1	2	3	4	5
never or very rarely true	**rarely true**	**sometimes true**	**often true**	**very often or always true**

_____ 23. It seems I am "running on automatic" without much awareness of what I'm doing.

_____24. When I have distressing thoughts or images, I feel calm soon after.

_____ 25. I tell myself that I shouldn't be thinking the way I'm thinking.

_____ 26. I notice the smells and aromas of things.

_____ 27. Even when I'm feeling terribly upset, I can find a way to put it into words.

_____ 28. I rush through activities without being really attentive to them.

_____ 29. When I have distressing thoughts or images I am able just to notice them without reacting.

_____ 30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.

_____ 31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.

_____ 32. My natural tendency is to put my experiences into words.

_____ 33. When I have distressing thoughts or images, I just notice them and let them go.

_____ 34. I do jobs or tasks automatically without being aware of what I'm doing.

_____ 35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.

_____ 36. I pay attention to how my emotions affect my thoughts and behavior.

_____ 37. I can usually describe how I feel at the moment in considerable detail.

_____ 38. I find myself doing things without paying attention.

_____ 39. I disapprove of myself when I have irrational ideas.

AAQ-II

Below you will find a list of statements. Please rate how true each statement is for you by circling a number next to it. Use the scale below to make your choice.

1	2	3	4	5	6	7
never true	**very seldom true**	**seldom true**	**sometimes true**	**frequently true**	**almost always true**	**always true**

1.	My painful experiences and memories make it difficult for me to live a life that I would value.	1	2	3	4	5	6	7
2.	I'm afraid of my feelings.	1	2	3	4	5	6	7
3.	I worry about not being able to control my worries and feelings.	1	2	3	4	5	6	7
4.	My painful memories prevent me from having a fulfilling life.	1	2	3	4	5	6	7
5.	Emotions cause problems in my life.	1	2	3	4	5	6	7
6.	It seems like most people are handling their lives better than I am.	1	2	3	4	5	6	7
7.	Worries get in the way of my success.	1	2	3	4	5	6	7

PANAS

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way **right now, that is, in the present moment.**

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

1) interested	1 2 3 4 5	11) irritable	1 2 3 4 5
2) distressed	1 2 3 4 5	12) alert	1 2 3 4 5
3) excited	1 2 3 4 5	13) ashamed	1 2 3 4 5
4) upset	1 2 3 4 5	14) inspired	1 2 3 4 5
5) strong	1 2 3 4 5	15) nervous	1 2 3 4 5
6) guilty	1 2 3 4 5	16) determined	1 2 3 4 5
7) scared	1 2 3 4 5	17) attentive	1 2 3 4 5
8) hostile	1 2 3 4 5	18) jittery	1 2 3 4 5
9) enthusiastic	1 2 3 4 5	19) active	1 2 3 4 5
10) proud	1 2 3 4 5	20) afraid	1 2 3 4 5

Appendix B

Scripts for Induction 1

Worry Condition Script

During this period, we would like you to create a worrisome state. Please refer to your list of worrisome topics. When I ask you to begin, please close your eyes and worry about your most worrisome topic, in the way you usually worry about it but as intensely as you can, until I ask you to stop and to open your eyes. If you normally worry about only one topic at a time, please try to do the same during this period. However, if your thoughts change to another worry topic during this period feel free to allow these thoughts to continue. It is all right to change topics during this period if the changes occur naturally during the worry process. Please close your eyes and begin. Keep going until I tell you to stop; I will let you know when the time is up. (*Five minute delay*). The time is up. Please move on to the next part of the survey.

No-Worry Control Script

During this period, we would like you to take a few minutes to think about what you did this past weekend. When I ask you to begin, please close your eyes and think about what you did last weekend, until I ask you to stop and to open your eyes. It may help to start by thinking about the three things that you listed above. Please close your eyes and begin thinking. Keep going until I tell you to stop; I will let you know when the time is up. (*Five minute delay*). The time is up. Please move on to the next part of the survey.

Appendix C

Scripts for Induction 2

Mindfulness Script

During this period, you will be guided through a meditation; I will let you know when the time is up. Please close your eyes, and listen to my voice. Begin by becoming comfortable in your seat, finding a place for your arms to rest, perhaps bringing both of your feet to the ground, taking an alert and relaxed body posture. Residing in the calm acceptance in the present without trying to fill it with anything. And start to notice your body, your physical sensations, as you switch from a mode of doing to a mode of non-doing. And take a moment to notice your breathing. Bring your full attention to the inbreaths, and the outbreaths. Let the breathing just happen, while observing it and feeling all of the sensations that are there, obvious and subtle. (*30-second pause*). Each time you notice your your mind is no longer on your breath, just see where it is. Then let go and come back to your belly and to your breathing (*20-second pause*). (*delay until the end of five minutes*). Begin to come back to your body, scanning all the way down from your nose to your throat, upper chest, ribcage, belly, hips, legs, feet. Take a deep, full breath. You can open your eyes, and please move on to the next part of the survey.

Thought Suppression Script

During this period, please notice occurrences of thoughts relevant to the topics you have listed. It is very important that you try as hard as you can to suppress your unwanted thoughts. So try not to think about your unwanted thoughts, but be sure to pay attention to whether or not the thoughts occur. It is important that you continue in the same way for the full time. Keep going until I tell you to stop; I will let you know when the time is up. (*Five minute delay*). The time is up. You can open your eyes, and please move on to the next part of the survey.

No-Strategy Control Script

During this period, we would like you to take a few minutes to think about the last three movies you watched. If you're not sure, just think about the last three that you remember clearly. When I ask you to begin, please close your eyes and think about these movies, until I ask you to stop and to open your eyes. Please close your eyes and begin thinking. Please keep going until I tell you to stop; I will let you know when the time is up. (*Five minute delay*). The time is up. You can open your eyes, and please move on to the next part of the survey.