

AWARENESS, ATTENTION, ACCEPTANCE: HOW MINDFULNESS AS AN
EMOTION REGULATION STRATEGY COULD REDUCE ANXIETY

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by
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Abstract

ATTENTION, AWARENESS, ACCEPTANCE: HOW MINDFULNESS AS AN EMOTION REGULATION STRATEGY COULD REDUCE ANXIETY

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This study examines how emotion regulation, particularly suppression and mindfulness, during stimulus encoding impacts feelings of anxiety at re-exposure. Prior research suggests that suppression is ineffective at changing negative feelings short-term, and may prolong or exacerbate negative emotions over time. In contrast, mindfulness-based therapies have been shown to reduce chronic negative affect in those suffering from psychopathological disorders such as generalized anxiety or PTSD. Prior research in our laboratory found that although mindfulness and suppression did not differ in short-term effectiveness, mindfulness improved stimulus memory in people who were highly anxious. This improved stimulus memory may in turn increase the calmness felt upon stimulus re-exposure. To test this hypothesis, I conducted a 2 (High vs. Low Anxiety) x 2 (Time 1 vs. Time 2) x 3 (Suppression vs. Natural (control) vs. Mindful regulation instruction) mixed experimental design. Participants completed the Beck Anxiety Inventory as a screen, allowing for selection of the upper and lower quartiles of anxiety scores for analyses. At Time 1, participants viewed a series of pictures under different

emotion regulation strategies, and rated each for levels of calmness and unhappiness experienced. At Time 2, participants viewed and rated the same pictures without instruction conditions. The anticipated hypotheses were not supported; there were no long-term effects of regulation on calmness. Moreover, the high-anxiety group remained less calm regardless of instruction or Time Point. This suggests that short-term use of emotion regulation does not impact feelings of calmness long-term.

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Awareness, attention, acceptance: How mindfulness as an emotion regulation strategy

could reduce anxiety

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Abstract

This study examines how emotion regulation, particularly suppression and mindfulness, during stimulus encoding impacts feelings of anxiety at re-exposure. Prior research suggests that suppression is ineffective at changing negative feelings short-term, and may prolong or exacerbate negative emotions over time. In contrast, mindfulness-based therapies have been shown to reduce chronic negative affect in those suffering from psychopathological disorders such as generalized anxiety or PTSD. Prior research in our laboratory found that although mindfulness and suppression did not differ in short-term effectiveness, mindfulness improved stimulus memory in people who were highly anxious. This improved stimulus memory may in turn decrease the arousal felt upon stimulus re-exposure. To test this hypothesis, I conducted a 2 (High vs. Low Anxiety) x 2 (Time 1 vs. Time 2) x 3 (Suppression vs. Natural (control) vs. Mindful regulation instruction) mixed experimental design. Participants completed the Beck Anxiety Inventory as a screen, allowing for selection of the upper and lower quartiles of anxiety scores for analyses. At Time 1, participants viewed a series of pictures under different emotion regulation strategies, and rated each for levels of arousal and valence experienced. At Time 2, participants viewed and rated the same pictures without instruction conditions. The anticipated hypotheses were not supported; there were no long-term effects of regulation on arousal. Moreover, the high-anxiety group remained more aroused regardless of instruction or time point. This suggests that short-term use of emotion regulation does not impact feelings of arousal long-term.

Keywords: emotion regulation, mindfulness, suppression, anxiety, memory

Awareness, Attention, Acceptance: How Mindfulness as an Emotion Regulation Strategy
Could Reduce Anxiety

The concept of mindfulness has existed in the Eastern world for several centuries, with the past twenty years showing rapid growth in the incorporation of mindfulness-based therapies into Western medicine. Mindfulness-based stress reduction therapy (MBSR) was the first of such therapies to be introduced into Western clinical practice in the early 1980s (Call, Miron, & Orcutt, 2014; Kabat-Zinn, 1982). The initial goal of MBSR was not to treat psychological disorders. Rather, the intention was to help improve stress-related physical problems (such as chronic pain) by cultivating awareness and acceptance in a non-judgmental manner. Subsequent research has shown significant reductions in psychological symptomology for those individuals engaged in mindfulness-based training programs: MBSR has proven itself to be an effective intervention in the treatment of anxiety, depressive, and panic- or stress-related disorders (Call et al., 2014; Rapgay et al., 2013).

Since MBSR's introduction, mindfulness-based techniques have been incorporated into multiple psychotherapies such as Dialectical Behavioral Therapy, Acceptance and Commitment Therapy, Cognitive Behavioral Therapy, and mindfulness-based Cognitive Behavioral Therapy (Follette, Palm, & Pearson, 2006; Frye & Spates, 2012). Beyond these programs, practices such as yoga, tai chi, body scans, even simple breathing exercises have been shown to increase mindfulness use in both clinical and non-clinical populations (Caldwell, Emery, Harrison, & Greeson, 2011; Call et al., 2014; Dick, Niles, Street, DiMartino, & Mitchell, 2014; Frye & Spates, 2012). According to mindfulness theory, this externally-oriented physical awareness fosters more internally-

oriented awareness of anxiety-triggering thoughts and emotions (Kabat-Zinn, 2005; Rapgay et al., 2013). In becoming more aware of both physical and mental sensations, one can better determine how to respond to these situations.

While research has not reached a consensus on how mindfulness improves anxiety and stress-related symptoms, several theories exist which attempt to explain this relationship (Nitzan-Assayag et al., 2017). Among these theories, the most relevant for the current study suggests that mindfulness reduces anxiety sensitivity. A cognitive predictor of PTSD, anxiety, depressive disorders, and panic disorders, anxiety sensitivity may be defined as the fear of anxiety or related symptoms (Elwood, Hahn, Olatunji, & Williams, 2009; Frye & Spates, 2012). Those high in anxiety sensitivity tend to judge symptoms of psychological distress, such as intrusive memories and negative affect, to be harmful, unacceptable, even intolerable (Elwood et al., 2009; Reiss, 1991). Because of this, those high in anxiety sensitivity may engage in avoidant strategies like suppression in order to avoid the experience of negative emotion.

In contrast to avoidance and suppression, being mindful during exposure or re-exposure to anxiety-provoking stimuli may help “over-write” the fear associated with the experience of anxiety. Exposure-based therapies operate on two basic principles: first, fear structures require activation before they can be changed and second, physical or cognitive exposure to fear-inducing stimuli activates these fear structures (Foa, 1986). Once activated, new conflicting information can be introduced and integrated into the structure. Such information can overwrite the connection between the memory and the fear. Thus, repeated exposure and repeated introduction of new information should eventually allow the individual to break down the fear-memory association. This

phenomenon is known as the violation of expectancy and is key in reducing feelings of anxiety.

It is important to note that in prolonged exposure therapy, memories of the traumatic event are not merely forgotten. Rather, they are faced and re-encoded in a different context, removing the fear and anxiety associated with the memory and the circumstances under which it was originally encoded (Foa, 1986). The current study proposes that encoding under stressful or anxiety-inducing situations will have an impact on the anxiety experienced at the time of recall. Mindfulness during time of encoding may break the anxiety sensitivity-fear cycle, allowing re-exposure without anxiety and fear.

This review examines the constructs of mindfulness and emotion regulation in depth and how they work together with memory in the etiology, maintenance, and treatment of various psychopathological disorders, particularly anxiety.

What is Mindfulness?

Mindfulness, as it originated in Buddhism, is concerned with awareness, attention, and non-judgmental acceptance of the sensations and feelings of the mind and body. The mindfulness literature posits that anxiety-inducing thoughts and emotions are not inherently triggering, but rather it is the *expectations*, or the views surrounding these experiences, that trigger the anxiety response (Collard & Walsh, 2008). For those high in anxiety sensitivity, this may be the expectation of negative consequences as a result of experiencing anxiety; For instance, the fear of judgment or social ostracization once their anxiety is noticed. The end goal of mindfulness and mindfulness-based therapies is to

train the client to change their view of these experiences, to the point where their response to these experiences is one of observation, acceptance, and release.

Researchers have yet to reach consensus on a single operational definition for mindfulness, although it is generally agreed that two pillars of mindfulness are attention and awareness, with several researchers agreeing on acceptance as a third pillar (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Call et al., 2014; Hofmann, Sawyer, Witt, & Oh, 2010; Rapgay et al., 2013; Vujanovic, Niles, Pietrefesa, Schmertz, & Potter, 2011). In the current study, mindfulness is defined as the intentional effort of practicing present-moment acceptance and awareness without judgment or conscious attempts to manipulate the emotion at hand (Call et al., 2014; Lalot, Delplanque, & Sander, 2014). In order to understand the complex construct that is mindfulness, it may be advantageous to examine how mindfulness' individual components of awareness, attention, and acceptance interact with each other to affect change.

Awareness. The first step in gaining mindfulness skills is the attainment of mind, body, and emotion awareness. This present-moment awareness can be defined as the continuous monitoring of experience, with an emphasis on monitoring *current* experiences, rather than ruminating on past or future events (Donald, Atkins, Parker, Christie, & Ryan, 2016). Cultivation of present-moment awareness is essential to the regulation and management of emotions; ignorance of an emotional state, whether intentional or unintentional, does not lend itself to healthy and effective regulation.

Becoming more aware of thoughts and feelings in the present moment allows one to determine how little or how much attention is appropriate to allot to these sensations. Awareness of current experiences can also foster acceptance of the affective response,

thus increasing the number of ways we can appropriately respond to a stressful situation (Donald et al., 2016; Vujanovic et al., 2011). Mindful awareness can take on an investigative nature, allowing observation and subsequently deeper understanding of the relationships between thoughts, feelings, and actions from a third-person perspective (Bishop et al., 2004).

Beyond increasing one's repertoire of situationally appropriate responses, awareness is thought to foster attentional skills. In becoming more aware of external and internal phenomena, individuals with anxiety, for instance, learn which sensations are "normal" and which can be attributed to their anxiety disorder. An appropriate response (as opposed to a reflexive or avoidant-based response) can then be selected to effectively cope with the situation. The application of such present-moment awareness on a daily basis can reduce stress, anxiety and depressive symptoms, in addition to increasing well-being and positive mood (Donald et al., 2016). State and trait awareness have also been associated with the infrequent use of avoidant coping strategies, with one study finding that individuals who self-reported higher levels of present-moment awareness on a daily basis were less likely to use avoidance-based strategies as coping mechanisms (Donald et al., 2016).

Attention. Once someone becomes better at monitoring their experiences, the next step requires paying attention to what is important. Emotional stimuli by nature automatically attract attention, especially negative stimuli (Banich et al., 2009; Kensinger & Corkin, 2003; LeBlanc, McConnell, & Monteiro, 2015). Individuals with anxiety disorders often have cultivated a learned avoidance response that automatically redirects attention from negative emotional information (Banich et al., 2009). On the opposite end

of the spectrum are those who pay too much attention to the peripheral aspects of negative experiences, in the form of worry or rumination. Dwelling unproductively on negative thoughts evoked from the experience does not allow acceptance to take place, which is key in most therapies aimed at treating depressive and anxious symptoms.

With both a lack of attention (avoidance) and too much attention on the wrong stimuli (rumination) leading to emotional distress, research in the field should focus on the necessary methods for effective attentional deployment. A key component of mindfulness is clarity and flexibility of attention (Nitzan-Assayag et al., 2017), sometimes referred to as “cognitive flexibility.” Cognitive flexibility allows an individual to easily shift and reallocate their attention, which may subsequently increase emotion regulation capabilities and reduce anxiety. Cognitive flexibility is positively correlated with working memory capacity (WMC), emotion regulation abilities, and present moment awareness (Jha, Krompinger, & Baime, 2007; Schmeichel, Volokhov, & Demaree, 2008).

Due to the role it plays in promoting cognitive flexibility, mindfulness is considered by many researchers to be a form of mental training, rather than a relaxation technique (Bishop et al., 2004). The intention of mindfulness training is to reduce cognitive vulnerabilities and their impact on development and maintenance of psychiatric disorders. Becoming better able to attend to and accept the experiences of the present moment may allow for a wider range of coping abilities, giving those who practice mindfulness the opportunity to respond in a reflective manner to their current situation, instead of a reflexive manner (Bishop et al., 2004; Shapiro, Carlson, Astin, & Freedman,

2006). The goal of mindfulness training is that this reflective reaction is one of acceptance.

Acceptance. In mindfulness practice, acceptance is simply experiencing thoughts, feelings, or events as transient experiences without attaching evaluative judgment to them (Hayes, 1994). The antithesis of avoidance-based strategies (such as suppression), nonjudgmental acceptance may allow individuals with high levels of negative emotionality to experience better outcomes when these negative emotions arise (Campbell-Sills, Barlow, Brown, & Hofmann, 2006). In fact, mindfulness is a key component of Acceptance and Commitment Therapy (ACT), which teaches clients to notice emotions without actively trying to control or manipulate them (Baer, 2003; Hayes, 1994; Hayes, Strosahl, & Wilson, 2003). Acceptance has been shown to improve psychological functioning, for both non-clinical populations and clinical populations diagnosed with panic disorders, depression, and anxiety disorders (especially GAD; Aldao et al., 2010).

Emotion Regulation and Emotional Disorders

Several psychological disorders are associated with increased use of maladaptive emotion regulation strategies (avoidance, suppression, and rumination) and reduced use of adaptive strategies (mindfulness). Gross (2013) defines emotion regulation as the process by which we shape our emotions, what they are, and how and when they occur. Effective emotion regulation is characterized by two components: the ability to tolerate strong emotions (both positive and negative) without feeling overwhelmed, and the ability to assert a degree of control over these emotions when needed (Price, Monson, Callahan, & Rodriguez, 2006). Gross (2013) also identifies three core features of the

emotion regulation process: goal, strategy, and outcome. Essentially, we attempt to control the affective outcome of the situation by controlling our emotions. This can be done by identifying what we hope to accomplish, selecting what we deem the best strategy for accomplishing this goal, and then facing the outcome of those decisions (Gross, 2013). Researchers have identified various domains of effective emotion regulation, including awareness and acceptance of emotions and access to appropriate emotion regulation strategies called for by various situations (Tull, Barrett, McMillan, & Roemer, 2007).

Emotion regulation and anxiety. Emotion regulation difficulties are common in several various psychopathologies, including anxiety disorders. For example, a recent meta-analysis found that habitual use of avoidance and suppression is associated with greater symptoms of anxiety (Aldao et al., 2010). This type of emotion dysregulation is considered to be a defining characteristic of several disorders, including PTSD and Generalized Anxiety Disorder (Badour & Feldner, 2013; Dick et al., 2014; Jerud, Pruitt, Zoellner, & Feeny, 2016; Kashdan, Breen, & Julian, 2010; Price et al., 2006; Seligowski, Rogers, & Orcutt, 2016; Tull et al., 2007).

Avoidance as a strategy can be internal or external. External avoidance can include avoiding physical situations, places, or people that could trigger anxiety and negative affective reactions. Internal avoidance can take the form of avoiding thinking about or suppressing thoughts of a traumatic event and associated triggering stimuli. Avoidance can therefore be thought of as the opposite of exposure, taking attention away from important emotions, thoughts, and experiences necessary for healthy emotion regulation (Foa, 1986; Tull et al., 2007).

An avoidant strategy commonly employed by those with anxiety, suppression is response-focused and can take the form of expressive or thought suppression (Aldao et al., 2010). Expressive suppression is defined as a way of regulating one's response by inhibiting emotionally expressive behavior (Gross, 1998; Gross & John, 2003). Thought suppression is commonly associated with PTSD and involves avoiding thoughts and memories. While expressive suppression may allow us to act in a more socially acceptable manner, when applied inflexibly this strategy does more harm than good: Suppression has been linked with increased negative affect, decreased positive affect, poor memory performance, and increases in anxiety (Gross & John, 2003; Richards & Gross, 2000).

The literature on the emotion regulation-psychopathology relationship generally finds that avoidance and suppression are associated with the etiology and maintenance of these disorders (Aldao et al., 2010). Though these strategies may alleviate anxiety in the short-term, the cognitive and behavioral consequences that occur from their chronic use may be responsible for more long-term negative consequences. Avoidance in particular tends to prolong suffering and can actually prevent therapies from being effective (Frye & Spates, 2012).

Cognitive and behavioral consequences of avoidance and suppression. The goal of avoidant strategies is to reduce the anxiety, negative emotions and behavioral reactions associated with exposure to triggering stimuli by reducing contact with those stimuli (Kashdan et al., 2010). Memories and emotions associated with traumatic events are usually overwhelming: A hallmark of PTSD, for example, is the experience of uncontrollable fear and anxiety (Price et al., 2006). Avoidance of triggering event-related

thoughts or other similar situations is a commonly employed strategy used by people with PTSD to reduce feelings of anxiety and fear (Kashdan et al., 2010). The use of avoidance as a strategy in such short-term situations is not inherently negative and can be effective in momentarily alleviating anxiety. An unintended consequence of this temporary alleviation, however, is an overreliance on avoidance to the detriment of long-term wellness. Use of an avoidant strategy allows a brief respite from the triggered anxiety, thus increasing the likelihood it will be used again when one is confronted with a triggering situation (Badour & Feldner, 2013). That is, the use of avoidance is negatively reinforced by the reduction of anxiety.

Unfortunately, habitual use of avoidance tends to paradoxically increase anxiety, negative affect, and intrusive emotions and thoughts over time (Follette et al., 2006). Chronic avoidance of anxiety-provoking situations may prolong symptoms by not allowing the necessary extinction training to take place (Badour & Feldner, 2013). Extinction training requires the aforementioned fear structure activation in order to reach effectiveness. If a memory is not recalled, the fear structure cannot be activated and thus cannot be overwritten.

Suppression has similar, negative cognitive consequences. Richards and Gross (2000) found that people who chronically used suppression also reported poorer memory in their daily lives. Several additional studies have found that suppression during exposure to an upsetting stimulus may reduce memory for that stimulus (e.g., Bonanno, Papa, Lalande, Westphal, & Coifman, 2004; Dillon, Ritchey, Johnson, & LaBar, 2007; Emery & Hess, 2011; Richards & Gross, 2000). Furthermore, suppression at the time of retrieval prevents fear structure activation. These effects are typically attributed to the

cognitively demanding nature of suppression. Constantly monitoring one's emotional state demands cognitive resources and attention.

As discussed previously, attentional deployment is a major factor in healthy emotion regulation strategies, particularly for mindfulness. It follows that a task that demands self-focus and self-directed attention (such as suppression of negative thoughts) results in attentional deficits outside of the self. This attention is not being deployed to one's environment, or to one's judgment of the most effective regulation strategy to use as a response to this environment. As response-focused strategies (ones that are implemented after the emotional response begins), both expressive and thought suppression are more cognitively demanding strategies than an antecedent-focused regulation strategy, such as mindfulness (Richards & Gross, 2000).

This impact on memory is of particular importance to the current study and in the literature. Repeated exposure to fear-provoking memories facilitates extinction processes, allowing this memory-fear connection to be broken down and rewritten into a new emotional context that does not evoke fear and anxiety upon thoughtful processing. Some researchers have hypothesized that antecedent-focused strategies (such as mindfulness) may be less cognitively demanding, and therefore improve memory (among the already discussed benefits of mindfulness). Prior research conducted by the current study's investigator examined this very question.

Mindfulness: How Better Encoding May Facilitate Extinction Processes

Previous research has found that mindfulness therapy can reduce anxiety, negative affect, depressive symptoms, and use of avoidance (Call et al., 2014; Vujanovic et al., 2011). Hofmann and colleagues (2010) conducted a meta-analysis of 39 studies and

1,140 participants examining the effectiveness of mindfulness-based therapies in reducing anxiety and depression. Findings indicated that mindfulness-based therapies tended to significantly reduce anxiety and depressive symptoms for a wide variety of disorders, with more significant results experienced by those with more severe anxiety (Hofmann et al., 2010). Studies conducted using MBSR-based yoga as therapy for individuals with PTSD have also found promising results in the reduction of anxiety, negative affect, even reduction in severity of PTSD symptoms (Dick et al., 2014; Frye & Spates, 2012). Kaur, Murphy, and Smith (2016) reported a reduction of PTSD symptoms in two individuals who were taught to be aware of their surroundings and their reactions to their environment; this awareness also increased the benefits of their exposure therapy.

Mindfulness may act as a type of cognitive exposure therapy: By paying attention to and increasing awareness of thoughts and emotions usually avoided, extinction training can take place (Rapgay et al., 2013; Vujanovic et al., 2011). Extinction is the unlearning of a contingency or association between a stimulus and response. In terms of the present study, extinction is the long-term dissociation between an anxiety-inducing stimulus and the fear response (Foa, 1986). Extinction involves removing the beliefs about the experienced anxiety. This anxiety causes such an extreme fear response because it is perceived as a threat; those who experience the anxiety expect extreme negative consequences as a result. The key to exposure therapy is to violate these expectations, changing the context of the connection (Foa, 1986).

Extinction training is normally facilitated through repeated exposure to and confrontation of negative experiences, thoughts, and emotions, reducing the likelihood of a negative response to anxiety-inducing stimuli (Foa, Gillihan, & Bryant, 2013). As

previously mentioned, the key idea is that exposure facilitates expectation violation (Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014). For example, most phobias are founded on specific expectations; i.e. if someone is afraid of snakes, they might believe that being in the same room as the snake for 10 minutes will result in them being bitten by the snake. If they communicate this expectancy and proceed to sit in a room with a snake for several minutes without anything happening, then their expectations have been violated. For people with entrenched fears, expectation violation typically has to occur several times over several sessions before fear reduction is seen, as the stimulus and the fear response become slowly uncoupled (Craske et al., 2014). Avoidance, in not allowing this expectation violation to take place, does not give us the chance to unpair the conditioned stimulus (CS) and the conditioned response (CR). That is, when regulating via avoidance, exposure to triggering stimuli never occurs, expectations are not violated, and thus extinction training cannot take place (Badour & Feldner, 2013).

Prolonged exposure therapy (PE) is the most common means through which such extinction training is facilitated. Along with fostering expectancy violation, repetitive exposure facilitates extinction by repeatedly presenting stimuli out of their original context, in hopes of uncoupling the CS and CR, thus reducing the typical fear response (Badour & Feldner, 2013; Craske et al., 2014; Cusack et al., 2016; Frye & Spates, 2012). While prolonged exposure remains the most effective treatment, some studies suggest that PE alone may not be enough; attrition is a common occurrence amongst patients receiving the therapy for PTSD, with some studies reporting drop-out rates as high as 50% (Cusack et al., 2016; Rapgay et al., 2013). A reason for this may be that patients suffering from PTSD are not emotionally able to process the overwhelming negative

emotions they have fought to avoid for so long. Unequipped to tolerate re-exposure, they cease treatment.

Mindfulness training prior to PE may help alleviate these attrition problems. An illustration of this potential can be seen in the following case study. Researchers in England found that PE was ineffective for two patients suffering from PTSD. Upon introducing the patients to awareness/mindfulness practices prior to imaginal exposure, the researchers found that the awareness/mindful component enhanced the positive effects of the PE treatment (Kaur et al., 2016). Frye and Spates (2012) reported similar findings during another case study. The patient, diagnosed with PTSD, showed no symptom improvement in response to prolonged exposure therapy. Researchers noted a steep reduction in both anxiety and symptoms of PTSD when they introduced the patient to emotion regulation therapy in the form of mindfulness training *before* prolonged exposure therapy (Frye & Spates, 2012; Price et al., 2006). These results suggest that mindfulness training may increase tolerance to threatening stimuli, thus reducing the likelihood of attrition and increasing the benefits of PE (Badour & Feldner, 2013; Jerud et al., 2016).

Finally, findings from two prior studies suggests that mindfulness can improve memory for emotional stimuli in highly anxious people (Knight, 2016; Pechanek, 2015). For example, I examined the effects of suppression and mindfulness on affect, anxiety, and memory for images viewed in the study (Knight, 2016). After a brief training on both suppression and mindfulness, participants viewed a series of images meant to induce positive or negative feelings. These images were viewed under suppression, mindfulness, and natural/no regulation conditions, and were each rated for levels of valence and

arousal. At the end of the study, participants were given a surprise recall test, to see how many pictures and picture details they could remember from the study. Results showed that high-anxiety participants showed better memory for images encoding under mindfulness instructions, and reported less arousal during both regulation conditions, in comparison with their lower-anxiety counterparts. For high-anxiety participants, therefore, mindfulness had the benefit of decreasing short-term arousal with the *added* benefit of better memory encoding. A limitation of the prior study, however, was that the potential long-term benefits of better encoding were not investigated. The current study is designed to address that limitation.

Current Study

In the current study, higher and lower anxiety participants performed the same training and received similar instruction as in Knight (2016), without the immediate memory test. They returned to the lab one week later for re-exposure to the encoded stimuli in the form of an old-new recognition test. At re-exposure, participants were exposed to both previously encoded stimuli and new stimuli matched on valence and arousal. They rated their emotional response to each stimulus and indicated whether the stimulus was previously encountered or was new. I expected to replicate my prior findings with respect to memory; the main dependent variable for the current study is the participants' emotional responses to previously encountered stimuli. For the purposes of the study, arousal was operationalized as *calmness* and valence operationalized as *unhappiness*: higher calmness ratings indicate higher levels of calmness, while higher unhappiness ratings indicate higher levels of unhappiness. Together, the calmness and unhappiness ratings serve to represent the participant's affective responses to the stimuli

presented in the study. Based on the existing research, I hypothesized that mindfulness, as an independent variable, will significantly reduce the amount of anxiety (displayed through increased calmness ratings) experienced by participants *over time*.

Specifically, I hypothesized an interaction between instruction condition and time point on affective responses, such that calmness ratings at Time 2 would be lower than Time 1 scores for pictures encoded under suppression instructions, indicating an increase in anxiety over time. Conversely, calmness ratings for those pictures encoded under the mindfulness condition would be higher at Time 2 than Time 1, indicating a decrease in anxiety over time. I also expected to find a significant three-way interaction between instruction condition, time point, and trait anxiety, such that the interaction between instruction condition and time point would be stronger for higher-anxiety participants.

Method

Design

This study is a 2 (Trait Anxiety: High vs. Low) x 3 (Instruction Condition: Natural vs. Mindful vs. Suppress) x 2 (Time of Testing: Time 1 vs. Time 2) mixed design. Trait anxiety is a between-subjects variable, with Instruction Condition and Time of Testing as within-subjects variables.

Participants

Prior to enrollment in the study, 300 undergraduate students completed the Beck Anxiety Inventory (BAI) online to assess their levels of trait anxiety. Scores in the top and bottom quartiles of this sample ($BAI > 22$ or $BAI < 10$, respectively) were then used as selection criteria for the experimental portion of the study. Participants in both the original sample of 300, and a subsequent sample of 60, who met the BAI criteria were

invited to participate in the full study. The sample size for the full study was determined by a conducting a power analysis with information provided by Hofmann et al.'s (2010) meta-analysis, which examined the effects of mindfulness-based therapies on anxiety and related symptoms across multiple disorders. According to their analysis of 39 studies, mindfulness training decreases anxiety over time with a moderate-to-large effect size. Using this information, an a priori power analysis indicated that a total sample size of 54 participants (27 per group) would be necessary to detect differences in change over time between the two trait anxiety groups in the mindfulness condition. All participants were compensated with course credit for their time. Because of the idiosyncrasies of using course credit for compensation, the final sample was slightly larger than the planned sample.

A total of 61 participants (45 women: $M_{age} = 19.58$, $SD_{age} = 1.45$) completed the Time 1 experimental session; 56 of these also completed the Time 2 session. The five participants who did not complete the second study session were about equally likely to come from the high and low anxiety subgroups [$N_{High} = 3$ (all women), $BAI M = 41.67$, $N_{Low} = 2$ (1 man, 1 woman), $BAI M = 0$]. However, it should be noted that all three high anxiety individuals who did not complete the study were diagnosed with both Generalized Anxiety Disorder and Panic Disorder, with one of these individuals also reporting diagnosis of a social phobia. These three individuals also had relatively high BAI scores compared to the rest of the High Anxiety group (see below). Out of the remaining 27 participants classified as high anxiety, 10 reported receiving diagnoses of Generalized Anxiety Disorder (GAD), with 2 of these 10 participants also reporting being diagnosed with Panic Disorder.

The final sample size therefore included 30 High Anxiety participants (28 women; $M_{BAI} = 33.83$, $SD_{BAI} = 8.19$) and 31 Low Anxiety participants (17 women; $M_{BAI} = 3.87$, $SD_{BAI} = 3.03$). Although there was a higher proportion of women in the high anxiety group than in the low anxiety group, rerunning the analyses excluding the men in the sample did not change the results reported below.

Materials and Equipment

E-Prime. E-Prime experimental software was used to present the pictures and record responses. E-Prime allows for randomization of images and instruction conditions between subjects (Schneider, Eschman, & Zuccolotto, 2002). In addition to this randomization, E-Prime also allows for the precise, standardized collection of data in preparation for analyses.

Self-Assessment Manikins (SAMS). Self-Assessment Manikins were used to illustrate to participants the emotional response corresponding with their numerical categorizations. These Manikins are displayed as cartoons of people experiencing varying levels of calmness and unhappiness. Calmness Manikins illustrate increasingly high levels of calmness by showing agitation decreasing as the rating scale shifts from ratings of 1 to ratings of 5. Unhappiness Manikins display increasing levels of happiness through facial expressions: The Manikins are proceed from smiling figures to frowning figures as the rating scale shifts from 1 to 5. Scales such as these, employing graphic methods of representation, help to mediate potential issues stemming from verbal self-report measures (Morris, 1995).

Picture Stimuli. Pictures were selected from the International Affective Pictures System (IAPS; Lang, Bradley, & Cuthbert, 2001). The IAPS is a database of emotional

images, used in many prior studies and normed for valence and arousal levels. The pictures selected for this study were a mixture of positive and negative images. The 72 images were selected so that the positive and negative images have very similar normed arousal ratings ($M_{Positive} = 5.86$, $M_{Negative} = 5.60$) and very different normed valence ratings ($M_{Positive} = 3.31$, $M_{Negative} = 7.21$), where higher scores indicate higher levels of arousal and negative affect, respectively. The selected images were then divided into two sets of 36 each. One set of images was presented at encoding (Time 1), and was mixed with the second set of 36 images for recognition testing at Time 2. The set presented at encoding was counterbalanced across participants. The full list of stimuli used is presented in Appendix A.

Beck Anxiety Inventory. The Beck Anxiety Inventory (BAI) was used as a screening tool, with participants completing the measure on the SONA system to assess which category they fall into (high vs. low anxiety) for the purposes of the study: Higher scores indicate higher levels of anxiety. The BAI is a 21-item self-report measure, designed to assess an individual's anxiety severity (Beck, Epstein, Brown, & Steer, 1988). The inventory has been used to differentiate between both anxious (such as those with Obsessive Compulsive Disorder) and non-anxious (such as those with Major Depressive Disorder) groups. Items ask participants how often in the past week they have experienced particular symptoms of anxiety disorders, such as "Feeling nervous" and "Unable to relax." Participants respond to each item on a scale of 0-3, where 0 = "Not at all" and 3 = "Severely-Could barely stand it". This measure was chosen to screen participants because it was used in two prior lab studies (Knight, 2016; Pechanek, 2015).

Manipulation check. At the end of each trial block (Mindful-Positive, Mindful-Negative, etc.), participants were asked to respond to all three of the following statements to assess how well they followed the given instructions:

“I tried to view the images as if I was watching television.”

“As I was viewing the images I attempted to inhibit any outward expression of what I was feeling.”

“As I was viewing the images I attempted to notice how I felt without trying to change how I felt.”

Participants were asked to rate on a scale from 1 to 5 how often they had followed the given instructions in the preceding block, where 1 = “Never” and 5 = “Almost Always.”

Procedure

This study was approved by the Institutional Review Board on October 30th, 2017 (Appendix B). Prior to beginning the study, participants completed two consent forms. The first consent form was an online form, filled out prior to completing the Beck Anxiety Inventory through the Appalachian State SONA system. Individuals scoring in the upper and lower quartiles were invited to participate in the study.

Participants filled out the second consent form (Appendix C) in person when coming in for the Time 1 study session. The consent form was completed prior to the introduction of mindfulness and suppression as emotion regulation strategies. Participants were given the opportunity to briefly practice these strategies (see Appendix D for the full study script) before proceeding with the study session.

The introduction to suppression consisted of a definition of suppression being provided; this was followed by having participants view a short emotional video clip,

with instructions to suppress their emotions while viewing the clip. Mindfulness practice consisted of a brief introduction to the concept of mindfulness, followed by a 12-minute guided sitting meditation. This guided meditation was part of a series of home training courses on CD-ROM, led by Dr. Jon Kabat-Zinn. The original version was 45 minutes long; due to time constraints, the version used in the current study was abbreviated to 12 minutes.

After these brief introductions, participants viewed the series of pictures taken from the IAPS. Prior to beginning the study, participants were randomly assigned to Order A or Order B, each containing 36 images. These pictures were viewed on a computer screen using E-Prime software. There were six “blocks,” or conditions under which the 36 (18 positively valenced, 18 negatively valenced) pictures were viewed. Each block contained six pictures, with 2 blocks per instruction condition (suppress, mindful, and natural): one block containing positively valenced pictures and one block containing negatively valenced pictures. The order of the blocks and the pictures within each valenced block were randomly determined by the E-Prime program for each participant to control for order effects. After viewing each picture, participants were asked to rate on a Likert-type scale from 1 to 5 their levels of unhappiness (1 = “Very Negative”, 5 = “Very Positive”) and levels of calmness (1 = “Aroused”, 5 = “Calm”).

At the beginning of each block, the computer screen displayed the instruction condition under which the participant should encode the following set of images. This was denoted by a single word (either “Suppress”, “Mindful”, or “Natural”) in the middle of the screen, followed by a single sentence description reminding the participants of the nature of the given regulation strategy. For instance, “Suppress” was followed by “While

watching the pictures, hide any outward expression of how you feel”, “Mindful” was followed by “While watching the pictures, pay attention to the way you feel without trying to change it”, and “Natural” was followed by “Watch the pictures naturally, as if you were watching them on television”. Adherence to the experimental manipulation was assessed by requiring participants to rate on a scale from 1 to 5 how often they had regulated their emotions using mindful strategies, suppression strategies, or no strategies (natural condition). The questions were presented at the end of each of the six blocks which comprised the Time 1 image set.

Participants then pressed the spacebar on the keyboard to view the images when they were ready to do so. Each image was presented on the screen for 10 seconds, after which a second and third screen appeared, containing the Self-Assessment Manikins (SAMS) for rating unhappiness and calmness, respectively. Participants were not given a time limit in which to make their rating. The next IAPS image appeared immediately after the participant entered their calmness response. These responses were made by pressing the appropriate number key on the computer keyboard. After viewing all 36 images, the Time 1 testing session was complete, and participants were asked to return for the second portion of the study at Time 2.

One week after Time 1 testing, participants returned to the same lab for Time 2 testing. This time was similar to Time 1 testing, with a few exceptions. First, participants were not given suppression or mindful instructions at the outset of this session, but instead viewed the same 36 pictures that were presented in the previous trial, in addition to 36 new images, presented as distractors and not previously seen by the participants, for a total of 72 pictures. At Time 2, these pictures were not separated into “blocks” by

valence and instruction condition, as they were at Time 1. These images were viewed on the same computer screen, with each image appearing on screen for 10 seconds before the participant was asked to rate their unhappiness and calmness responses, respectively. Participants once again made these ratings on a scale from 1 to 5 in response to each picture, using the number keys on the keyboard. After making each rating, the participant were also asked to indicate whether the image was viewed previously at Time 1 (“Old”) or whether the image was not viewed at Time 1 (“New”).

Results

Manipulation Check

Due to a programming error, manipulation check data was only recorded for 19 out of the 61 participants (9 high anxiety, 10 low anxiety). To determine how well participants adhered to the instructions, three separate 3 (Instruction Condition) x 2 (Image Valence) x 2 (Trait Anxiety) mixed ANOVAs were conducted, one with each of the three manipulation check questions as dependent variables. These results are depicted in Figure 1.

For the mindfulness manipulation check (“As I was viewing the images I attempted to notice how I felt without trying to change how I felt”), there was a significant main effect of Instruction Condition, $F(2, 34) = 17.19, p < .001, \eta_p^2 = .50$; no other effects were statistically significant (all F 's < 2.1 , all p 's $> .13$). Simple contrasts indicated that scores on the mindfulness manipulation check were higher under mindfulness instructions than under either natural instructions, $F(1, 17) = 12.69, p = .002, \eta_p^2 = .43$, or suppress instructions, $F(1, 17) = 28.77, p = .002, \eta_p^2 = .63$.

For the suppression manipulation check (“As I was viewing the images I attempted to inhibit any outward expression of what I was feeling”), there was also a significant main effect of Instruction Condition, $F(2, 34) = 46.37, p < .001, \eta_p^2 = .73$; no other effects were statistically significant (all F 's < 1.1 , all p 's $> .34$). Simple contrasts indicated that scores on the suppression manipulation check were higher under suppression instructions than under either natural instructions, $F(1, 17) = 66.26, p < .001, \eta_p^2 = .80$, or mindfulness instructions, $F(1, 17) = 35.94, p < .001, \eta_p^2 = .68$.

Finally, for the natural manipulation check (“I tried to view the images as if I was watching television”), there was a significant main effect of both Instruction, $F(2, 34) = 13.91, p < .001, \eta_p^2 = .45$ and Anxiety Level, $F(1, 17) = 5.41, p = .033, \eta_p^2 = .24$; no other effects were statistically significant (all F 's < 2.23 , all p 's $> .12$). Simple contrasts indicated that scores on the natural manipulation check were higher under natural instructions than under either mindfulness, $F(1, 17) = 13.20, p = .002, \eta_p^2 = .44$, or suppression instructions, $F(1, 17) = 22.42, p < .001, \eta_p^2 = .57$. The main effect of anxiety reflects higher scores (thus more compliance) in high anxiety participants ($M = 4.20, SD = 0.27$) than in low anxiety participants ($M = 3.35, SD = .25$).

In sum, it appears that participants closely followed instructions, suppressing when told to suppress and being mindful when told to do so, indicating that the experimental manipulation was successful.

Recognition Accuracy

Although not a primary hypothesis, I anticipated replicating our lab's prior findings about memory: that high anxiety participants' memory would benefit from encoding under mindfulness instructions compared to suppression instructions. To test

this prediction, a 3 (Instruction Condition) x 2 (Image Valence) x 2 (Trait Anxiety) mixed ANOVA was run on hit rates (correctly saying an old picture was old). The ANOVA indicated a significant main effect of image valence, $F(1, 54) = 6.03, p = .017, \eta_p^2 = .10$, with negatively valenced photos having higher hit rates ($M = .87, SE = .02$) than positively valenced photos ($M = .83, SE = .03$). No other effects were statistically significant (all F 's < 1.6 , all p 's $> .20$). In particular for my prediction, there was no effect of instruction condition, $F(2, 108) = 1.07, p = .35, \eta_p^2 = .02$, nor an interaction between instruction condition and trait anxiety, $F(2, 108) = 1.61, p = .21, \eta_p^2 = .03$.

To determine if memory was truly “better” for negative pictures than for positive ones, the false alarm rates (incorrectly identifying a new picture as old) were also analyzed using a 2 (Image Valence) x 2 (Trait Anxiety) mixed ANOVA. This ANOVA indicated a large, statistically significant main effect of image valence, $F(1, 54) = 43.25, p < .001, \eta_p^2 = .45$, such that negative images ($M = .21, SE = 0.02$) produced nearly two times as many false alarms as positive images ($M = .11, SE = 0.02$). No other effects were statistically significant (all F 's < 0.11 , all p 's $> .75$). Negative images therefore appear to elicit higher rates of “Old” responses than positive images, even when the images are new, suggesting that participants had a response bias on the memory test.

Calmness Ratings

My primary hypotheses focused on changes over time in calmness ratings. First, I anticipated a significant two-way interaction between instruction condition and time point, such that images encoded under suppression would result in reduced calmness upon re-exposure at Time 2, with the opposite holding true for images encoded under mindfulness. Second, I predicted a significant three-way interaction between instruction

condition, time point, and trait anxiety, with more significant Time 1-Time 2 differences in calmness ratings for high anxiety participants.

To test these hypotheses, data were analyzed using a 3 (Instruction Condition) x 2 (Image Valence) x 2 (Time Point) x 2 (Trait Anxiety) mixed ANOVA, with self-reported calmness ratings as the dependent variable. Instruction condition, image valence, and time point were within-subjects variables, and trait anxiety was the between-subjects variable.

Primary hypotheses. The first hypothesis predicted an Instruction Condition x Time Point interaction; the results for this interaction are depicted in Figure 2. The ANOVA results indicated that this effect was not statistically significant, $F(2, 108) = 2.09, p = .129, \eta_p^2 = .04$, suggesting that encoding instructions did not impact change over time in calmness ratings. The three-way Instruction Condition x Time Point x Trait Anxiety interaction predicted by the second hypothesis was also not statistically significant, $F(2, 108) = 1.20, p = .305, \eta_p^2 = .02$.

Other effects. There were significant main effects of image valence and trait anxiety on calmness ratings. The effect of image valence, $F(1, 54) = 117.42, p < .001, \eta_p^2 = .69$, indicated that people reported being less calm when viewing negative images ($M = 3.32, SE = .10$) than when viewing positive images ($M = 4.06, SE = .09$). The effect of trait anxiety, $F(1, 54) = 12.20, p = .001, \eta_p^2 = .18$, indicated that high anxiety participants reported being significantly less calm ($M = 3.38, SE = 0.13$) than low anxiety participants ($M = 4.00, SE = 0.12$). Neither of the other main effects were significant; $F(2, 108) = 1.11, p = .33, \eta_p^2 = .02$ for instruction, $F(1, 54) = 0.32, p = .58, \eta_p^2 = .01$ or for time point, $F(1, 54) = 0.32, p = .58, \eta_p^2 = .01$.

There was also a significant two-way interaction between image valence and time point, $F(1, 54) = 9.47, p = .003, \eta_p^2 = .15$, such that negatively valenced images evoked marginally more calmness over time, $t(55) = -1.73, p = .09$, while the calmness evoked by positive images did not change over time, $t(55) = 0.87, p = .39$. This resulted in a slightly smaller difference in calmness ratings between negative and positive images at Time 2 than at Time 1.

No other interactions reached statistical significance, but there were two marginal interactions involving trait anxiety: a marginal two-way interaction between Trait Anxiety & Time Point, $F(1, 54) = 3.43, p = .069, \eta_p^2 = .06$, and a marginal three-way interaction between Trait Anxiety, Instruction, and Valence, $F(2, 108) = 2.58, p = .08, \eta_p^2 = .05$. The Trait Anxiety x Time Point interaction suggested that high and low anxiety participants responded differently across time. Within the high-anxiety group, there was no main effect of time point, indicating that high anxiety participants' calmness levels did not change over time ($M_{T1} = 3.43, SE_{T1} = 0.14; M_{T2} = 3.34, SE_{T2} = 0.13; F(1, 26) = 0.58, p = .45, \eta_p^2 = .02$). In contrast, low anxiety participants reported marginally increased calmness at time 2 compared to time 1, ($M_{T1} = 4.18, SE_{T1} = 0.14; M_{T2} = 4.32, SE_{T2} = 0.12; F(1, 28) = 4.63, p = .04, \eta_p^2 = .14$). The three-way interaction suggested that the impact of image valence on calmness ratings varied with both trait anxiety and instruction condition. That is, there was a significant Valence x Trait Anxiety interaction in the Mindfulness condition, $F(1, 54) = 6.03, p = .017, \eta_p^2 = .10$, but not the Suppress, $F(1, 54) = 0.08, p = .77, \eta_p^2 = .002$, or Natural condition, $F(1, 54) = 2.19, p = .14, \eta_p^2 = .04$ (see Figure 3).

Exploratory Analysis: Unhappiness Ratings

The experimental manipulation in the current study appeared successful, given the aforementioned significant ANOVA results. Therefore, it is somewhat surprising that emotion regulation had no significant impact on either memory or calmness ratings. This prompted me to investigate the impact of the experimental manipulation on the participants' self-reported unhappiness ratings. Data were analyzed using a 3 (Instruction Condition) x 2 (Image Valence) x 2 (Time Point) x 2 (Trait Anxiety) repeated measures ANOVA, examining unhappiness ratings as the dependent variable. As with the calmness ratings, this analysis indicated significant main effects of valence, $F(1, 54) = 272.24, p < .001, \eta_p^2 = .83$, and trait anxiety, $F(1, 54) = 7.25, p = .009, \eta_p^2 = .12$, and a Valence x Time Point interaction, $F(1, 54) = 6.77, p = .012, \eta_p^2 = .11$.

Unlike the calmness ratings, there was also a significant Instruction Condition x Image Valence x Time Point interaction, $F(2, 108) = 5.23, p = .007, \eta_p^2 = .09$. Analyses also found a marginal Instruction Condition x Time Point x Trait Anxiety interaction, $F(2, 108) = 3.00, p = .054, \eta_p^2 = .05$. No other effects were statistically significant (All F 's < 1.57 , all p 's $> .21$).

To further understand the nature of the Instruction Condition x Image Valence x Time Point interaction, separate Instruction Condition x Time Point ANOVAs were conducted within each level of Image Valence. For negative images, only the effect of Time Point was statistically significant, $F(1, 54) = 10.58, p = .002, \eta_p^2 = .16$. For positive images, there was a significant Instruction Condition x Time Point interaction, $F(1, 54) = 5.11, p = .008, \eta_p^2 = .09$. As may be seen in Table 1, these results may simply indicate less extreme scores at Time 2. Upon re-exposure, without instruction condition, these

ratings may have returned to normality, in which case positive images would become less extremely positive (thus appearing to become more negative), with the opposite holding true for negatively valenced images.

To further understand the nature of the Instruction Condition x Time Point x Trait Anxiety interaction, separate Instruction Condition x Time Point ANOVAs were conducted within each Trait Anxiety group (see Figure 4). There were no significant main effects or interactions found for the High Anxiety group. However, for the Low Anxiety group, there was a significant two-way interaction between Instruction and Time Point, $F(2, 56) = 3.76, p = .029, \eta_p^2 = .12$. This interaction indicated that images encoded under suppression decreased unhappiness over time, $M_{T1} = 2.83, SE_{T1} = 0.11, M_{T2} = 2.67, SE_{T2} = 0.09, t(28) = 2.41, p = .023$. There was no significant Time 1-Time 2 difference in the other two conditions.

Discussion

This study was designed to examine whether engaging in mindfulness, rather than suppression, during stimulus exposure resulted in increased calmness during stimulus re-exposure. Similar to exposure therapy, mindfulness should have allowed participants to allocate attention towards their current experience, thus improving their memory for the event and rendering it more calming when re-experienced one week later. Suppression, on the other hand, is a form of experience avoidance that results in poor stimulus memory and decreased calmness over time. Finally, individuals with high levels of trait anxiety were expected to receive more benefits from mindfulness than individuals with low trait anxiety.

Despite a seemingly effective experimental manipulation of the emotion regulation strategy used at encoding (“Instruction Condition”), neither of the hypotheses about calmness ratings were supported: There was no Instruction Condition x Time Point interaction, nor was there an Instruction Condition x Time Point x Trait Anxiety interaction. Moreover, although prior research found that images encoded under suppression resulted in poorer memory than images encoded mindfully (Knight, 2016; Pechanek, 2015), analyses indicated that neither instruction nor anxiety level significantly impacted hits (correctly judging old images as such) or false alarms (incorrectly judging new items as old).

Exploratory analyses suggested that participants’ unhappiness ratings was dependent on the emotion regulation strategy used at encoding. Specifically, these analyses indicated that while all conditions showed increased happiness for negatively valenced images over time, encoding positive images under mindfulness instructions actually increased the unhappiness felt upon re-exposure.

Methodological Issues

Before turning to the theoretical implications of these results, some methodological issues relating to the rejection of the original hypotheses need to be addressed. First, insensitive measurement may have played a role in both the memory and affective response. For calmness, participants were asked to rate on a scale from 1 to 5 how aroused or calm they felt after viewing an image. Despite its successful use in prior single-session research, this five-point scale may not have been sensitive enough to detect small, subtle changes in participants’ calmness responses over time. It could also have

been advantageous to collect more objective, physiological data from participants (e.g., heart rate or skin conductance responses) to quantify calmness.

For memory, providing only two response options (old-new) may have resulted in a ceiling effect for hit rates. These high hit rates may also be due to the length of time participants were allowed to encode the images at Time 1, as each image was presented in E-Prime for 10 seconds (as opposed to 5 seconds in Knight, 2016, and Pechanek, 2015). Furthermore, asking participants to recognize rather than recall images may have contributed to this ceiling effect: Recognition is less cognitively effortful than recall (e.g., Erk et al., 2003). Our dichotomous old-new recognition task, in not requiring more active recall of information, may not have been sensitive enough to be influenced by different emotional contexts at encoding.

Additionally, the week-long period between encoding and retrieval may have facilitated consolidation of the stimuli viewed in the study, compared to the immediate memory test in the prior studies. Recent research suggests that sleep may serve as an effective consolidation mechanism, improving memory for emotional stimuli (but not for neutral stimuli; Payne & Kensinger, 2018). It may be that several nights of sleep between study sessions served to consolidate the images in the long-term memories of the participants. This consolidation process, combined with prolonged encoding time and the emotional nature of the stimuli, may not have allowed participants to forget what they had seen.

A further methodological issue in the current study may be a lack of power. The estimate of sample size necessary to detect an effect in the current study was calculated using Hofmann et al.'s (2010) meta-analysis of 39 studies examining mindfulness.

Although an a priori power analysis indicated a sample of 54 participants was necessary to detect a moderate effect size, the nature of the studies within the meta-analysis was not taken into consideration. Those studies were designed to allow participants to gain mindfulness skills over time, which may have led to the moderate effect sizes they found. Unintentionally, then, this study may have been underpowered. A further indication of this possibility is the number of marginally significant effects found in our analyses. These findings, therefore, should be considered for similar future studies and in conjunction with our more significant findings.

Finally, although calmness ratings were initially selected as the primary dependent variable and “representative” for participants’ affective states, results suggest that unhappiness ratings were actually more sensitive to the type of emotion regulation participants used. It is not immediately clear why unhappiness, but not calmness, ratings were more impacted by emotion regulation. Closer examination of this difference is beyond the purpose of the current study; however, it may benefit future studies in this domain to explore these relationships.

Theoretical Implications

Short vs. long term effects of suppression and mindfulness. Beyond measurement and power issues, what do these findings say about the use of mindfulness and suppression to regulate one’s emotions? First, it appears that short-term or one-time suppression use may not be particularly detrimental to long-term mood. The suppression condition in the current study did not significantly reduce calmness or impair memory, and did not impact how people felt about negative images over the long-term. It should be noted that most of the prior research linking suppression to poor psychological health

is correlational (e.g., Aldao et al., 2010). Experimental research in which suppression is manipulated and mood is measured is more equivocal about whether suppression impacts mood (Kalokerinos, Greenaway, & Denson, 2015). In fact, suppression has been shown to be advantageous in various social situations, as long as one remains flexible about its use. Bonanno et al.'s (2004) research on "expressive flexibility" shows that the ability to adapt one's expression to match the social situation predicts long-term adjustment, without the detriments typically associated with overreliance on a single strategy such as suppression. Similar to mindfulness, suppression may also be an acquired "skill", such that repetitive practice may be required before there can be an impact of the use of suppression on affective responses.

With respect to mindfulness, the current study found little effect of short-term use of mindfulness on affective experience. As noted in the previous discussion of power, prior research on the efficacy of mindfulness interventions uses extensive training and practice in the technique, rather than a single use. Most of the benefits of mindfulness training, including "better" memory and increased cognitive flexibility, likely come about through the *cultivation* of effective attentional deployment, awareness of external and internal sensations, and the ultimate acceptance of these sensations. The current study, in focusing on short-term effects, would not have allowed the extensive practice of these techniques that may be required for them to be effective. In fact, it may be that those who engage in therapeutic mindfulness training share similar experiences with our participants in the initial stages of therapy; this would account for the aforementioned high rates of attrition in exposure-based therapies.

Related to this short- vs. long-term practice issue, the hypotheses of the current study relied on the assumption that mindfulness overwrites established fear connections through a process known as “extinction training.” However, overwriting requires that there be a connection between stimulus and response to begin with. In not being exposed to these images repeatedly, participants may not have formed any sort of connection (fear-based or otherwise) between the images and their responses to these images. With no connection to extinguish, mindfulness may not have been able to impact the calmness responses of participants in the current study. In not being repeatedly exposed to the anxiety inducing stimuli, the participants may only have experienced this initial discomfort, with none of the benefits typically associated with either prolonged exposure or mindfulness-based therapies.

Finally, although prior research has found that mindfulness and suppression differentially impact memory, the current results hint at possible boundary conditions for these effects. One fruitful avenue for future research would be to more carefully consider how these emotion regulation strategies interact with stage of memory processing. Prior research has shown that emotion can differentially impact each of the three stages of the memory process of encoding, consolidation, and retrieval (Kensinger, 2009). Specifically, emotional content (e.g., the stimuli used) has more of an impact on memory processes during encoding, while emotional context (e.g., the conditions surrounding the stimuli) typically has more of an impact during retrieval (Erk et al., 2003; Kensinger, 2009; LeBlanc et al., 2015).

The results of the current study may be interpreted in this framework if we consider emotion regulation as an emotional (albeit internal) context and consider

valence as the emotional content of the stimulus itself. Because there was no context reinstatement during the second study session, it may have contributed to the lack of difference between conditions in terms of memory accuracy. Reinstating a mindfulness context at retrieval, for instance, may have facilitated better recall of images encoded under mindfulness instructions. This lack of context reinstatement may also explain why there was no effect of instruction on calmness ratings. Reinstatement may have brought about the heightened (or reduced) calmness anticipated from the mindfulness and suppression conditions, respectively.

Implications for anxiety disorders. Finally, what do these results imply about treatment for anxiety disorders? The only strong and consistent finding related to trait anxiety was that the high anxiety group felt more anxious (e.g., more aroused and more negative) than the low anxiety group overall. Moreover, the marginal two-way interaction between trait anxiety and time point showed high anxiety participants did not become calmer across time points, while low anxiety participants did. The marginally significant three-way interaction between valence, anxiety level, and instruction showed that the lowest rates of calmness were reported by high anxiety participants instructed to regulate their response to negatively valenced images, as compared to the natural condition. And with respect to unhappiness ratings, emotion regulation had little impact on how unhappy the high anxiety participants felt. Taken together, this suggests that emotion regulation made high-anxiety participants less happy and did nothing to increase their low calmness levels.

With respect to treatment for anxiety disorders, perhaps mindfulness-based therapies aimed at treating anxiety disorders should take into consideration the exposure-

based nature of mindfulness and the associated risks. Exposure therapies, though effective, are associated with high levels of attrition (Cusack et al., 2016; Rappay et al., 2013). In understanding the origin of the discomfort experienced by those engaging in therapy, modifications to existing therapeutic structures may be implemented to reduce attrition. Higher anxiety participants within the current study appeared to experience discomfort as a result of being instructed to regulate their emotions. Mindfulness in particular requires exposure to overwhelming emotions, with participants reporting the lowest levels of calmness in both the suppression and mindfulness conditions during encoding. This should be taken into consideration when mindfulness-based therapies are recommended and implemented. Furthermore, it may be the case that the third stage of mindful regulation, acceptance, is the all-important factor. The current study, in focusing on the attention and awareness components of mindfulness, may not have painted a complete picture of mindful regulation. If this non-judgmental acceptance is the driving force behind mindfulness' effectiveness, then mindfulness-based therapies may be aimed at reducing anxiety *sensitivity*, rather than anxiety itself. As discussed in the introduction, anxiety sensitivity results in one avoiding anxiety-inducing situations at all cost, due to fears about the sensation of anxiety. Mindfulness therapies, in emphasizing non-judgmental acceptance of emotional reactions, may show participants that these feelings are not harmful, that experiencing them will not cause long-term damage. This may not change how participants experience anxiety, but may allow them to confront their anxiety (and related triggering stimuli) without adverse reactions.

Conclusions

The results of the current study imply that short-term usage of emotion regulation strategies such as suppression or mindfulness may have little to no long-term impact on either memory or affective experience. This is not the first time that suppression has been found less detrimental than anticipated and mindfulness, less beneficial. This may be particularly true for high anxiety participants who experience chronically high levels of negative affect on a daily basis. This prolonged experience is unlikely to be disrupted with a brief introduction to an unfamiliar regulation strategy. These results appear to further support the aforementioned flexibility hypothesis, positing that one-time *non-habitual* employment of strategies such as suppression may be beneficial, and not as harmful as previously believed. These results also illustrate the need to practice mindfulness diligently, with dedication and commitment, if beneficial results are desired.

The results of the current study may illustrate the struggles experienced by those engaging in mindfulness-based therapies; initial exposure to thoughts and emotions typically avoided will be uncomfortable and overwhelming, as mindfulness skills are underdeveloped at this stage. This may be particularly true for high-anxiety participants who have experienced chronic levels of anxiety and negative affect. If the results of this study have indeed allowed a glimpse into the affective state of individuals going through therapies, it is important that this information is communicated to individuals in therapy or who may be considering therapy. When they have yet to experience relief from their chronic symptoms after the first few weeks, they may decide to discontinue therapy. It is important they are made aware of this possibility, and informed that this does not indicate a lack of progress or benefit from the therapy. This further illustrates the usefulness of

longitudinal study examining the development of mindfulness skills over time. For the time being, this initial discomfort should be taken into consideration by both therapists and those seeking therapy to improve participant experience and reduce attrition rates from potentially beneficial therapies.

In sum, single use regulation strategies may not be powerful enough to impact stimulus memory or affective experience in the long term; suppression was not as harmful as anticipated, nor was mindfulness as helpful as anticipated. These results bear further investigation into the short-term vs. long-term effects of different emotion regulation strategies.

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Table 1

Change over time in “unhappiness” (valence ratings)

Instruction-Valence	Time 1		Time 2		<i>t</i> (55)	<i>p</i>	95% CI		Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			<i>LL</i>	<i>UL</i>	
Mindful-Negative	3.54	0.60	3.38	0.64	2.84	.006	0.05	0.27	0.38
Mindful-Positive	2.14	0.54	2.25	0.60	-2.02	.049	-0.23	-0.00	-0.29
Natural-Negative	3.51	0.55	3.37	0.61	2.66	.010	0.04	0.25	0.35
Natural-Positive	2.16	0.51	2.29	0.57	-1.95	.056	-0.27	0.00	-0.26
Suppress-Negative	3.49	0.64	3.39	0.59	1.82	.074	-0.01	0.21	0.24
Suppress-Positive	2.29	0.66	2.21	0.52	1.02	.311	-0.08	0.24	0.14

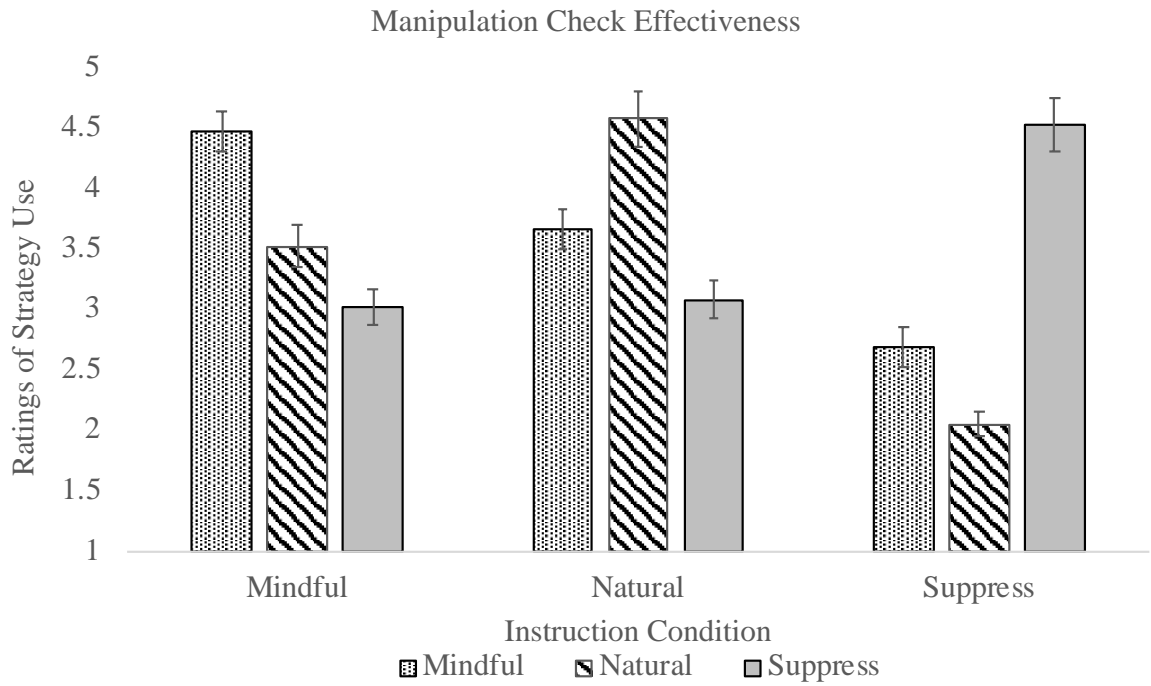


Figure 1. Average scores on manipulation checks provided at Time 1, where the axis represents the instruction provided, and each bar represents the response to each manipulation check question under that condition.

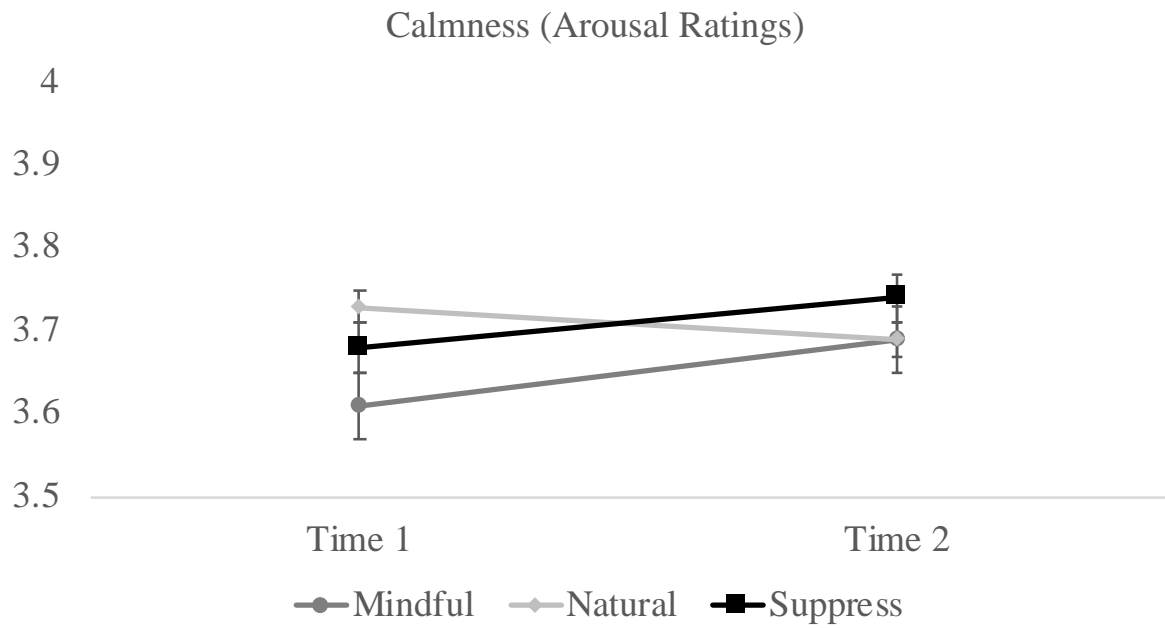


Figure 2. Average scores showing increases in ratings of calmness across time points under each instruction condition, collapsed across valences.

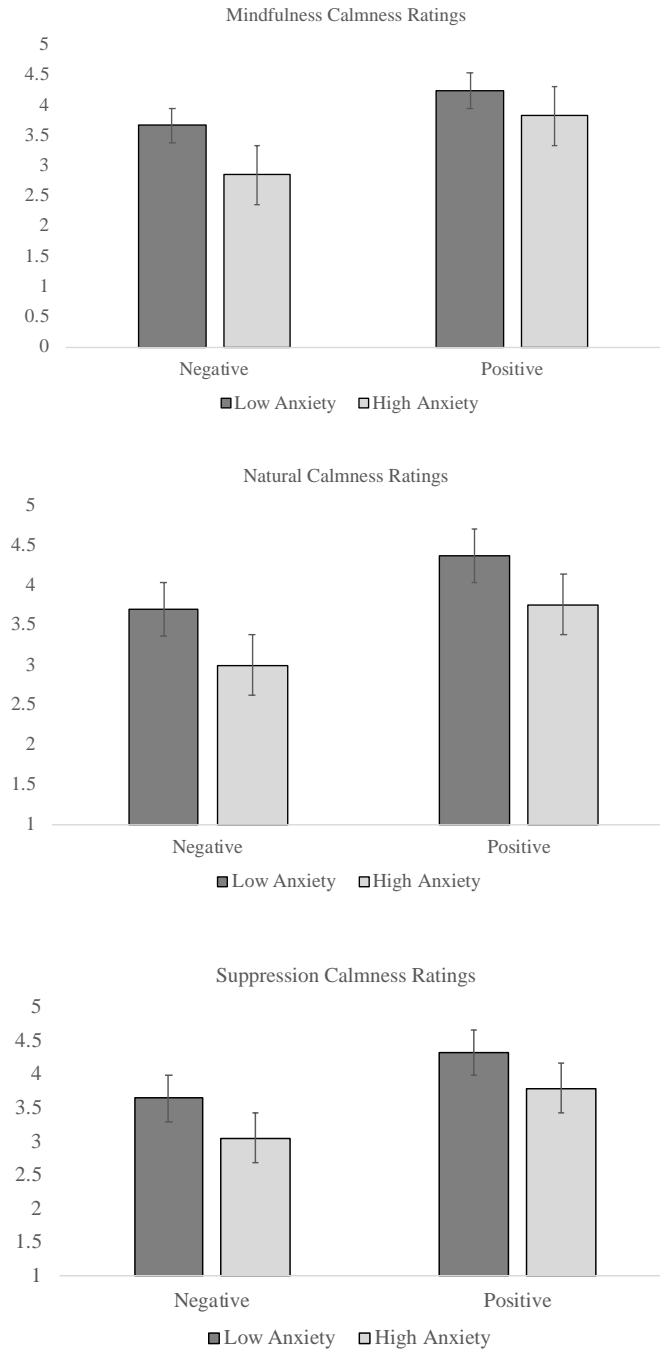


Figure 3. Graphs illustrating the interaction between anxiety level and valence under mindfulness instructions (top panel), natural instructions (middle panel), and suppression instructions (bottom panel).

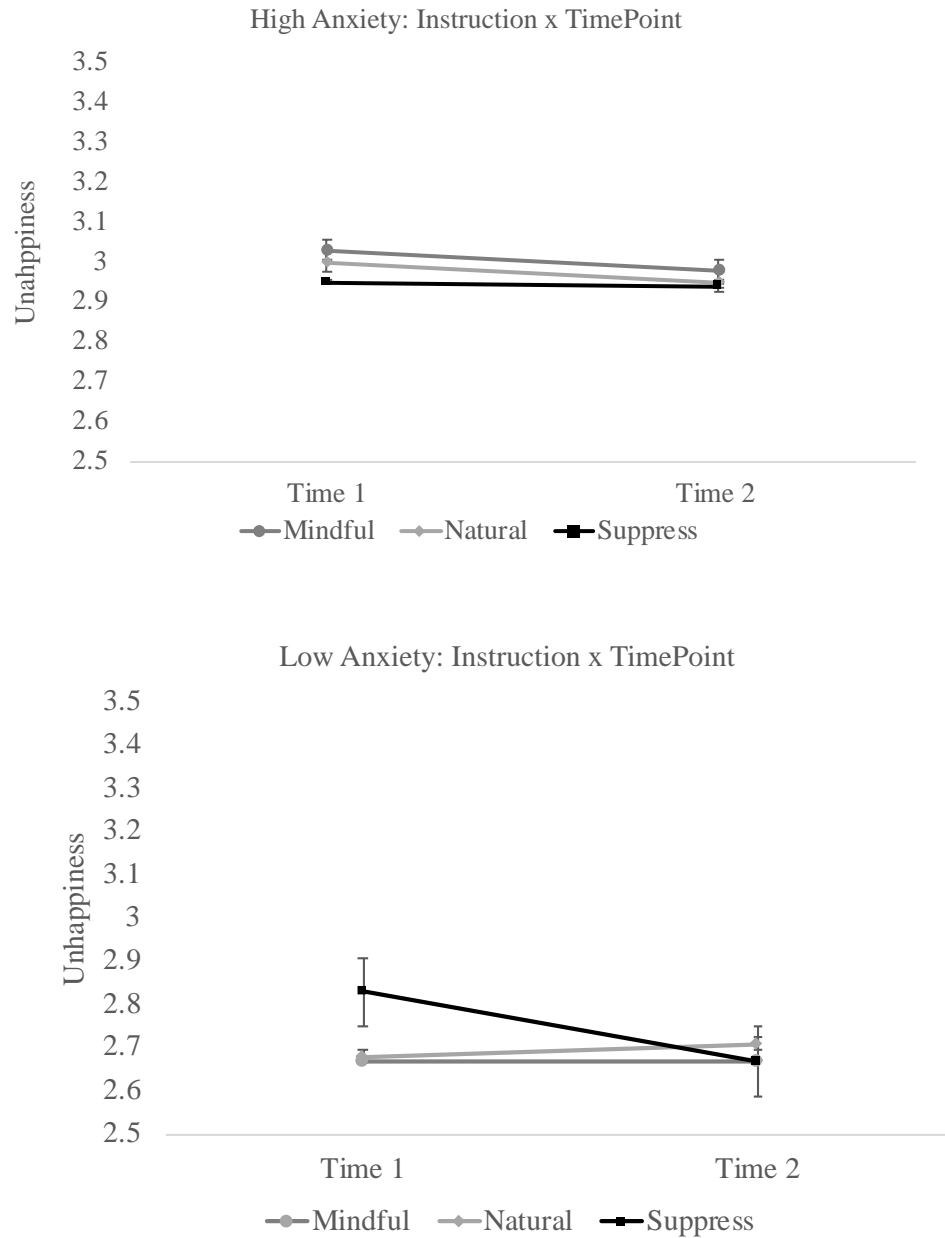


Figure 4. Instruction x Time Point Interaction effect on unhappiness (valence) ratings for high anxiety participants (top panel) and low anxiety participants (bottom panel).

Appendix A*IAPS images and normed ratings used for List A*

Image Label	Valence Label	Valence Rating [M (SD)]	Arousal Rating [M (SD)]
1050	Negative	3.46 (2.15)	6.87 (1.68)
1201	Negative	3.55 (1.88)	6.36 (2.11)
1463	Positive	7.45 (1.76)	4.79 (2.19)
1932	Negative	3.85 (2.11)	6.47 (2.20)
2045	Positive	7.87 (1.19)	5.47 (2.34)
2055.1	Negative	3.15 (1.84)	4.95 (2.11)
2120	Negative	3.34 (1.91)	5.18 (2.52)
2151	Positive	7.32 (1.63)	4.37(2.13)
2340	Positive	8.03 (1.26)	4.90 (2.20)
2682	Negative	3.69 (1.65)	4.48 (2.10)
2691	Negative	3.04 (1.73)	5.85 (2.03)
3022	Negative	3.70 (1.91)	5.88 (2.08)
3211	Negative	4.15 (1.91)	5.72 (1.94)
4597	Positive	6.95 (1.65)	5.91 (1.86)
4626	Positive	7.60 (1.66)	5.78 (2.42)
5450	Positive	7.01 (1.60)	5.84 (2.40)
5470	Positive	7.35 (1.62)	6.02 (2.26)
5700	Positive	7.61 (1.46)	5.68 (2.33)
5833	Positive	8.22 (1.08)	5.71(2.66)
5910	Positive	7.80 (1.23)	5.59 (2.55)
6211	Negative	3.62 (2.07)	5.90 (2.22)
6250.1	Negative	2.63 (1.74)	6.92 (1.92)
6300	Negative	2.59 (1.66)	6.61 (1.97)
6312	Negative	2.48 (1.52)	6.37 (2.30)
7481	Positive	6.53 (1.78)	4.92 (2.13)
7499	Positive	6.47 (1.57)	5.58 (2.16)
7502	Positive	7.75 (1.40)	5.91 (2.31)
7650	Positive	6.62 (1.91)	6.15 (2.24)
8251	Positive	6.16 (1.68)	6.05 (2.12)
8470	Positive	7.74 (1.53)	6.14 (2.19)
8503	Positive	7.02 (1.71)	5.22 (2.59)
9050	Negative	2.43 (1.61)	6.36 (1.97)
9582	Negative	4.18 (2.28)	5.29 (2.21)
9592	Negative	3.34 (1.75)	5.23 (2.09)
9908	Negative	2.34 (1.49)	6.63 (2.13)
9921	Negative	2.04 (1.47)	6.52 (1.94)

IAPS images and normed ratings for List B

Image Label	Valence Label	Valence Rating [M (SD)]	Arousal Rating [M (SD)]
1120	Negative	3.79 (1.93)	6.93 (1.68)
1202	Negative	3.35 (1.77)	5.94 (2.17)
1710	Positive	8.34 (1.12)	5.41 (2.34)
1930	Negative	3.79 (1.92)	6.42 (2.07)
2040	Negative	8.17 (1.60)	4.64 (2.54)
2070	Positive	8.17 (1.46)	4.51 (2.74)
2100	Negative	3.85 (1.99)	4.53 (2.57)
2208	Positive	7.35 (1.68)	5.68 (2.34)
2216	Positive	7.57 (1.31)	5.83 (2.20)
2347	Positive	7.83 (1.36)	5.56 (2.34)
2457	Negative	3.20 (1.51)	4.94 (2.01)
2681	Negative	4.04 (1.60)	4.97 (2.26)
3210	Negative	4.49 (1.91)	5.39 (1.91)
4599	Positive	7.12 (1.48)	5.69 (1.94)
5626	Positive	6.71 (2.06)	6.10 (2.19)
5825	Positive	8.03 (1.18)	5.46 (2.72)
5890	Positive	6.67 (1.75)	4.60 (2.30)
5920	Positive	5.16 (1.92)	6.23 (2.08)
6260	Negative	2.44 (1.54)	6.93 (1.93)
6315	Negative	2.31 (1.69)	6.38 (2.39)
6350	Negative	1.90 (1.29)	7.29 (1.87)
6834	Negative	2.91 (1.73)	6.28 (1.90)
7230	Positive	7.38 (1.65)	5.52 (2.32)
7640	Positive	5.00 (1.31)	6.03 (2.46)
7660	Positive	6.61 (1.70)	5.59 (2.23)
8158	Positive	6.53 (1.66)	6.49 (2.05)
8190	Positive	8.10 (1.39)	6.28 (2.57)
8250	Positive	6.19 (1.62)	5.04 (2.49)
8501	Positive	7.91 (1.66)	6.44 (2.29)
8540	Positive	7.48 (1.51)	5.16 (2.37)
9424	Negative	2.87 (1.62)	5.78 (2.12)
9584	Negative	3.34 (1.57)	4.96 (2.15)
9590	Negative	3.08 (1.63)	5.41 (2.23)
9900	Negative	2.46 (1.39)	5.58 (2.13)
9925	Negative	2.84 (1.35)	5.59 (2.23)
9927	Negative	2.71 (1.56)	5.29 (1.91)

Appendix B

IRB Approval

To: Rebekah Knight
Psychology
CAMPUS EMAIL

From: Dr. Andrew Shanely, IRB Chairperson

Date: October 30, 2017

RE: Notice of IRB Approval by Expedited Review (under 45 CFR 46.110)

STUDY #: 18-0012

STUDY TITLE: Short Term and Long Term Effects of Emotion Regulation

Submission Type: Initial

Expedited Category: (6) Collection of Data from Recordings made for Research Purposes,(7) Research on Group Characteristics or Behavior, or Surveys, Interviews, etc.

Approval Date: 10/30/2017

Expiration Date of Approval: 10/29/2018

The Institutional Review Board (IRB) approved this study for the period indicated above. The IRB found that the research procedures meet the expedited category cited above. IRB approval is limited to the activities described in the IRB approved materials, and extends to the performance of the described activities in the sites identified in the IRB application. In accordance with this approval, IRB findings and approval conditions for the conduct of this research are listed below.

1. Log into IRBIS
2. Click "Home" on the top toolbar
3. Click "My Studies" under the heading "All My Studies"
4. Click on the IRB number for the study you wish to access
5. Click on the reference ID for your submission
6. Click "Attachments" on the left-hand side toolbar
7. Click on the appropriate documents you wish to download

Approval Conditions:

Appalachian State University Policies: All individuals engaged in research with human participants are responsible for compliance with the University policies and procedures, and IRB determinations.

Principal Investigator Responsibilities: The PI should review the IRB's list of PI responsibilities. The Principal Investigator (PI), or Faculty Advisor if the PI is a student, is ultimately responsible for ensuring the protection of research participants; conducting sound ethical research that complies with federal regulations, University policy and procedures; and maintaining study records.

Study Regulatory and other findings:

The IRB determined that this study involves minimal risk to participants.

All approved documents for this study, including consent forms, can be accessed by logging into IRBIS. Use the following directions to access approved study documents.

Modifications and Addendums: IRB approval must be sought and obtained for any proposed modification or addendum (e.g., a change in procedure, personnel, study location, study instruments) to the IRB approved protocol, and informed consent form before changes may be implemented, unless changes are necessary to eliminate apparent immediate hazards to participants. Changes to eliminate apparent immediate hazards must be

reported promptly to the IRB.

Approval Expiration and Continuing Review: The PI is responsible for requesting continuing review in a timely manner and receiving continuing approval for the duration of the research with human participants. Lapses in approval should be avoided to protect the welfare of enrolled participants. If approval expires, all research activities with human participants must cease.

Prompt Reporting of Events: Unanticipated Problems involving risks to participants or others; serious or continuing noncompliance with IRB requirements and determinations; and suspension or termination of IRB approval by an external entity, must be promptly reported to the IRB.

Closing a study: When research procedures with human subjects are completed, please log into our system at https://appstate.myresearchonline.org/irb/index_auth.cfm and complete the Request for Closure of IRB review form.

Websites:

1. PI responsibilities: <http://researchprotections.appstate.edu/sites/researchprotections.appstate.edu/files/PI%20Responsibilities.pdf>

2. IRB forms: <http://researchprotections.appstate.edu/human-subjects/irb-forms>

CC:

Lisa Emery, Psychology

Appendix C

Consent to Participate in Research *Information to Consider About this Research*

Mindfulness and Suppression as Emotion Regulation Strategies

Principal Investigator: Rebekah Knight
Department: Psychology
Faculty Adviser: Lisa Emery, Ph.D.
Contact Information (PI): knightrc@appstate.edu

222 Joyce Lawrence Lane
Boone, NC 28608
828-262-2272, ext. 416
EmeryLJ@appstate.edu

You are being invited to take part in a research study about *emotion regulation*. If you take part in this study, you will be one of about 60 people to do so. By doing this study we hope to learn *different emotion regulation strategies affect memory and anxiety*.

The research procedures will be conducted at *room 201C Smith-Wright hall*

Prior to taking part in the study, you were asked to complete the Beck Anxiety Inventory, the The Emotion Regulation Questionnaire, The Five Facet Mindfulness Questionnaire, the Anxiety Sensitivity Index-3, The PTSD Checklist-5, and a demographic questionnaire through SONA.

Upon coming into our lab, 201C, you will be asked to view both happy and anxiety-producing photographs on a computer screen. The anxiety-provoking pictures are photos of biological fears (e.g., snakes, spiders, heights), threat of violence (guns, knives) or medical procedures (e.g., surgery). The happy photos are pictures of animals (e.g., puppies, kittens), social interactions (e.g., children playing, weddings, vacations) and food (e.g., sundaes, cakes). After receiving instructions and information about mindfulness and suppression, you will be asked to control your emotional feelings and expression in different ways while watching the photographs, and will be videotaped while you do this. You will also be asked to rate your levels of arousal and valence in response to each image. You will be asked to return a second time, one week later. During the second session, you will be asked to view and rate all the same images you viewed at Time 1, this time without being instructed to regulate your emotions. Each procedure, Time 1 and Time 2, should take about 45 minutes.

You cannot volunteer for this study if are under 18 years of age.

What are possible harms or discomforts that I might experience during the research?

To the best of our knowledge, the risk of harm for participating in this research study is no more than you would experience in everyday life.

What are the possible benefits of this research?

There may be no personal benefit from your participation but the information gained by doing this research may help others in the future by *increasing our understanding of effective and ineffective ways of dealing with anxiety.*

Will I be paid for taking part in the research?

You will not be paid for your participation in this study. However, you can earn 4 ELC credits for your participation, including 1 ELC for completing the Beck Anxiety Inventory through SONA prior to taking part in the study. There are other research options and non-research options for obtaining extra credit or ELC's. One non-research option to receive 1 ELC is to read an article and write a 1-2 page paper summarizing the article and your reaction to the article. More information about this option can be found at: psych.appstate.edu/research. You may also wish to consult your professor to see if other non-research options are available.

How will you keep my private information confidential?

We will make every effort to prevent anyone who is not on the research team knowing that you gave us information or what that information is. All data will be identified with a participant number that is not linked to your name. Consent forms will be stored separately from the data.

Videos will be stored on a password-protected computer in the testing room. At the conclusion of the study, a copy of the videos will be placed on the faculty adviser's password-protected computer. Videos will be stored for 7 years following study completion. Videos will not be shown or shared outside the research team.

Who can I contact if I have questions?

The people conducting this study will be available to answer any questions concerning this research, now or in the future. You may contact the Faculty Adviser at 828-262-2272, *ext. 416*. If you have questions about your rights as someone taking part in research, contact the Appalachian Institutional Review Board Administrator at 828-262-2692 (days), through email at irb@appstate.edu or at Appalachian State University, Office of Research and Sponsored Programs, IRB Administrator, Boone, NC 28608.

Do I have to participate? What else should I know?

Your participation in this research is completely voluntary. If you choose not to volunteer, there will be no penalty and you will not lose any benefits or rights you would normally have. If you decide to take part in the study you still have the right to decide at any time that you no longer want to continue. There will be no penalty and no loss of benefits or rights if you decide at any time to stop participating in the study. If you decide to participate in this study, let the research personnel know. A copy of this consent form is yours to keep.

This research project has been approved by the Institutional Review Board (IRB) at Appalachian State University.

This study was approved on: 10/30/2017. This approval will expire on 10/29/2018 unless the IRB renews the approval of this research.

Participant's Name (PRINT)

Signature

Date

Appendix D

EXPERIMENTER SCRIPT-TIME 1 SESSION

Make sure the computer is turned on before the participant comes in. Also, go ahead and prepare the mindfulness exercise, so all you will need to do is press play when the participant is ready to engage in the exercise. Get E-Prime running and ready, so all you have to do is pull it up and enter the session number and participant number (check the participant file to find out which number they are, the session number will be the same for all participants).

*The videos for the mindfulness and suppression exercises are bookmarked in Google Chrome: when you pull up Google Chrome, go to the upper right hand corner to a button labelled “Other bookmarks”. There will be two little arrows to the left, hover over that and you will see a list of bookmarks, with the folder **“KnightThesisEmotionRegulationEx.”** Hover over that, and two youtube video titles will pop up on the left, one for mindfulness meditation and the other for suppression (labelled “My father is a liar”). Click on those and immediately press pause. Thus, all you have to do for the study is press play and maximize the screen. Just minimize the internet window when you’re finished. Make sure, before the participant arrives, that the volume is not too loud.*

*To find the E-Prime files, go to the windows icon in the bottom left hand corner of the screen → Documents → EXPERIMENTS → KNIGHT_MAThesis_SP18 → E-Prime → Time 1 → **Knight_MAThesis_Time 1_ListA.ebs2** or **Knight_MAThesis_Time 1_ListB.ebs2**.*

Once the participant comes in, move the “Experiment in progress” magnet from the whiteboard in here to the little whiteboard on the front of the door.

INFORMED CONSENT PROCEDURE

Thank you for participating in this study! In order to ensure that we treat everyone the same way, I must read these instructions to you word for word, even though that may feel a bit formal. In this first session, you will be asked to view a series of images while using different emotion regulation strategies. You will also be asked to rate how you feel while watching the images. A week from today, you will need to return to view these pictures again, along with others that you have not yet seen, and once again indicate your feelings while viewing them. You will also complete a task to assess your short-term memory.

The images you see will be similar to what you would come across in your daily life, for instance, when watching the news or surfing the web. These images should not cause significant distress, however, please inform the experimenter (me) if you feel unable to continue the study for any reason, and we will end the session. Do you have any questions so far?

In order to proceed to the next section of the study, you will first need to fill out this consent form.

Hand participant consent form and pen

This form will tell you what we are studying and what we will be doing in both this session and the next session, one week from today. Please read through the form and let me know if you have any questions. When you reach the end of the form, sign your name, write down today's date, and let me know you have finished. Just so you are aware, this consent form applies to both this study session and the Time 2 study session you will be participating in next week.

Wait for participant to complete consent form

We are now about to begin the Time 1 study Session. Do you have any questions? Let's begin!

If it is not already, we would like for your phone to be off and out of your sight, in order to minimize potential distractions during the study.

MINDFULNESS AND SUPPRESSION TRAINING

This experiment explores the nature of different emotion regulation strategies. Emotion regulation is the means by which we attempt to influence our emotions, including how we feel them and how we express them. This study examines two strategies: suppression and mindfulness.

Suppression is an avoidant strategy, in which people tend to 'push away' certain thoughts or feelings, and attempt to not display any outward sign of what they are feeling/experiencing. This can involve controlling our facial muscles, holding back laughter, or holding back tears; in short, doing anything we can to prevent ourselves from fully expressing the emotion.

To help you get used to using suppression as a technique, I will be showing you a short video clip, and ask that you not show any emotions. The video will not be traumatizing in any way, but if at any point during it you feel unable to continue, please let me know.

Play the "My dad is a liar" commercial; it will be bookmarked on Google Chrome.

In contrast to suppression, **Mindfulness** involves *paying attention* to what is happening in the present moment *without* judging the experience or attempting to change it. Often, our minds wander back and forth in time, trying to escape from the current moment and the experiences it holds. Being Mindful requires *paying attention* to your current experience: not just your physical sensations and surroundings, but the thoughts, feelings, and emotions you are experiencing. In sum, mindfulness is paying attention to your

thoughts, feelings, and emotions *now*, attempting to accept, rather than change, these experiences.

To help you better understand how to be “mindful”, I will now ask you to participate in a brief 12 minute exercise in mindfulness training. After you put on these headphones, I will play the video clip, and ask that you follow the instructions provided in the clip. When you are finished, you may remove the headphones and we will continue on to the study.

Play the guided meditation exercise clip; try not to move around too much or make any noises that could be distracting to the participant in order to maximize the effectiveness of the exercise.

Now that you have completed the mindfulness training exercise, you are ready to commence the study. Do you have any questions? Then we can begin!

PICTURE VIEWING

Turn on webcam & pull up E-prime, enter the participant #, session # will always be 1.

*Go into the **Time 1** Folder and select either **Knight_MAThesis_Time 1_ListA** or **Knight_MAThesis_Time 1_ListB**, depending on whether the participant is in the A or B condition; if you're not sure which condition they're in, check their email on the excel spreadsheet.*

You will be viewing a series of images in this portion of the study. When you are ready to begin this practice session, you may press the space bar.

Each section of images will be preceded by a screen with the word natural, suppress, or mindful. This is the emotion regulation strategy we want you to engage in while viewing this series of images.

Press space bar to go to the “Natural” screen

For the natural condition, do not attempt to regulate or change your emotions. Simply view the images as if you were watching television.

Press space bar to go to the “Suppress” screen

For the Suppress condition, try to hide any outward expression of your thoughts and feelings.

Press space bar to go to the “Mindful” screen

And for the mindfulness condition, remember to pay attention to the way you feel without trying to change how you feel.

Each of these instruction screen will be followed by a set of images once you press the space bar. After each image is presented, you will be asked to rate how you are currently feeling.

Press space bar to go to the “Happy/Unhappy” rating scale screen

For the first rating scale, you will be asked to rate how happy/unhappy the preceding image made you feel, using the five figures on the screen. Here, a score of 5 indicates that you were unhappy or upset, while a score of 1 indicates that you were happy or content. You can make your rating by using the numbers on the keyboard in front of you.

Press any key to continue on to the next screen.

After rating how happy or unhappy the image made you feel, you will be asked to rate how nervous/excited or calm this same image made you feel, once again using the five figures on the screen. For this scale, a score of 1 indicates that you were nervous, agitated, or anxious, while a score of 5 indicates that you were calm, relaxed, and not agitated.

Press any key to bring up the manipulation check screens.

After all of the pictures in a given section are presented, you will also be asked to rate on a scale from 1 to 5 how often you followed the given instructions, where 1 = “Never” and 5 = “Almost Always”. For instance, you will be asked this question to determine if you viewed the images naturally

Press a number 1 through 5

...this question to determine if you suppressed your emotions while viewing the images...

Press a number

...And this question to determine if you were mindfully viewing the images.

Press any key to bring up the “To begin practice, press any button” screen.

After you have rated the picture, the next image will appear on the screen. Do you have any questions about this procedure or about the rating scale? Good! You may press any key to proceed with a short practice session to familiarize yourself with the structure of the study. When you are done with this section, you should see a screen that says “Press any button to begin study”. Let me know when you have reached this point.

When participant finishes the practice session

You are now about to begin the study. Do you have any questions about the study? Great! Press any button when you are ready to begin the study, and let me know when you have finished.

*Participants will probably take about 10 minutes to complete.
Remember to turn off the webcam when they are finished!*

You have now finished with this first study session! We ask that you come back to this same room (201C) on this same day and at this same time next week; you will be sent a reminder email via the SONA system.

After the participant leaves, open up the Logitech Webcam again, and save this participant's video by selecting the thumbnail along the bottom, and clicking "Go to file" next to the "print" button. A new window full of videos will pop up, all you have to do is find the one you just saved (it will probably be along the bottom), right click, and rename it as "MAParticipant17", whichever participant number they are.

Also, remember to take off the "experiment in progress magnet" when you're done!

TIME 2 SESSION SCRIPT

*Again, make sure E-Prime is pulled up before the participant arrives. Go into the **Time 2** folder and open the **Knight_MAThesis_Time2** file. It doesn't matter whether they were A or B at Time 1, everyone gets the same set of images for Time 2.*

Thank you for returning to complete the study! We appreciate your time. You have already filled out the consent form, so we will go ahead and begin. Once again, we will be asking you to view a series of images and rating each image. After viewing these images, you will also complete a task designed to assess your memory and concentration. Do you have any questions so far?

*Go ahead and get E-Prime pulled up, ready to enter the participant number. Once they come in, enter their number, the session number (always **1**), and wait for the "Wait" screen to appear.*

PICTURE VIEWING

This study session differs slightly from that of last week's session. For this portion of the study, you will not be instructed to regulate your emotions in a particular manner. You will simply view all the images and rate them. However...

Have participant press the spacebar to pull up the "You are about to view a series of images..." screen.

...the series of images you are about to see will be a mixture of old and new images.

Before rating your response to each image in terms of calm/nervousness or happiness/sadness, you will be asked to rate whether or not the image is ‘old’ or ‘new’.

Have participant press spacebar to pull up the “Old or New?” Screen

“Old” indicates that you saw the image in question during last week’s session, while “New” indicates that this is the first time you have seen this image.

Have participant press spacebar to pull up the Old/New Rating Screen

When presented with the “old or new?” question, please press the number 1 for “old” and the number 5 for “new” to make your rating

Spacebar to pull up arousal scale

As a reminder, you will again be asked to rate on a scale of 1 to 5 how nervous or calm this image made you feel, using the five figures on the screen as a reference. A score of 1 indicates that you were nervous or agitated, while a score of 5 indicates that you were calm or relaxed. You can make your rating by using the numbers on the keyboard in front of you.

Have participant press any key to continue to the Valence Rating screen

After rating how nervous or calm you felt, you will be asked to rate how happy or sad the same image made you feel, once again using the five figures on the screen. In this case, a score of 1 indicates that you were happy or content, while a score of 5 indicates that you were unhappy or upset. Once again, use the numbers on the keyboard in front of you to make your rating.”

Have participant press space bar to bring up the “When you are ready...” screen.

Do you have any questions about the procedure? Great, you can begin! The study will start once you press the space bar, and there will not be a practice session this time. Notify me when you have completed this portion of the study. You can begin when you are ready.

When participant has finished with E-Prime

Great! We are now ready to proceed to our final task.

Open the OST booklet and prepare the score sheet, but do not allow the participant to see the score sheet at any point during the study.

OPERATION SPAN

In this next task, you will be asked to solve arithmetic problems while remembering words.

Show participant first sample card

You will be shown a series of equation-word pairs, like the one shown here. As soon as each equation is presented, you should read the equation out loud. You should then say “yes” if the equation is true, and “No” if it is false. After you solve the equation, you should say the word aloud.

For example, for this equation word-pair, you would say “Is $(9-7) + 2 = 4$ ”, “Yes”, “Drum”.

After you complete one equation, I will show you another one...

Show participant the second sample card

...and you do the same thing. For this equation, you would say that “Is $(2 + 1) + 2 = 3$ ”, “No”, “Toaster”. After a few equations have been presented, you will see the word **RECALL**.

Show participant the RECALL card

You should then recall the set of words you just saw. For example, in this case you would say “Drum, toaster”. You may recall the words in any order, but do not recall the last word first unless it is the only word you can remember.

Do you have any questions? Ok, let’s practice.

*Give the two practice trials (**willow & swan**) and record the participant’s responses on the answer sheet.*

You are now ready to begin the test. During the test, you will remember lists of between 2 and 5 words. The number of words you need to remember will change from trial to trial. Are you ready?

There are no stopping criteria, you can run the participant through all the trial blocks.

You have now completed the study! The purpose of this study was to examine the effects of different emotion regulation strategies on memory and state anxiety. Past research has shown that suppression tends to impair memory and increase anxiety, while mindfulness tends to enhance memory and decrease anxiety. This is why we asked you to come in twice, in order to better understand the effects of emotion regulation on memory for the images you viewed. Do you have any questions about the study?

Thank you for your participation. You will be awarded your ELC's within the next 24-48 hours.

Thank you!

Vita

Rebekah C. Knight was born in Charleston, South Carolina in 1994 to Jeff and Laurie Knight. She has two older brothers, Lucas and Daniel Knight. She was homeschooled all throughout middle school and high school, graduating in 2012. From 2012 to 2014, she attended Central Piedmont Community College, graduating in 2014 with her Associate's of Arts Degree. She then transferred to Appalachian State University in Boone, North Carolina, graduating summa cum laude in 2016 with a Bachelor of Arts degree in Psychology and a minor in Leadership Studies. She continued her graduate education at Appalachian State University to earn her Master of Arts degree in Experimental Psychology. After graduating in 2018, Rebekah will pursue her Ph.D. in Lifespan Developmental Psychology at North Carolina State University.