A Laboratory Investigation of Mindfulness and Reappraisal
As Emotion Regulation Strategies

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Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor of Philosophy in the Department of
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<u>ABSTRACT</u>

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Abstract

Effective emotion regulation plays an important role in psychological health. Two commonly-researched emotion regulation strategies are reappraisal, a cognitive change-based strategy, and mindfulness, an acceptance-based strategy. Although their potential in facilitating adaptive emotion regulation has been empirically demonstrated, little work has directly compared their cognitive and emotion regulatory effects, particularly in a symptomatic population. Using an analogue depressed sample, this study examined the relative effects of mindfulness and reappraisal in reducing sad mood and whether individual differences in trait mindfulness and habitual use of reappraisal moderated the effects. The study also compared the extent to which implementation of these strategies incurred cognitive resources and affected attitudes towards negative experiences. One hundred and twenty-nine participants were randomly assigned to receive training in mindfulness, reappraisal, or no training prior to undergoing an autobiographical sad mood induction. Following mood induction, participants rated their sadness on a visual analog scale before completing a Stroop test. Results showed that mindfulness and reappraisal were superior to no training, and equivalent in their effects in lowering sad moods. Compared to the mindfulness group, the reappraisal group reported significantly higher Stroop interference scores, reflecting greater depletion of cognitive resources. Higher trait mindfulness predicted greater

reductions in sadness in the reappraisal group, but not in the mindfulness group.

Habitual reappraisal did not moderate the effects of either mindfulness or reappraisal.

Mindfulness, relative to reappraisal or no training, resulted in significant increases in

acceptance of negative experiences and decreases in maladaptive beliefs about

rumination. Overall, the study suggests that although mindfulness and reappraisal are

equally effective in down-regulating sad mood, they incur different levels of cognitive

costs and lead to differential changes in attitudes towards negative experiences.

Dedication

To my parents for bringing me into this world, nurturing me, and giving me the freedom to fly and pursue my dreams. Just as the Buddha said, "Even if one should carry about one's mother on one shoulder and one's father on the other, and while doing so should live a hundred years, reach the age of a hundred years… even that would not be doing enough for one's parents, nor would repay them," I am forever indebted to them for all that they have done for me. To my brother, Chia-Hung Keng, for being supportive and caring, and for being physically there for the family while I have been away from home all these years. To my best friend and soul mate, SiYing Tan, for being there for me through my ups and downs. To LeyKoon Lim, for loving me and accepting me for who I am. To Andrew Procter, Jeremy Chiu, Irene Teo, Yuliya Nikolova, Katie Ehrenberg, and Chetan Rupakheti, for being the most wonderful and supportive friends, and for making surviving graduate school a journey that is possible and fun for most of the time. ☺ To Andrew Ekblad, Jennie Lacy, Prue Cuper, Mike Stanton, Pam Buck, and Amy Sanchez, for being my big brothers and sisters in the program and helping me in more ways that I can list. To Sumi Loundon Kim and Wongong Kyomunin, for your wisdom, kindness, and humor, and for lending me your ears and heart during times of challenge and confusion. To the Buddhist Community at Duke, for being a spiritual refuge where I could continue to cultivate wisdom, moral discipline, and meditation.

Contents

List of Tables

List of Figures

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1. Introduction

The ability to regulate one's emotions has important implications for psychological health, physical health, and interpersonal well-being (Gross, 2002). Disruptions in emotion regulation have been linked to greater symptoms of several psychological disorders, including major depressive disorder (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008), generalized anxiety disorder (Mennin, Holaway, Fresco, Moore, & Heimberg, 2007), and social anxiety disorder (Kashdan & Breen, 2008). Recent research has also identified specific forms of maladaptive emotion regulation strategies that may predispose individuals towards developing certain psychopathology (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Rumination, an emotion regulation strategy that involves repetitively focusing on one's emotional experiences, their causes and consequences (Nolen-Hoeksema, 1991), has been widely studied and found to predict duration and severity of depressive symptoms (Nolen-Hoeksema, 2000; Nolen-Hoeksema, Morrow, & Fredrickson, 1993) and onset of new depressive episodes (Nolen-Hoeksema, 2000). An important next step in this research area is to identify forms of adaptive emotion regulation strategies that can serve as protective factors against psychological distress and examine their relative effects.

Of a number of potentially adaptive emotion regulation strategies that have been identified, a distinction can be made between mindfulness- or awareness-based emotion regulation strategies and cognitive change-based emotion regulation strategies. Whereas

mindfulness-based strategies emphasize attending to one's thoughts and emotions

nonjudgmentally and without much cognitive elaborations (Brown, Ryan, & Creswell,

2007), cognitive change-based strategies emphasize actively evaluating and changing the

content of one's thoughts and emotions (Hofmann & Asmundson, 2008). These two

classes of emotion regulation strategies mirror key intervention techniques that are

emphasized in mindfulness- and acceptance-based therapies, such as Mindfulness-based

Cognitive Therapy (Segal, Williams, & Teasdale, 2002) and Acceptance and

Commitment Therapy (Hayes, Strosahl, & Wilson, 1999), and traditional cognitive

therapies, such as Cognitive Therapy (Beck, 1976), respectively.

One approach to learning more about the effectiveness of these strategies is to

conduct what Hayes, Luoma, Bond, Masuda and Lillis (2006) called "micro-studies" –

experimental studies that investigate key elements of psychotherapy to see if they are

psychologically active and work in a theory-consistent fashion. Whereas research has

provided some support for the efficacy of mindfulness-based and cognitive change-

based strategies in facilitating emotion regulation, little is known concerning their

relative psychological effects, individual differences that moderate their effectiveness,

and how the mechanisms underlying them may differ. The primary goal of this study

was to compare the emotional and cognitive effects of mindfulness with those of

reappraisal, a cognitive change-based emotion regulation strategy, in a sample of high

risk participants who report elevated symptoms of depression. The study also aimed to

examine individual differences in mindfulness and habitual use of reappraisal as

potential moderators of the effectiveness of both forms of emotion regulation strategies,

as well as examine changes in attitudes towards negative experiences as a potential

mechanism of change that may distinguish mindfulness from reappraisal.

1.1 Emotion regulation

Emotion regulation has been defined in a variety of ways. One of the most

commonly cited definitions is Gross' (1998) definition, which defines emotion regulation

as processes through which individuals "influence which emotions [they] have, when

[they] have them, and how these emotions are experienced or expressed" (p. 224).

According to Gross' process model of emotion regulation, emotion regulation strategies

can be broadly divided into antecedent-focused strategies and response-focused

strategies (Gross, 1998; Gross & John, 2003). Antecedent-focused strategies refer to

attempts to regulate emotions at or prior to the onset of emotions; response-focused

strategies are attempts to modulate emotional responses after they are fully activated.

Whereas the term *strategies* may give the implication that emotion regulation processes

are executed consciously, these processes can also be implemented automatically,

without much deliberation or conscious awareness (Gross & John, 2003; Mauss, Cook, &

Gross, 2007). The present study focuses on examining ways in which individuals can

deliberately down-regulate negative emotions when coping with dysphoric mood.

1.2 Reappraisal: Emotional and cognitive effects

One of the most widely-studied emotion regulation strategies under Gross' model is reappraisal, an emotion regulation strategy that involves reformulating the meaning or interpretation of an emotion-inducing situation to reduce its emotional impact (Gross, 1998). Reappraisal is commonly emphasized and taught in cognitive-behavioral therapies for depression and anxiety (Beck, Rush, Shaw, & Emery, 1979) and has its roots in early theories of stress and coping (Lazarus & Alfert, 1964) and appraisal (Folkman & Lazarus, 1986). These theories postulate that individuals' emotional responses to a situation are influenced by their interpretations or meanings of a situation. An important implication of these theories is that modifying how people appraise a situation should alter their emotional responses to the situation. In Gross' model, reappraisal is considered primarily as an antecedent-focused emotion regulation strategy (Gross, 1998), and most research to date has compared the effectiveness of reappraisal with that of expressive suppression, an emotion regulation strategy that involves intentionally inhibiting behavioral expressions of emotions that arise in response to emotion-inducing stimuli, among healthy adult populations. Relative to expressive suppression, reappraisal was found to be more effective at reducing negative affect and lowering sympathetic nervous system activation when individuals were exposed to a disgust-eliciting film (Gross, 1998). Research has also shown that compared to rumination, reappraisal of a negative autobiographical event leads to greater positive

affect (Grisham, Flower, Williams, & Moulds, 2009), lower negative affect (Ray, Wilhelm, & Gross, 2008), and lower sympathetic nervous system activation (Ray et al., 2008).

In addition to examining affective and physiological outcomes, researchers have also investigated the extent to which employing reappraisal as an emotion regulation strategy entails cognitive resources relative to other emotion regulation strategies. Such work is motivated by the important need to identify strategies that facilitate optimal cognitive performance and self-regulation – outcomes that are crucial considering that emotions often arise when important goals are at stake (Richards & Gross, 2000). Several studies that have investigated the cognitive consequences of reappraisal have found that compared to expressive suppression, reappraisal results in better memory for emotional events and the content of social conversations (Richards, Butler, & Gross, 2003; Richards & Gross, 2000) and improved social responsiveness during a social interaction (Butler et al., 2003). These findings are in line with Gross' hypothesis that reappraisal is effective as an antecedent-focused emotion regulation strategy; reappraising an emotional situation before emotions are fully activated diverts the emotional trajectory early, enabling one to down-regulate negative emotions effectively and in a way that does not entail excessive cognitive cost or inhibitory self-control resources.

Recent research investigated reappraisal as an "online" emotion regulation strategy. Online emotion regulation is defined as the attempt to modulate emotional

responses that begin and continuously operate while an emotional situation unfolds (Sheppes & Meiran, 2007). It is similar to response-focused emotion regulation described in Gross' model in the sense that it involves regulating emotional responses that are already underway. Online emotion regulation is highly relevant in everyday life; individuals are often faced with continuously-unfolding emotional situations that require them to manage their emotional responses effectively. It has been hypothesized that initiating reappraisal at a later time point in an emotional situation, as opposed to an earlier time point, may render it a less effective and cognitively more effortful emotion regulation strategy (Sheppes & Meiran, 2007; Sheppes & Meiran, 2008).

Several researchers have demonstrated that online reappraisal, compared to distraction, a strategy that involves diverting attention away from the emotional situation by producing and focusing on independent neutral thoughts, is less effective at down-regulating negative emotions (Sheppes & Meiran, 2007) and results in greater sympathetic nervous system activation (Sheppes, Catran, & Meiran, 2009) in the context of watching a sadness-inducing film clip. Relative to distraction, reappraisal also results in greater impairment on performance on a cognitive task administered post-regulation, which indicates increased depletion of cognitive resources (Sheppes & Meiran, 2008). The latter finding is especially noteworthy as it reveals, for the first time, increased cognitive cost associated with utilizing reappraisal as a regulation strategy. The researchers argued that initiating reappraisal late in an emotional situation poses greater

self-control challenges as it requires individuals to override strong, well-established

negative interpretations of the situation. This finding is consistent with predictions from

ego depletion theory, which posits that the capacity for self-regulation is a limited

resource that can be exhausted as a result of effort to regulate competing urges,

behaviors, and desires (Muravan & Baumeister, 2000). According to the theory, an initial

act of self-control (in this context, attempt to reappraise a situation in a high emotion

context) would result in impairment in performance on a subsequent self-control task. In

Sheppe and Meiran (2008)'s study, participants instructed to employ reappraisal half

way through watching an emotional film clip demonstrated greater interference on a

Stroop test, a standard measure of ego depletion (Inzlich, McKay, & Aronson, 2006;

Webb & Sheeran, 2003), compared to those instructed to distract.

A study by Urry, van Reekum, Johnstone, and Davidson (2009) provided further

evidence for increased cognitive load associated with initiating and engaging in

reappraisal in midst of watching unpleasant pictures. This study showed that

instructions to reduce negative emotions using reappraisal, relative to instructions to

maintain emotions, resulted in increased pupil diameter and cardiac acceleration,

physiological indices that reflect greater cognitive load. Reappraisal-related activation in

two medial prefrontal regions (dorsal medial frontal gyrus and dorsal cingulate gyrus)

correlated positively with cardiac acceleration and electrodermal activity, indicating the

role of these regions in the allocation of attentional resources to regulate negative

7

emotions.

Use of distraction as a regulation strategy is not without its own cognitive cost:

Even though the strategy entails less inhibitory control resources relative to reappraisal

(Sheppes & Meiran, 2008), it results in impaired memory encoding of an emotional

situation (Richards & Gross, 2006; Sheppes & Meiran, 2008). These findings suggest that

reappraisal and distraction, when implemented as online regulation strategies, each

results in some forms of cognitive costs. They also highlight the need for research

examining alternative forms of emotion regulation strategies that can down-regulate

ongoing negative emotional responses in a way that involves few cognitive resources.

1.3 Mindfulness: Emotional and cognitive effects

Mindfulness has been defined as the awareness that arises through "paying

attention in a particular way: on purpose, in the present moment, and nonjudgmentally"

(Kabat-Zinn, 1994, p. 4). The term *mindfulness* may be used to describe a psychological

trait (i.e., the extent to which an individual is generally mindful in daily life), a practice

of cultivating mindfulness, or a psychological process (Germer, Siegel, & Fulton, 2005).

In a collaborative effort to develop an operational definition for mindfulness, Bishop et

al. (2004) proposed that mindfulness encompasses two components: self-regulation of

attention, and adoption of a particular orientation towards one's experiences. Self-

regulation of attention refers to non-elaborative observation and awareness of sensations,

thoughts, or feelings from moment to moment. It requires both the ability to anchor

one's attention on what is occurring and the ability to switch attention intentionally from one aspect of the experience to another. The orientation to experience aspect of mindfulness involves maintaining an attitude of curiosity, openness, and acceptance toward one's experiences.

Several clinical intervention packages have incorporated mindfulness training as a treatment component, and these have been shown in randomized trials to lead to a variety of positive psychological effects, such as reduced anxiety and depressive symptoms, reduced risk of depressive relapse among patients with recurrent depression, reduced stress symptoms among patients with medical disorders, and improved quality of life (Keng, Smoski, & Robins, 2011). Researchers have also been interested in investigating the processes through which mindfulness interventions lead to positive psychological outcomes. One way in which mindfulness benefits psychological functioning may be via attenuating negative emotional responses that typically occur in the presence of an emotion-triggering event. Several studies have examined the immediate effects of brief mindfulness instructions on coping with negative affect. Whereas the brief manipulations presented in these studies are not analogous to a full mindfulness intervention program, they may help delineate the causal effects of temporarily altering the way one relates to thoughts and emotions on mood and other psychological parameters (Huffziger & Kuehner, 2009; Williams, 2010). Instructions to practice mindfulness of thoughts and feelings following negative mood induction have

been found to be more effective than rumination or no instruction in alleviating negative

mood states in healthy university students (Broderick, 2005), previously depressed

individuals (Singer & Dobson, 2007), and currently depressed individuals (Huffziger &

Kuehner, 2009). Brief mindfulness training has also been shown to be more effective

than worry or control inductions (Arch & Craske, 2006; Erisman & Roemer, 2010) in

down-regulating negative emotions in response to emotionally-evocative laboratory

stimuli. Similarly, in individuals with mood or anxiety disorders, instructions to accept

emotions as they are (acceptance – a key element of mindfulness) were found to result in

less negative affect and decreased heart rate in response to an emotional film clip

compared to suppression (Campbell-Sills, Barlow, Brown, & Hofmann, 2006). Another

study found that among depressed individuals, acceptance, relative to suppression, led

to greater sadness in response to a sadness-inducing film clip, but a quicker recovery

from sadness (Liverant, Brown, Barlow, & Roemer, 2008). In the context of coping with

anxiety-inducing interoceptive stimuli (i.e., exposure to carbon dioxide-enriched air),

instructions to mindfully observe emotional states, relative to no instruction or

suppression, have been found to lead to lower intense fear, cognitive symptoms, and

catastrophic thoughts among high anxiety sensitive females (Eifert & Heffner, 2003) and

less subjective anxiety among patients with panic disorders (Levitt, Brown, Orsillo, &

Barlow, 2004).

Little is known regarding the extent to which mindfulness, when used as an emotion regulation strategy, consumes cognitive resources, but research on cognitive effects of brief mindfulness training may be relevant. Because mindfulness practice involves directing attention to the present-moment experience and switching it back to the present-moment experience whenever it wanders (Bishop et al., 2004), training in mindfulness positively impacts several aspects of attentional control and cognitive functioning (Chiesa, Calati, & Serretti, 2011).

Several sub-components of attention, each related to different neurobiological substrates, may be distinguished (McDowd, 2007; Posner & Peterson, 1990): orienting (also known as selective attention; the ability to direct attention towards a set of sensory inputs), alerting (also referred to as sustained attention; the ability to remain vigilant or receptive towards a range of potential sensory inputs), and conflict monitoring (also known as divided attention or executive attention; the ability to prioritize attention among competing cognitive demands). Using a variety of neuropsychological tasks, studies have shown that mindfulness training is associated with improvements in orienting (Jha, Krompinger, & Baime, 2007) and in conflict monitoring (Cozza, 2010; Tang et al., 2007; Wenk-Sormaz, 2005) among novice meditators. Participation in mindfulness training has also been associated with improvements in alerting among both experienced meditators (Jha et al., 2007) and novice meditators (Chambers, Lo, & Allen, 2008). Mindfulness training has also been shown to buffer against decreases in

working memory capacity during high stress periods (Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2010) and reduce overgeneral autobiographical memory (Hargus, Crane, Barnhofer, & Williams, 2010; Heeren, Van Broeck, & Philippot, 2009; Williams, Teasdale, Segal, & Soulsby, 2000), a psychological marker of increased depression severity (Kuyken & Brewin, 1995). These findings suggest that mindfulness training may enhance or buffer against decreases in cognitive and attentional resources. No studies to date, however, have examined the extent to which engaging in mindfulness as a strategy to respond to heightened negative emotions entails cognitive resources.

1.4 Mindfulness and reappraisal: A comparison of emotional and cognitive effects

Although mindfulness and reappraisal each facilitate more effective emotion regulation than no instruction or known maladaptive strategies (such as rumination, suppression, and worry), little research has directly compared their effectiveness, especially in a sample of depressed individuals – the population to which interventions that utilize these regulation strategies as key techniques are commonly applied. To date, two studies have examined the relative effects of acceptance, reappraisal, and suppression in reducing anxiety (Hofmann, Heering, Sawyer, & Asnaani, 2009) and anger (Szasz, Szentagotai, & Hofmann, 2011) in non-clinical populations. Hofmann et al. (2009) found that relative to suppression, both reappraisal and acceptance were more effective at reducing physiological arousal when university undergraduates were engaging in an anxiety-provoking laboratory task (giving an impromptu speech).

12

Reappraisal, however, led to greater reductions in subjective anxiety during the task compared to acceptance and suppression. In another study (Szasz et al., 2011), undergraduates instructed to reappraise their anger reported less subjective anger during a frustrating laboratory task (a mirror tracing task) and demonstrated greater persistence on the task relative to those instructed to accept or suppress their emotions. Wolgast, Lundh, and Viborg (2011) compared the effects of acceptance, reappraisal and no instruction on subjective distress while watching emotion-eliciting film clips in a sample of community adults. The study showed that compared to no instruction, both acceptance and reappraisal resulted in significant decreases in subjective distress in response to sadness-inducing, fear-inducing, and disgust-inducing film clips. No significant difference was observed between the acceptance group and the reappraisal group in the level of reported negative emotions during exposure to sadness-inducing and fear-inducing films. The disgust-inducing film clip elicited greater negative emotions in the acceptance group than the reappraisal group. In another study, Aldao and Mennin (2012) investigated the relative subjective effects of acceptance, reappraisal and no instruction in a sample of individuals with and without a diagnosis of GAD, and found that relative to reappraisal, both acceptance and no instruction led to greater subjective negative affect in response to emotion-eliciting film clips across both groups.

Taken together, the above studies suggest that reappraisal and acceptance, in some contexts, are more effective than no instruction or suppression in down-regulating

13

subjective negative emotions. Under some conditions, however, the effectiveness of reappraisal surpasses that of acceptance. It seems likely that the relative effectiveness of reappraisal and acceptance may vary depending on sample characteristics (e.g., clinical vs. non-clinical populations) and contextual factors (e.g., types of emotions being regulated, standardized emotion-eliciting stimuli vs. personally relevant emotional stimuli). Also, notably, in these studies, acceptance was conceptualized primarily according to the framework of Acceptance and Commitment Therapy, in which it is defined as "the active and aware embrace of those private events occasioned by one's history without unnecessary attempts to change their frequency or form, especially when doing so would cause psychological harm" (Hayes et al., 2006, p. 7). This conceptualization is somewhat more limited than the common conceptualization of mindfulness, which additionally emphasizes being aware of one's experiences in a nonjudgmental manner and viewing them as passing mental events. Further, the acceptance training provided in some of these studies (i.e., Hofmann et al., 2009; Szasz et al., 2011; Aldao and Mennin, 2012), unlike how mindfulness is typically taught in standard mindfulness-based interventions, does not contain an experiential component, such as instructing individuals to intentionally pay attention to their thoughts and emotions in nonjudgmental ways or explaining the rationale for engaging in acceptance of emotions and thoughts. Variations in how acceptance is conceptualized and how participants are trained in acceptance across these studies may in part account for

14

differences in their findings. To date, no research has directly compared the effects of mindfulness versus reappraisal in the context of regulating on-going, heightened subjective experience of sadness among individuals with elevated depressive symptoms.

Another research area that remains unexplored involves the extent to which engagement in mindfulness and reappraisal as emotion regulation strategies consumes cognitive resources. Although no studies have directly compared the cognitive costs of mindfulness and reappraisal, it is theoretically plausible that implementation of mindfulness, relative to reappraisal, incurs fewer cognitive resources. Compared to other forms of emotion regulation strategies, mindfulness can arguably be considered almost as a "non-regulation" strategy, in that it primarily involves taking a metacognitive stance to observe one's emotional and cognitive reactions nonjudgmentally rather than actively altering or changing the content of one's thoughts and emotions, a process that may entail more cognitive effort. One may also reasonably argue, however, that the process of shifting one's attention from focusing on the content of one's emotions and thoughts to observing emotions and thoughts as they are can itself be an effortful cognitive process. This study is thus designed to examine whether mindfulness or reappraisal entail more cognitive resources when implemented as an online regulation strategy. Based on earlier findings pointing to increased cognitive demand associated with online reappraisal (Sheppes & Meiran, 2008; Sheppes et al.,

15

2009), it is hypothesized that compared to mindfulness, reappraisal would result in greater depletion of cognitive resources.

1.5 Changes in attitudes towards negative experiences as a process of change potentially unique to mindfulness

In addition to examining the emotional and cognitive effects of reappraisal and mindfulness, the present study aimed to investigate potential psychological processes that distinguish the effect of mindfulness from that of reappraisal. In recent years, researchers have emphasized the importance of going beyond examining the effects of psychotherapy interventions or techniques to understanding the unique mechanisms that are associated with a particular psychotherapeutic technique (Hayes et al., 2006; Kazdin, 2007). Such work is important not only for determining if psychotherapeutic techniques work in a fashion that accords with theory but also for optimizing therapeutic change.

One psychological mechanism on which mindfulness and reappraisal may differ involves changes in attitudes towards, or metacognitive appraisals about negative experiences. In a discussion of metacognitive styles that may predispose formerly depressed individuals to depressive relapses, Singer and Dobson (2007) distinguished among three types of metacognitive styles: positive metacognitive appraisal about rumination, negative metacognitive appraisal about rumination, and acceptance of and openness towards negative experiences. Positive metacognitive appraisal refers to the belief that repeated thinking or ruminating about problems is somehow beneficial and

16

can lead to solution of the problems (Papageorgiou & Wells, 2001). Individuals may also

make negative metacognitive appraisals about rumination (i.e., believing in the

uncontrollability and harmfulness of rumination), which might lead to attempts to

distract from or avoid negative thoughts and feelings. Both positive and negative

metacognitive appraisals about rumination are positively associated with rumination

and depression in non-clinical samples and clinically depressed individuals

(Papageorgiou & Wells, 2001; 2003). An alternative to engaging in positive or negative

metacognitive appraisals about rumination is maintaining an attitude of acceptance of,

or openness towards negative experiences, with the understanding that thoughts and

emotions are simply passing events in the mind (Singer & Dobson, 2007). Increased

acceptance towards negative thoughts and feelings may facilitate disengagement from

ruminative processing, a process that has been proposed to be one key mechanism

through which mindfulness-based interventions result in positive psychological

outcome (Shapiro, Carlson, Astin, & Freeman, 2006).

Recent research suggests that brief training in mindfulness or acceptance may be

uniquely associated with beneficial changes in attitudes towards negative experiences.

Using a non-clinical sample, Arch and Craske (2006) showed that relative to unfocused

attention, mindfulness training resulted in increased willingness to remain in contact

with aversive visual stimuli, presumably because the training fosters an attitude of

acceptance towards one's experience, regardless of the valence of the experience. These

results are consistent with findings of two other experimental studies that showed that

acceptance training, relative to suppression or no instruction, was associated with

reduced behavioral avoidance (Eifert & Heffner, 2003) and greater willingness to

participate in a second carbon dioxide challenge (Levitt et al., 2004). Comparing the

effects of acceptance, rumination, distraction and no training in a remitted depressed

sample, Singer and Dobson (2007) found that mindfulness significantly lowered

negative beliefs about rumination relative to rumination and distraction. However, no

significant differences were found in changes in positive beliefs about rumination and

acceptance of negative experiences across conditions. The authors noted that the lack of

significant differences might have been due, in part, to the fact that many participants in

the study reported high levels of acceptance of negative experiences (i.e., a ceiling effect)

and low levels of positive beliefs about rumination (i.e., a floor effect) prior to training.

It is unknown if these effects would emerge in a more clinical sample, in which baseline

levels of positive beliefs about rumination might be higher and acceptance of negative

experiences might be lower.

Wolgast et al. (2011) examined the relative effects of reappraisal and acceptance

on subjective distress towards emotional film clips in a non-clinical sample. Whereas

both interventions were more effective at reducing subjective distress than to no

instruction, the relationship between behavioral avoidance (assessed by self-reported

willingness to watch the same film clips again) and elicited distress differed between the

two conditions. Specifically, avoidance and distress were positively correlated in the reappraisal condition, whereas they were not correlated in the acceptance condition. The findings provide preliminary evidence that acceptance training may decouple the relationship between emotional distress and avoidance, and that such an effect may be unique to acceptance. Overall, these studies suggest that acceptance or mindfulness training may foster more adaptive metacognitive styles by increasing acceptance of negative experiences and decreasing maladaptive beliefs about rumination. This study aimed to examine the hypotheses that mindfulness, relative to reappraisal and no instruction, would result in significantly greater decreases in positive and negative beliefs about rumination, and greater increases in acceptance of negative experiences.

1.6 Mindfulness and reappraisal: Mutually exclusive emotion regulation strategies?

Thus far, it may seem as though mindfulness and reappraisal have been set up as a dichotomy – that if one engages in mindfulness, one automatically disengages from any form of reappraisal, and that if one reappraises, one is not practicing mindfulness. In reality, these two forms of emotion regulation strategies may not be mutually exclusive. As several authors (e.g., Hanh, 1976; Kabat-Zinn, 1994; Mikulas, 2011) have noted, mindfulness is a form of awareness that inherently underlies many activities that people do in daily life. A corollary to this perspective is that one can engage in a variety of activities with varying degrees of nonjudgmental awareness. It has also often been presumed that the more one is able to practice present-focused attention and

nonjudgmental awareness while engaging in an activity, the more effective one can be in executing the activity. Within the context of emotion regulation, recent theoretical work (Garland, Gaylord, & Park, 2009) suggests that mindfulness is an intrinsic process involved in reappraisal, as generating a new appraisal for an event requires that one first disengages from the previous meaning or appraisal given to an event. It is further proposed that mindfulness may facilitate more effective emotion regulation via augmenting one's ability to make positive appraisals in face of negative, stressful events.

Research has provided some support for the hypothesis that mindfulness facilitates more effective engagement in reappraisal. Coffey and Hartman (2008) used structural equation modeling to explore the mediational relationships between mindfulness and psychological distress in a cross-sectional sample of college students and found that emotion regulation ability, a construct under which measures relating to positive reappraisal are included, mediated the relationship between mindfulness and psychological distress. In another study (Garland, Gaylord, & Frederickson, 2011), participants of a mindfulness training program evidenced significant increases in mindfulness from pre- to post-intervention, and the increases predicted improvements in positive reappraisal. Improvements in positive reappraisal also partially mediated the link between increases in mindfulness and reductions in perceived stress. Taken together, these findings support the role of mindfulness in enhancing the effectiveness of reappraisal.

Greater trait mindfulness may also predict greater effectiveness in using mindfulness to cope with negative affect. Among remitted depressed patients, higher scores on trait mindfulness predict stronger reductions in negative mood after a mindfulness induction, independent of the effect of baseline severity of depression (Huffziger & Kuehner, 2009). The present study aimed to extend the above findings by examining whether individual differences in trait mindfulness moderate the effectiveness of mindfulness and reappraisal in down-regulating sad mood.

Habitual tendency to reappraise may also predict more effective use of emotion regulation strategies, particularly reappraisal. Research has demonstrated that individuals who habitually reappraise experience greater positive emotion, lower negative emotion, and better interpersonal functioning compared to individuals who habitually suppress their emotions (Gross & John, 2003). A greater tendency to reappraise has also been associated with more adaptive emotional and cardiovascular responses to anger-provoking events (Mauss, Cook, Cheng, & Gross, 2007; Memedovic, Grisham, Denson, & Moulds, 2010). Whereas this evidence highlights a positive association between habitual tendency to reappraise and psychological well-being, less is known about the processes through which habitual reappraisal leads to adaptive functioning. Functional MRI research on individual differences in reappraisal may shed some light on the relationship between habitual reappraisal and people's ability to engage in effective emotion regulation. In one study, greater habitual tendency to

21

reappraise predicted increased activation in several prefrontal regions during processing of negative emotional facial expressions (Drabant, McRae, Manuck, Hariri, & Gross, 2009). Given the known role of prefrontal regions in cognitive control and executive functioning (Miller & Cohen, 2001), the finding suggests that people who habitually reappraise may have greater executive functioning and cognitive control abilities, which may facilitate more effective engagement in reappraisal. This study aimed to explore the link between habitual tendency to reappraise and adaptive functioning by considering habitual reappraisal to be a potential moderator of the effects of reappraisal on coping with dysphoric mood.

1.7 Specific aims and hypotheses

The primary aim of this study was to compare the emotion regulatory effects and cognitive costs of mindfulness and reappraisal in the context of coping with laboratory-induced sad mood. To increase the clinical applicability of the findings, and to add to the growing literature examining the effectiveness of emotion regulation strategies in the context of depression, the study recruited a sample of participants who endorsed mild to moderate symptoms of depression. This study also examined trait mindfulness and habitual reappraisal as potential moderators of the effectiveness of mindfulness and reappraisal in down-regulating sadness, and examined relative changes in attitudes towards negative experiences as a result of training in mindfulness and reappraisal.

The hypotheses for this study were as follows:

1. Relative to no instruction, both mindfulness and reappraisal would result in greater decreases in sadness from pre- to post-regulation. Given mixed evidence from previous studies concerning the relative subjective effects of these strategies, there was no *a priori* hypothesis with regard to whether mindfulness or reappraisal would be more effective in reducing sadness.

2. Relative to mindfulness, reappraisal would result in greater depletion of cognitive resources, as indicated by greater interference scores on the Stroop test post-regulation.

3. Relative to no instruction and reappraisal, mindfulness would result in greater decreases in positive and negative beliefs about rumination, and increases in acceptance of negative experiences.

4. Higher trait mindfulness would predict greater decreases in sadness from pre- to post-regulation for both the mindfulness condition and the reappraisal condition.

5. Greater habitual tendency to reappraise would predict greater decreases in sadness from pre- to post-regulation for the reappraisal condition. The question regarding whether habitual reappraisal would also moderate the effects of mindfulness is exploratory.

2. Methods

2.1 Participants

One hundred and twenty-nine participants were recruited for this study.

Participants were randomly assigned to receiving training in mindfulness (n = 43) or

reappraisal (n = 43), or to a no-instruction condition (n = 43). Inclusion criteria were: age

between 18-55 years old and obtaining a score between 10 and 29 on the Beck

Depression Inventory (BDI; Beck et al., 1979). Out of ethical concerns, participants were

excluded and offered resources for psychological services if they scored above 29 on the

BDI or endorsed active suicidality or suicidal ideation, defined by a score of 3 on the

item on suicidality (item #9) on the BDI. This study was approved by the Duke

University Institutional Review Board, and informed consent was obtained from all

participants prior to enrollment in the study.

2.2 Procedures

2.2.1 Recruitment and screening

Potential participants were recruited from Duke Department of Psychology and

Neuroscience Undergraduate Subject Pool, Duke Interdisciplinary Initiative in Social

Psychology (DIISP) participant database, the internet (e.g., Craigslist), and flyers posted

around Duke Campus and Duke University Medical Center. Potential participants from

Duke Department of Psychology and Neuroscience Undergraduate Subjects Pool were

recruited through a pre-screening process held during Fall semester of 2011 and Spring

semester of 2012. During the prescreening process, participants completed the BDI online. Potential participants who fulfilled the study criteria were sent an invitation email to participate in the study.

Potential participants from communities other than Duke Department of Psychology and Neuroscience Undergraduate Subjects Pool were directed to a pre-screening website containing the BDI, created using Qualtrics and hosted by Duke University. Questionnaire data was reviewed daily to screen for participants who fulfilled the study criteria. Those who qualified for the study were sent an invitation email or contacted by phone to participate in the study.

2.2.2 Laboratory procedures and tasks

Participants who agreed to participate in the study were scheduled to attend a 1.5-hour individual experimental session. Experimental sessions were held at the DIISP Laboratory. Each session was conducted by one of either two experimenters (the author and a research assistant). The research assistant was trained fully on the experimental protocol prior to running subjects independently. Upon arrival, participants were brought to a closed room, given a consent form, and verbally explained the purpose, procedure, risks, and benefits of the study. Participants were told that the purpose of the study was to examine cognitive functioning and ways in which individuals regulate emotions. After signing the consent form, participants completed a set of online self-report questionnaires.

2.2.2.1 Stroop test

After completing these questionnaires, participants engaged in a practice phase

of a computerized Color-Word Stroop test, which would be administered after the

manipulation phase of the study. The Stroop test has been used in a number of studies

as a measure of cognitive control and depletion of cognitive resources following a task

that requires inhibitory self-control (e.g., see Chepenik, Cornew, & Farah, 2007; Richeson

& Trawalter, 2005; Sheppes & Meiran, 2008). Following Sheppes and Meiran (2008), the

practice phase was included to minimize learning effects, which may mask cognitive

depletion effects. The test was constructed using DirectRT. For each trial, participants

were first presented with a 500 millisecond fixation cross, followed immediately by the

word "red", "yellow", "green", "blue", or a string of four "x" letters (i.e., "xxxx"). The

color words would always appear in a color font other than their semantic meaning. For

example, the word "yellow" would appear only in red, blue, or green fonts. These trials

were considered as incongruent trials. The strings of "xxxx"s were presented in all four

colors, and were control trials. Participants were instructed to name as quickly and

accurately as possible the color in which a word appears. Their reaction times were

measured and recorded by the program to the nearest millisecond. Each experimental

block consisted of eight trials, and trials were presented in a random order across

experimental blocks. The practice phase included 32 trials (2 experimental blocks), and

the test phase included 160 trials (10 experimental blocks). For both phases, the ratio of control to incongruent trials was 1 to 3.

2.2.2.2 Training of emotion regulation strategy

After engaging in the practice phase of the Stroop test, participants were randomly assigned to receive training in using mindfulness or reappraisal to cope with negative emotions, or to a no-instruction condition. The training period for both strategies lasted for approximately 10 minutes, and instructions were verbally read to each participant. The instructions for the mindfulness condition emphasized registering thoughts and emotions as they are without judging or elaborating them, and included a mindfulness experiential exercise (see Appendix A for the training script). Instructions were adapted from the acceptance training script used in Singer and Dobson (2007)'s study. In the reappraisal condition, participants were taught to reframe the meaning of an emotional event in order to reduce the emotional impact of the event (see Appendix B for the training script). The instructions also included an experiential exercise that involved reappraising a hypothetical situation. The training instructions for this condition were adapted from Grisham et al. (2009) and Ray et al. (2008).

At the end of the training session, participants were administered a question to assess their perceived usefulness of the technique in which they were trained. The question read: "On a scale of 0-7, please rate to what extent you think this technique can be effective in coping with negative emotions." After the training phase and

27

immediately preceding mood induction, participants completed a demographic data form. The questionnaire was administered at this time point to minimize any immediate impact that the training might have on participants' ability to engage fully in the mood induction procedure.

2.2.2.3 Autobiographical mood induction

Participants underwent a mood induction procedure that involved a combination of negative autobiographical recall and mood suggestive music. The efficacy of this procedure in inducing sad mood has been demonstrated in previous studies (Singer & Dobson, 2007; Westermann, Spies, Stahl, & Hesse, 1996). The procedure required each participant to recall life incidents that made him or her feel lonely, sad, rejected or hurt. The music chosen was "Adagio-G Minor" composed by Albinoni and played at half speed. This piece of music has been used to augment the effects of negative autobiographical recall in several studies (e.g., Huffziger & Kuehner, 2009; Kuehner, Huffziger, & Liebsch, 2009; Singer & Dobson, 2007).

Participants were first asked to provide a baseline rating of their mood on a visual analogue scale (VAS) presented on the computer (T1). They were then instructed to recall three incidents that made them feel lonely, sad, rejected, or hurt, and write a brief description of each of the incidents on a piece of paper. The following instructions were read to the participants: "Let's begin the mood induction part of the study. Before we begin, I would like you to rate your mood on the computer [at this point,

participants were presented with the VAS on the computer screen]. Next, I am going to ask you to close your eyes, if that feels comfortable for you, and think back to three events that made you feel lonely, sad, rejected, or hurt. These three events should be progressively sadder and more unpleasant. I would like you to recall these events in detail, remembering how you felt and what happened. Please take your time to recall the incidents and provide a brief description of each of them on a piece of paper. I will now leave the room and return in the about 5 minutes."

After the participants provided a brief written description of each of the recalled events, they rated the extent to which each event was upsetting to them. The following instructions were verbally read to the participants: "It's now time for the mood induction process. Again, I am going to ask you to close your eyes, if that feels comfortable for you, and recall each of these events in detail, remembering how you felt and what happened. You will also hear some music to help you get into the negative mood. Also, it is OK if your thoughts naturally shift to some other negative memories during this time. You can allow those thoughts to continue if they occur. I will now leave the room and give you an opportunity to think about these events. In a few minutes, you will see another instruction coming up on the screen that asks you to rate your mood, followed by another instruction about what you should do with your mood. Please do not engage in any further writing for the rest of this procedure."

Each participant was alone in the study room while participating in the rest of the mood induction procedure. During the procedure, the following instructions appeared and remained on the computer screen: "Close your eyes and think back to three events that made you feel lonely, sad, rejected, or hurt. These events should be progressively sadder and more unpleasant. Recall these events in detail, remembering how you felt and what happened. Allow yourself to re-experience, as intensely as possible, how you felt during each of these events," and music was played during this time. The induction period lasted for three minutes before participants were asked to rate their mood again (T2).

2.2.2.4 Regulation/ strategy implementation period

Participants who were assigned to the mindfulness or reappraisal condition received instructions to apply the strategy in which they were trained to cope with their mood. The instructions for the mindfulness condition read: "Please practice mindfulness of your present experience, including your thoughts and emotions about the situations that you thought about earlier, to respond to your current mood. You will be asked to rate your mood periodically." Instructions for the reappraisal condition read: "Please change your thoughts about the situations that you thought about earlier to respond to your current mood. You will be asked to rate your mood periodically." The instruction for the no training condition read: "Please respond to your current mood. You will be asked to rate your mood periodically." To increase the mood regulation challenge, the

music continued to play in the background at this time. All participants rated their mood on the VAS (prompted by a "beep" sound on the computer) once every thirty seconds, for five minutes (T3, T4, T5, T6, T7, T8, T9, T10, T11, T12).

2.2.2.5 Post-regulation period questions

At the end of the mood regulation period, the music stopped and participants completed the computerized Stroop test to assess their cognitive performance. They then responded to several questions regarding (1) how tired they felt at the beginning of the test, (2) how hard they tried to do well on it, and (3) how much they felt that they were distracted during the test. Participants were also administered several manipulation check questions to assess the extent to which they engaged in various common emotion regulation strategies (mindfulness, reappraisal, distraction, rumination, suppression) during the regulation period (see Appendix C). After completing the manipulation check questions, participants completed a questionnaire and two final questions to assess the extent to which they thought the experimenter was enthusiastic and credible (see Appendix D).

2.2.2.6 Positive mood induction procedure

Finally, all participants participated in a positive mood induction procedure, which involved watching a funny Youtube video (a 5-minute video of talking animals, taken from a BBC One show "Funny Talking Animals - Walk On The Wild Side"), to help alleviate any remaining negative mood from the earlier mood induction procedure.

31

Participants were asked to rate, on a 0 to 10 scale, the extent to which they experienced

negative emotions before and after watching the video. If a participant reported

continued distress (as indicated by a mood rating of 5 or higher) after watching the

video, a second positive mood induction procedure would be implemented. This

procedure involved recall of positive events. The instructions for the procedure were as

follows: "I am going to ask you to close your eyes, if that feels comfortable for you, and

think back to three events that made you feel happy, joyful, and contented. I would like

you to recall these events in detail, remembering how you felt and what happened.

Please take your time to recall these events, and allow yourself to re-experience the joy

and happiness that you felt during those times."

2.2.2.7 Debriefing

Participants were thanked, debriefed, and asked if they had any questions or

comments about the study. All participants, regardless of the condition to which they

were assigned, were provided with written introductory materials about reappraisal and

mindfulness, as well as information regarding psychological and mental health services

available in the area. Participants from the Undergraduate Research Subject Pool

received two hours of credits toward a course research requirement for participating in

the study. Those from communities other than the Undergraduate Research Subject Pool

were paid twenty dollars for their participation.

2.2.3 Measures

Demographic data form. The demographic data form contained questions about

participants' age, gender, ethnicity, education background, income, history of receiving

psychological and/or psychiatric treatment, and prior experience with meditation and

mindfulness training.

Beck Depression Inventory (Beck et al., 1979). The BDI is a widely used 21-item self-

report questionnaire designed to assess symptoms of depression (see Appendix E). All

items are scored on a 0 to 3 scale. For each item, respondents choose one of four

statements to indicate how they have been feeling over the past week. The first item, for

example, contains the following statements: (0) I do not feel sad, (1) I feel sad, (2) I am

sad all the time and can't snap out of it, and (3) I am so sad or unhappy that I can't stand

it. For non-psychiatric samples, BDI's internal consistency ranged between 0.73 through

0.92 (Beck, 1988). Within psychiatric populations, the range was between 0.76 and 0.95.

Traditional classifications of BDI's scores are none or minimal depression (0-9), mild to

moderate depression, (10-18), moderate to severe depression (19-29), and severe

depression (30-63).

Southampton Mindfulness Questionnaire (SMQ; Chadwick et al., 2008). The SMQ is

a 16-item self-report questionnaire designed to measure individual differences in the

ability to be mindfully aware of distressing thoughts and images (see Appendix F). The

questionnaire has a single factor structure, and captures four related aspects of

mindfulness: decentered awareness, acceptance, nonjudgment, and letting go. All items begin with "Usually when I experience distressing thoughts and images", and are followed by statements such as "I 'step back' and am aware of the thought or image without getting taken over by it" (Decentered Awareness), "I keep thinking about the thought or image after it's gone" (Letting Go, reverse-scored), "I judge the thought/image as good or bad" (Nonjudgment, reverse-scored), and "I am able to accept the experience" (Acceptance). These statements are rated on a 0 (strongly disagree) to 6 (strongly agree) Likert-type scale. In a community sample and a clinical sample, the SMQ demonstrated acceptable Cronbach's alphas of 0.89 and 0.82 respectively.

Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). The ERQ is a self-report questionnaire assessing the extent to which individuals regulate their emotions by using reappraisal and suppression (see Appendix G). The questionnaire consists of 10 items, categorized into two independent subscales: tendency to reappraise (Reappraisal) and tendency to suppress emotions (Suppression). The items are rated on a scale from 1 (strongly disagree) to 7 (strongly agree). Examples of items include "I control my emotions by changing the way I think about the situation I'm in" (Reappraisal), "When I am feeling negative emotions, I make sure not to express them" (Suppression), and "When I want to feel less emotion (such as sadness or anger), I change what I'm thinking about" (Reappraisal). Across four samples of undergraduate students, the internal consistencies for the Reappraisal subscale and the Suppression subscale averaged 0.79

and 0.73 respectively, and both subscales showed test-retest reliability of 0.69 over three months. In this study, the total score from the Reappraisal subscale was used as an index of habitual reappraisal.

Visual Analogue Scale (VAS). The VAS is used as a state measure of emotion in this study. It consists of a 10 cm line with "neutral, no sadness" on one end of the line and "sadness" on the other end of the line. Respondents are asked to place a mark on the line to indicate how they feel in the moment. The VAS has been used in previous mood induction studies to assess changes in emotion (Singer & Dobson, 2007; Watkins, Teasdale, & Williams, 2003), and its results have been shown to be highly reproducible and sensitive to change (De Boer et al., 2004; Grant et al., 1999).

Ruminative Responses Scale (RRS; Nolen-Hoeksema & Morrow, 1991). The RRS measures the tendency to engage in rumination: a method of coping characterized by passive and repetitive focus on one's negative experiences (see Appendix H). The scale is composed of 22 items that are answered on a 4-point Likert-type scale (1 = *almost never*; 4 = *almost always*). The scale also gives sub-scores on three facets of rumination: brooding, reflection, and depression-related thoughts. A factor analysis by Treynor, Gonzalez, and Nolen-Hoeksema (2003) suggested that 12 items represented depression-related thoughts that would be confounds in relation to depression measures, and the remaining items sorted into a 5-item Reflection subscale and a 5-item Brooding subscale. Treynor et al. (2003) reported internal consistencies of α = .90, .72, and .77 for the total

score, reflection, and brooding, respectively, and test-retest reliabilities of r = .67, .60, and .62, respectively, over one year.

Affective Control Scale (ACS; Williams, Chambless, & Ahrens, 1997). The ACS is a 42-item self-report scale used to measure fear of the experience of emotions and fear of loss of control over internal and behavioral reactions to emotions (see Appendix I). The questions are rated on a 7-point, Likert-type scale and yield a total score and four subscale scores: Anger, Depression, Anxiety, and Positive Emotions. Williams et al. (1997) reported good internal consistency for the overall scale (α = .94) and subscales (α = .72 to .91), acceptable 2-week test-retest reliability for the overall scale (r = .78) and subscales (r = .66 to .77), and evidence of construct validity.

Attitude towards Negative Experiences Scale (ATNES; Singer & Dobson, 2007). The ATNES is a 15-item questionnaire developed to assess beliefs in depressive experiences (see Appendix J). It is composed of 3 subscales: (1) *positive attitude*, which refers to the belief that rumination is a useful coping strategy (e.g., "Thinking a lot about my problems helps me to find answers to them."), (2) *negative attitude*, which refers to the belief that rumination is harmful and uncontrollable, resulting in attempts to voluntarily control thinking (e.g., "When something bad happens, I try to avoid and control the depressive thoughts that come to mind.") and (3) *acceptance*, which refers to an attitude of acceptance and openness towards negative experiences (e. g., Remaining mindful of the present moment is helpful in reducing depressing feelings."). Items are rated on a 5

point scale (1 = *strongly disagree*; 4 = *strongly agree*). The internal consistencies of the

positive, *negative*, and *acceptance* subscales in a remitted depressed sample were reported

to be 0.76, 0.67, and 0.53 respectively (Singer & Dobson, 2007). This scale was

administered both at baseline and after the regulation period.

2.3 Statistical analyses

The design of the study is a 3 × 11 design, with 1 between-subjects factor

(instruction type [mindfulness, reappraisal, and no-instruction]) and 1 within-subjects

factor (time [11 time points, from pre- through post-regulation period]). The main

dependent variables are self-reported sadness during the regulation period (from T2

through T12), interference scores on the Stroop test at post-regulation, and attitudes

towards negative experiences at pre- and post-regulation. The study employed repeated

measures ANOVA as the statistical technique to address its primary research question.

A power analysis was conducted using G*power (software available at

http://www.psycho.uni-duesseldorf.de/aap/projects/gpower/) to determine the sample

size needed for the study. The power analysis indicated that a sample size of 90 was

needed to detect a medium effect size (f = .25; alpha = .05).

2.3.1 Preliminary analyses

2.3.1.1 Data cleaning and checking of data distribution

All analyses were conducted using SPSS version 16. Because all data were

collected using computer programs (Medialab and Qualtrics) and all questions were set

up in such a way that participants would not be able to proceed to a next set of

questions without having first answered prior questions, there were no missing data.

Data were also examined for inconsistent responses.

The distributions of participants' scores on all continuous dependent variables

were checked for normality and homogeneity. Outliers (data points that were more than

1.5 times the interquartile range) were removed from the data (Field, 2009).

Transformations such as logarithmic, square root, or reciprocal transformations were

applied to normalize the distributions of any variables that has excessive skewness (>

2.0) or kurtosis (> 7.0) (Curran, West, & Finch, 1996). For any variables that could not be

normalized in this way, an equivalent nonparametrical statistical test (e.g., the Kruskal-

Wallis H test) was used in place of the parametric tests. Following Sheppes and Meiran

(2008), Stroop response times shorter than 150 ms and longer than 3000 ms were deemed

as outliers and discarded from the data.

2.3.1.2 Mood induction manipulation check

A manipulation check was conducted to examine the efficacy of the negative

mood induction. Previous studies implementing negative autobiographical mood

induction in non-clinical (e.g., Watkins et al., 2003) and remitted depressed (e.g., Singer

& Dobson, 2007) samples have adopted a minimum negative mood shift of 2 points (2cm

on a 10cm line) as the criterion for successful mood induction. This study adopted a

slightly more liberal criterion: a minimum mood shift of 1 point as the requirement for

successful mood induction. The rationale behind this decision was motivated by both

practical and theoretical reasons. In this study, the percentage of participants who failed

to achieve a 2-point increase in sad mood was 30.2% (39 participants), which is much

higher than the percentage reported in Singer and Dobson (2007)'s study (14.3%). One

reason behind such discrepancy may be the differing nature of the samples recruited in

these two studies. In Singer and Dobson (2007)'s study, the participants were remitted

depressed individuals who were almost asymptomatic (mean BDI score ranged from 4

to 6 across study sub-groups). This study, on the other hand, recruited mildly- to

moderately depressed participants with a mean BDI score (across the whole sample) of

16.2. Given previous research's finding that major depression is associated with emotion

context insensitivity (Rottenberg, Gross, & Gotlib, 2005; Rottenberg, Kasch, Gross, &

Gotlib, 2002), the sample in this study is probably overall less reactive to negative mood

induction compared to the sample in Singer and Dobson (2007)'s study, due to its

greater depression severity. Other autobiographical recall mood induction studies that

have adopted the 2-point mood shift criterion similarly recruited participants who were

low in depression severity (e.g., in Watkins et al., 2003, the mean BDI score of the

participants ranged from 3.8 to 5.2). Further, 29% of the current sample reported a

minimum of 50 (out of 100) as the baseline (pre-mood induction) mood rating. There

were significantly more participants in this category who failed to achieve the minimum

2-point increase in their level of sadness post-mood induction, compared to those who

reported a baseline mood rating of lower than 50, $\chi^2(1) = 21.01$, $p < .001$, suggesting the presence of a ceiling effect in the mood induction procedure for those who were already high in sadness prior to participating in the procedure.

Given these observations, as well as the need to retain the statistical power of this study, this study adopted a more liberal criterion for mood induction. Amount of mood shift was calculated by subtracting each participant's score on the VAS at T2 (3 minutes after T1) from that at T1. Participants who reported a mood shift of less than 1 point were excluded from the subsequent analyses. Mixed-model ANOVA, with time as the within-subjects factor and group as the between-subjects factor, was conducted to examine the effect of mood induction on sadness and determine if there were any group differences in the effect. One-way MANOVA was conducted to examine if there were group differences in the degree to which recalled events were experienced as upsetting by the participants and in the level of sadness prior to the regulation period.

2.3.1.3 Manipulation check with regard to strategy implementation

I examined the extent to which participants engaged in various emotion regulation strategies during the regulation period. Those who were assigned to the mindfulness and reappraisal conditions needed to report a minimum score of 4 out of a 7-point scale on their respective manipulation check question to be considered adherent to the instructions and included in the analyses. I conducted a one-way MANOVA on the extent of engagement in various emotion regulation strategies (mindfulness,

reappraisal, distraction, suppression, and rumination) to examine between-group

differences on use of any of the emotion regulation strategies during the regulation

period.

2.3.1.4 Analyses of pre-test differences across conditions

A one-way MANOVA was conducted to compare baseline characteristics of

participants across the three study conditions. For dichotomous variables such as gender

and ethnicity, chi-square tests were used in place of MANOVA. For any variable for

which there was a significant difference across conditions, a correlation was calculated

between the variable and each of the dependent measures, including changes in sadness

and attitudes towards negative experiences from pre- to post-regulation, and Stroop

interference scores at post-regulation. If the analysis produced significant findings, the

variable was included as a covariate in subsequent analyses.

2.3.1.5 Test of experimenter effects and demand characteristics

To test for potential experimenter effects and demand characteristics, a one-way

MANOVA was conducted to examine if there were differences among groups on their

ratings of the enthusiasm and credibility of the experimenter. An independent samples

t-test was also conducted to compare perceived usefulness of the randomized emotion

regulation strategy in the mindfulness group and the reappraisal group. If the analyses

revealed significant differences between groups on any of these variables, the variable(s)

were used as a covariate in the primary analyses.

41

2.3.2 Primary analyses

2.3.2.1 Effects of condition on changes in sadness

A 3 (group [mindfulness, reappraisal, and no-instruction]) x 11 (time [11 time points]) repeated measures ANOVA was conducted to examine the effects of group on sadness during the regulation period. Follow-up ANOVAs were conducted to explore any significant interaction effects. If any of the analyses did not meet the assumption of sphericity, Greenhouse-Geisser-corrected degrees of freedom and p values are reported. Effect sizes are reported as partial eta-squared.

2.3.2.2 Effects of condition on Stroop interference

I conducted ANCOVA with post-hoc comparisons to examine the effects of group on participants' Stroop interference scores. Stroop interference scores were determined by calculating the difference between latencies associated with incongruent trials and control trials, divided by the total of the latencies associated with both trials ($[RT_{incongruent} - RT_{control}]/ [RT_{incongruent} + RT_{control}]$; Sheppes & Meiran, 2008).

2.3.2.3 Moderating effects of trait mindfulness and habitual reappraisal

To examine whether trait mindfulness and habitual use of reappraisal each moderated the effects of mindfulness and reappraisal on changes in sadness from pre- to post-regulation, I conducted mixed-model ANOVA separately for the mindfulness condition and the reappraisal condition, with sadness ratings as the within-subjects factor, and trait mindfulness and habitual use of reappraisal as between-subjects factors

(each variable transformed into a dichotomous variable, e.g., high vs. low trait mindfulness split by median). Both trait mindfulness and habitual reappraisal were included in the same model to test their unique effects on the outcome.

2.3.2.4 Effects of condition on attitudes towards negative experiences

Because there were significant between-group differences in each of the subscales of the ATNES (positive beliefs about rumination, negative beliefs about rumination, and acceptance of negative experiences) at baseline (see results section), I conducted a one-way ANOVA with post-hoc comparisons on changes in each of these variables from pre- to post-regulation period. According to Weinfurt (2000), compared to repeated measures ANOVA and ANCOVA, ANOVA on change scores is a more valid analysis when there are significant pre-test group differences in the dependent variable of interest.

2.3.3 Ancillary analyses

In addition to the above analyses, I conducted several ancillary analyses, all of which were exploratory in nature, to examine whether there might be variables in addition to trait mindfulness and habitual reappraisal that moderated the effects of group on recovery from sad mood. Variables considered as potential moderators included baseline severity of depression (as measured by the BDI), rumination (as measured by the RRS), and fear of emotion (as measured by the ACS). A series of mixed-model ANOVAs, with each of these variables (transformed into a dichotomous variable)

entered as a between-subjects factor, and sadness ratings from T2 through T12 entered

as a within-subjects factor, were conducted for the mindfulness group and the

reappraisal group to explore these research questions.

3. Results

3.1 Preliminary Analyses

3.1.1 Checking of data distribution

As stated earlier, because of the way that questionnaires and response scales were set up in this study, no data were missing. Also, no inconsistent responding patterns were detected. All dependent variables (self-reported sadness from T2 through T12, Stroop interference scores, changes in positive beliefs about rumination, negative beliefs about rumination, and acceptance of negative experiences from pre- to post-regulation) were inspected for non-normality. None of the variables were substantially skewed or leptokurtic (skew > 2.0, kurtosis > 7.0).

3.1.2 Mood induction and strategy implementation manipulation check

Twenty-one participants (16.3%) did not meet the criterion (1 point increase in sad mood) for successful mood induction and were excluded from subsequent analyses. Groups did not differ significantly on the number of participants who did not meet criteria for successful mood induction, $\chi^2(2) = 2.39$, $p = .303$. Of all participants who were assigned to the mindfulness or reappraisal condition, eight (9%) failed to adequately engage in the technique to which they were assigned. This leaves a final sample size of 100 (reappraisal n = 34; acceptance n = 32, no-instruction n = 34). A 3 (group) × 2 (sadness ratings pre- and post-mood induction) mixed-model ANOVA demonstrated a significant main effect of time, $F(1, 89) = 393.55$, $p < .001$, no main effect of group, and no

interaction, indicating that the mood induction procedure resulted in significant increases in sadness that did not differ by group. Using Pillai's trace, there was a marginally significant effect of group on the degree of unpleasantness of events recalled during the mood induction procedure and in the level of sadness in the pre-regulation period, $V = .10$, $F(4, 178) = 2.41$, $p = .051$. However, separate univariate ANOVAs on the outcome variables revealed non-significant group effects on the degree of unpleasantness of events recalled during the mood induction procedure, $F(2, 89) = 1.76$, $p = .18$, and the level of sadness before the regulation period, $F(2, 89) = 2.05$, $p = .13$.

Using Pillai's trace, there was a significant effect of group on self-reported use of various emotion regulation strategies during the regulation period, $V = .49$, $F(12, 186) = 5.08$, $p < .001$. Follow-up univariate ANOVAs revealed that there were significant between-group differences in the extent to which participants engaged in mindfulness, $F(2, 97) = 9.74$, $p < .001$, and reappraisal, $F(2, 97) = 14.66$, $p < .001$. As expected, the mindfulness group reported significantly greater engagement in mindfulness (M = 5.59) relative to the reappraisal group (M = 4.74), $p = .006$, and the control group (M = 4.12), $p < .001$, and the reappraisal group engaged in reappraisal (M = 5.56) to a significantly greater extent than the mindfulness group (M = 3.81), $p < .001$, and the control group (M = 3.62), $p < .001$. There were no significant between-group differences in the extent to which participants engaged in suppression, $F(2, 97) = 2.37$, $p = .10$, positive distraction,

$F(2, 97) = 1.18$, $p = .31$, distraction by planning or thinking about other things, $F(2, 97) = .69$, $p = .55$, or rumination $F(2, 97) = .79$, $p = .46$, during the regulation period.

3.1.3 Sample characteristics

Table 1 presents the demographic and clinical characteristics of the sample across the three groups. The average age of the sample was 29 years (SD = 11.50, range 18-55). Sixty-nine percent of the sample (n = 69) was female. Using Pillai's trace, there was a significant effect of group on age, salary, baseline depressive symptoms, habitual use of reappraisal, habitual use of suppression, mindfulness, rumination, fear of emotion, positive beliefs about rumination, negative beliefs about rumination, and acceptance of negative experiences, V = .40, $F(22, 176) = 1.99$, $p = .008$. Follow-up univariate ANOVAs were conducted to examine the effects of group on each of these variables. At baseline, the three groups did not differ significantly in age, $F(2, 97) = 162.44$, $p = .30$, gender, $\chi^2(2) = .07$, $p = .97$, ethnicity (Caucasian vs. non-Caucasian), $\chi^2(2) = .24$, $p = .89$, education, $\chi^2(8) = 13.91$, $p = .08$, marital status (married/living with partner vs. not married/living with partner), $\chi^2(2) = .38$, $p = .15$, employment status (employed vs. not employed), $\chi^2(2) = .31$, $p = .86$, income, $F(2, 97) = .85$, $p = .43$, depressive symptoms, $F(2, 97) = .24$, $p = .79$, the proportion in therapy at the time of the study, $\chi^2(2) = 1.56$, $p = .46$, the proportion having had therapy, $\chi^2(2) = .53$, $p = .77$, the proportion taking psychotropic medications at the time of study, $\chi^2(2) = .64$, $p = .73$, the proportion having taken psychotropic medications,

$\chi^2(2) = .52$, $p = .77$, and the proportion having practiced mindfulness meditation or any other types of mindfulness exercises, $\chi^2(2) = 1.07$, $p = .59$.

Further, experimental groups were comparable in terms of habitual use of reappraisal, $F(2, 97) = .30$, $p = .74$, habitual use of suppression, $F(2, 97) = 1.46$, $p = .24$, trait mindfulness, $F(2, 97) = 1.42$, $p = .25$, rumination, $F(2, 97) = .63$, $p = .53$, and fear of emotion, $F(2, 97) = .12$, $p = .89$. There were significant between-group differences in positive beliefs about rumination, $F(2, 97) = 6.26$, $p = .003$, negative beliefs about rumination, $F(2, 97) = 3.65$, $p = .03$, and acceptance of negative experiences, $F(2, 97) = 5.52$, $p = .005$. Post-hoc comparisons using the Bonferroni test indicated that positive beliefs about rumination were significantly higher in the mindfulness group ($p = .004$) and the reappraisal group ($p = .03$) than in the control group. Similarly, acceptance of negative experiences was significantly higher in the mindfulness group ($p = .04$) and the reappraisal group ($p = .007$) compared to the control group. Relative to the control group, the mindfulness group also reported significantly higher negative beliefs about rumination, $p = .04$. Because of the significant between-group differences in these variables, I examined if these variables were correlated with changes in any of the dependent variables. No significant correlations were found, except for a significant negative association between positive beliefs about rumination and Stroop interference, $r = -2.81$, $p = .005$. Positive beliefs about rumination were therefore included as a covariate in the subsequent analysis of Stroop interference.

Table 1: Sample characteristics across conditions

Variable	All Participants (n = 100)	Mindfulness (n = 32)	Reappraisal (n = 34)	Control (n = 34)
Female	69.00%	68.80%	67.60%	70.60%
Caucasian	53.00%	53.10%	50.00%	44.10%
Marital status (% married/living with a partner)	27.00%	25.00%	38.20%	17.60%
Employment status (% employed)	45.00%	46.90%	41.20%	47.10%
In therapy at the time of study	12.00%	9.40%	17.60%	8.80%
Having been in therapy	43.00%	46.90%	44.10%	38.20%
Taking psychotropic medications	19.00%	21.90%	14.70%	20.60%
Having taken psychotropic medications	34.00%	37.50%	35.30%	29.40%
Having practiced mindfulness meditation/ any other kinds of mindfulness exercises	43.00%	40.60%	50.00%	38.20%
Education (% with at least a college degree)	49.00%	53.13%	58.82%	35.29%

	M (SD)	M (SD)	M (SD)	M (SD)
Age	29.04 (11.49)	30.28 (12.47)	30.38 (11.98)	26.53 (9.83)
Depressive symptoms (BDI)	16.05 (4.98)	16.50 (4.91)	15.65 (4.50)	16.03 (5.59)
Habitual use of reappraisal (ERQ-R)	28.81 (6.36)	28.19 (8.30)	29.41 (5.08)	28.79 (5.48)
Habitual use of suppression (ERQ-S)	15.46 (5.59)	16.31 (5.53)	14.15 (6.29)	15.97 (4.79)
Mindfulness (SMQ)	42.47 (13.05)	41.78 (15.59)	40.21 (10.68)	45.38 (12.40)
Rumination (RRS)	52.67 (10.43)	53.88 (8.98)	53.12 (11.85)	51.09 (10.30)
Fear of emotion (ACS)	148.69 (33.95)	151.09 (31.13)	147.41 (31.38)	147.71 (39.44)
Positive beliefs about rumination (ATNES-POS)	14.42 (4.00)	15.72 (4.07)	15.03 (3.93)	12.59 (3.38)
Negative beliefs about rumination (ATNES-NEG)	15.95 (3.50)	17.28 (2.85)	15.47 (3.13)	15.18 (4.09)
Acceptance of negative experiences (ATNES-ACC)	16.31 (3.46)	16.88 (3.15)	17.29 (3.04)	14.79 (3.71)

Note. BDI = Beck Depression Inventory; ERQ-R = Emotion Regulation Questionnaire-Reappraisal Subscale; ERQ-S = Emotion Regulation Questionnaire- Suppression Subscale; SMQ = Southamptom Mindfulness Questionnaire; RRS = Rumination

Responses Scale; ACS = Affective Control Scale; ATNES-POS = Attitude toward Negative Experiences Scale- Positive Beliefs about Rumination Subscale; ATNES-NEG = Attitude toward Negative Experiences Scale- Negative Beliefs about Rumination Subscale; ATNES-ACC = Attitude toward Negative Experiences Scale- Acceptance of Negative Experiences Subscale.

3.1.4 Experimenter effects and demand characteristics

Using Pillai's trace, there were no significant differences between experimental groups on perceived levels of enthusiasm and credibility of the experimenter, $V = .02$, $F(4, 194) = .45$, $p = .77$, suggesting that to the extent that experimenter effects were present, they were comparable across groups. The mindfulness group and the reappraisal group also did not differ significantly on perceived usefulness of the randomized technique, $t(84) = -.72$, $p = .47$.

3.2 Primary Analyses

3.2.1 Effects of condition on changes in sadness

Table 2 shows the descriptive statistics of the sadness ratings from pre-mood induction through post-regulation across all three groups. A 3 × 11 mixed-model ANOVA on sadness ratings indicated a significant main effect of time, $F(4, 86) = 82.45$, $p < .001$, $\eta_P^2 = .49$, a significant main effect of group, $F(2, 86) = 6.33$, $p = .004$, $\eta_P^2 = .12$, and a significant group by time interaction, $F(8, 86) = 2.53$, $p = .01$, $\eta_P^2 = .06$. Averaging across groups, sadness ratings decreased significantly from T2 to T12, $p < .001$, $\eta_P^2 = 69$. Planned contrasts showed that the average sadness ratings reported by the control group (M = 60.12, SE = 3.84) were significantly higher than those reported by the mindfulness group

(M = 43.78, SE = 3.39), p = .002 and the reappraisal group (M = 45.76, SE = 3.39), p = .006.

Figure 2 shows the changes in sadness ratings from pre- through post-regulation for the

three groups.

To break down the group by time interaction, I conducted three two-way

ANOVAs comparing the mindfulness and control conditions, the reappraisal and

control conditions, and the reappraisal and mindfulness conditions respectively, using

the error term from the omnibus ANOVA. ANOVA on sadness ratings comparing the

mindfulness group and the control group revealed a significant main effect of time, $F(4,$

332) = 45.76, p = .001, η_P^2 = .33, a significant main effect of group, $F(1, 55)$ = 9.69, p = .003,

η_P^2 = .15, and a significant time by group interaction, $F(4, 332)$ = 3.25, p = .012, η_P^2 = .03.

On average, the sadness ratings reported by the control group were significantly higher

than those reported by the mindfulness group. Simple contrasts using T2 as the

reference time point showed that relative to no training, mindfulness resulted in

significantly greater decreases in sadness from T2 to T3 (p = .001, η_P^2 = .18), T2 to T4 (p <

.001, η_P^2 = .21), T2 to T5 (p = .020, η_P^2 = .10), T2 to T6 (p = .04, η_P^2 = .08), T2 to T7 (p = .046,

η_P^2 = .07), and T2 to T8 (p = .048, η_P^2 = .07). There were no significant between-group

differences on changes in sadness from T2 to T9, T2 to T10, T2 to T11, and T2 to T12 (ps

ranged from .17 to .58). ANOVA comparing the reappraisal group and the control group

on their sadness ratings showed a significant main effect of time, $F(3, 332)$ = 72.89, p <

.001, η_P^2 = .41, a significant main effect of group, $F(1, 55)$ = 10.42, p = .002, η_P^2 = .16, and a

marginally significant group × time interaction, $F(3, 332) = 2.33$, $p = .070$, $\eta_P^2 = .02$. On average, the reappraisal group reported significantly lower levels of sadness ratings compared to the control group, and sadness ratings in both groups decreased over time.

Lastly, ANOVA on sadness ratings for the mindfulness group and the reappraisal group revealed a significant main effect of time, $F(4, 332) = 58.06$, $p < .001$, $\eta_P^2 = .43$, and a marginally significant group by time interaction, $F(4, 332) = 2.34$, $p = .055$, $\eta_P^2 = .03$. The main effect of group was not significant, $F(1, 62) = .15$, $p = .70$, $\eta_P^2 = .002$, indicating that on average, the sadness ratings did not differ significantly between the mindfulness group and the reappraisal group. Because the interaction was almost significant ($p = .055$), follow-up contrasts were conducted to explore the interaction. Simple contrasts using T2 as the reference time point indicated that the groups did not differ significantly on changes in sadness from T2 to any subsequent time point (ps ranged from .09 to .77). Difference contrasts, which compare sadness ratings of a time point to the sadness rating of an immediately preceding time point, showed that the reappraisal group reported significantly greater *decreases* in sadness from T10 to T11 ($p = .005$, $\eta_P^2 = .12$), and significantly greater *increases* in sadness from T11 to T12 ($p = .02$, $\eta_P^2 = .09$), relative to the mindfulness group.

Table 2: Descriptive statistics of sadness ratings from pre-mood induction to post-regulation across conditions

	Mindfulness M (SD)	Reappraisal M (SD)	Control M (SD)
T1	27.75 (3.96)	30.18 (3.76)	25.68 (4.09)
T2	71.25 (14.78)	76.38 (13.38)	77.40 (8.95)
T3	53.66 (26.64)	61.84 (17.25)	75.52 (10.35)
T4	46.44 (26.38)	55.75 (20.38)	71.36 (11.40)
T5	45.63 (26.19)	55.75 (20.38)	71.36 (11.40)
T6	43.06 (27.19)	45.91 (23.65)	61.72 (17.35)
T7	40.59 (26.40)	44.03 (21.55)	59.52 (22.32)
T8	37.31 (27.80)	38.03 (22.32)	56.40 (17.25)
T9	36.16 (27.54)	35.13 (22.73)	51.76 (20.94)
T10	35.75 (28.65)	34.59(23.76)	49.72 (22.10)
T11	36.09 (28.46)	29.97 (21.19)	46.36 (24.50)
T12	35.63 (27.22)	30.56 (22.74)	45.72 (24.61)
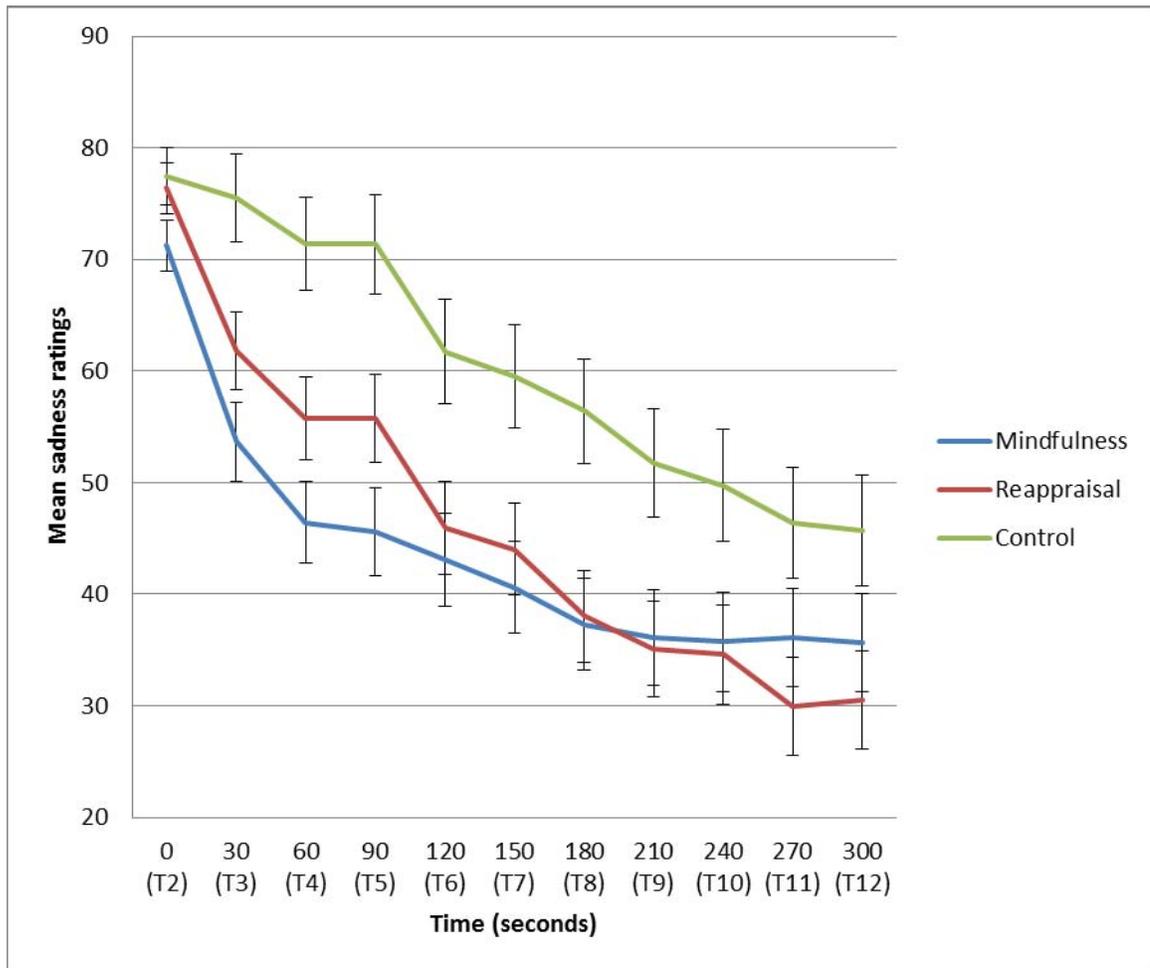
Figure 1: Changes in sadness ratings from pre- through post-regulation across conditions

3.2.2 Effects of condition on Stroop interference

ANCOVA with positive beliefs about rumination entered as a covariate indicated that groups differed significantly on Stroop interference scores, $F(2, 96) = 3.43$, $p = .04$, $\eta_p^2 = .07$. Post-hoc comparisons using the Bonferroni test showed that the Stroop interference scores of the mindfulness group were significantly lower than those of the reappraisal group, $p = .03$. There were no significant differences in Stroop interference

scores between the mindfulness group and the control group, $p = .60$, or between the

reappraisal group and the control group, $p = .66$. The mean (and standard deviation) of

the Stroop interference scores for the mindfulness, reappraisal, and control groups was

.033 (.040), .059 (.038) and .054 (.373) respectively (see Figure 2). There were no

significant between-group differences in the extent to which participants reported trying

to do well on the test, $F(2, 97) = .09$, $p = .92$, and in the extent to which they reported

feeling distracted, $F(2, 97) = .19$, $p = .82$, or tired, $F(2, 97) = .02$, $p = .98$, during the test.

Further, there was no significant correlation between Stroop interference scores and

either changes in sadness from T2 to T12 or sadness at T12, suggesting that the

interference effect obtained cannot be attributed to differences in mood ratings across

groups. This result is consistent with a previous study's finding that sad mood does not

influence performance on a Stroop task (Chepenik, Cornew, & Farah, 2007).

Figure 2: Stroop interference scores across conditions

56

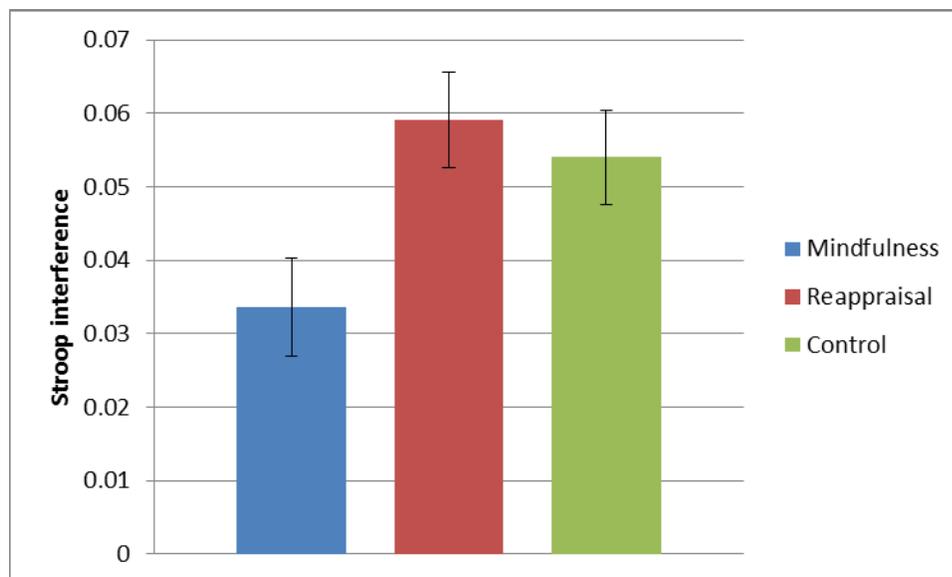### 3.2.3 Moderating effects of trait mindfulness and habitual reappraisal

A 2 (high vs. low trait mindfulness) × 2 (high vs. low habitual reappraisal) × 11 (time) ANOVA on sadness ratings was conducted for the mindfulness group and the reappraisal group separately. In this study, the correlation between trait mindfulness and habitual reappraisal was 0.22, $p < .05$. Analyses for the mindfulness group indicated no significant interaction between the level of mindfulness and time, $F(4, 28) = .44$, $p = .78$, $\eta_P^2 = .02$, or between the level of habitual reappraisal and time, $F(4, 28) = .75$, $p = .68$, $\eta_P^2 = .03$, suggesting that neither trait mindfulness nor habitual reappraisal moderated the effects of mindfulness training on changes in sadness. For the reappraisal group, there was a significant interaction effect between the level of mindfulness and time, $F(4, 28) = 2.48$, $p = .047$, $\eta_P^2 = .08$, and no significant habitual reappraisal × time interaction, $F(4, 28) = .30$, $p = .98$, $\eta_P^2 = .01$, suggesting that trait mindfulness moderated the effects of reappraisal on sadness ratings from pre- through post-regulation. To break down the interaction between the level of mindfulness and time, simple contrasts were performed comparing sadness ratings at each time point to sadness ratings at T2 (pre-regulation period). The contrasts showed that participants who were high on trait mindfulness, relative to those who were low on trait mindfulness, reported greater decreases in sadness from T2 to T3 ($p = .04$, $\eta_P^2 = .14$), T2 to T4 ($p = .02$, $\eta_P^2 = .17$), T2 to T5 ($p = .01$, $\eta_P^2 = .19$), T2 to T6 ($p = .03$, $\eta_P^2 = .15$), T2 to T8 ($p = .03$, $\eta_P^2 = .15$), T2 to T9 ($p = .02$, $\eta_P^2 = .17$), T2 to T10 ($p = .02$, $\eta_P^2 = .18$), T2 to T11 ($p = .01$, $\eta_P^2 = .21$), and T2 to T12 ($p = .01$, $\eta_P^2 = .21$).

Decreases in sadness from T2 to T7 were marginally greater for the high trait

mindfulness group than the low trait mindfulness group, $p = .07$, $\eta_p^2 = .11$. Figure 3

shows the interaction between trait mindfulness and time for the reappraisal group.
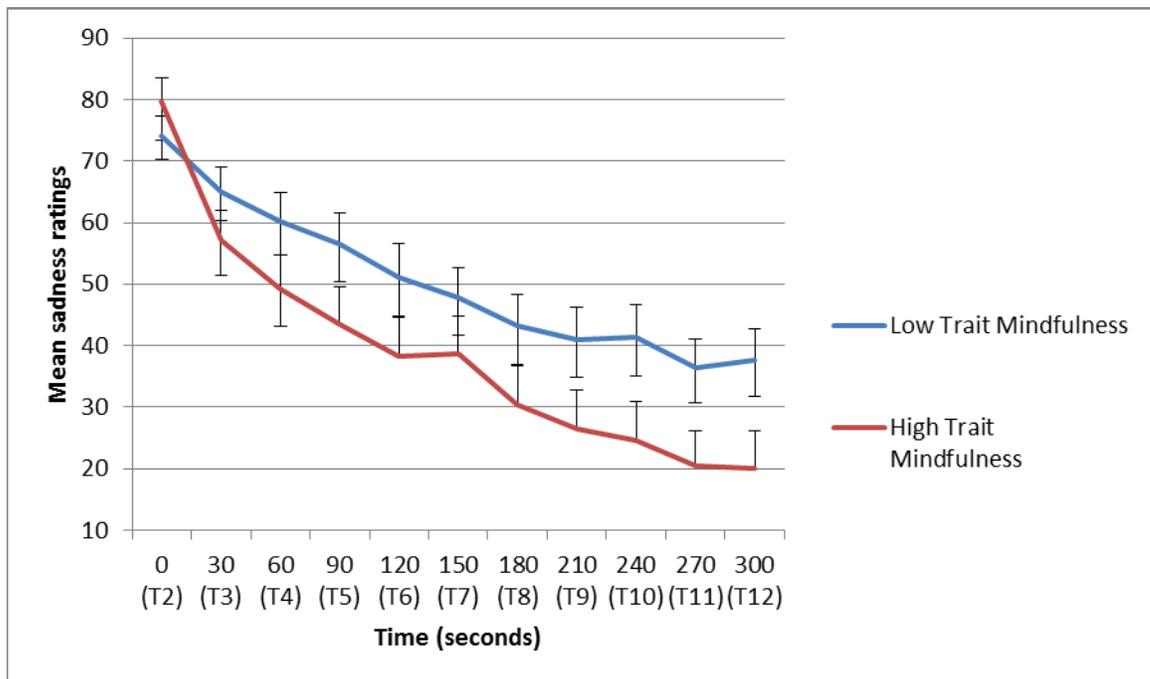
Figure 3: Interaction between trait mindfulness and time for the reappraisal group

3.2.4 Effects of condition on attitudes towards negative experiences

Table 3 and figure 4 show the descriptive statistics of changes in positive beliefs

about rumination, negative beliefs about rumination, and acceptance of negative

experiences across the three groups. One way ANOVA on pre- to post-regulation

changes in positive beliefs about rumination revealed a significant between-group effect,

$F(2, 97) = 3.35$, $p = .04$, $\eta^2 = .01$, such that the decreases in positive beliefs about

rumination were significantly greater in the mindfulness group than in the control

group (mean difference = 2.09, SE = .86), p = .04. Groups also differed significantly on

changes in negative beliefs about rumination, $F(2, 97)$ = 12.91, $p < .001$, η^2 = .21, such that

decreases in this variable were significantly larger in the mindfulness group compared

to the reappraisal group (mean difference = 3.50, SE = .76), $p < .001$, and the control group

(mean difference = 3.23, SE = .76), $p < .001$. Lastly, the Welch test (used in place of one

way ANOVA because of heterogeneity of variance in the dependent variable) indicated

a significant between-group effect on acceptance of negative experiences, p = .02.

Relative to the reappraisal group, the mindfulness group demonstrated significantly

greater increases in acceptance of negative experiences (mean difference = 1.49, SE = .56),

p = .03.

Table 3: Descriptive statistics of changes in attitudes towards negative experiences across conditions

	Mindfulness M (SD)	Reappraisal M (SD)	Control M (SD)
Change in positive beliefs about rumination	-.47 (3.40)	-.03 (2.91)	1.62 (4.02)
Change in negative beliefs about rumination	-1.44 (3.03)	2.06 (2.80)	1.79 (3.43)
Change in acceptance of negative experiences	1.81 (2.58)	.32 (1.87)	1.85 (4.00)
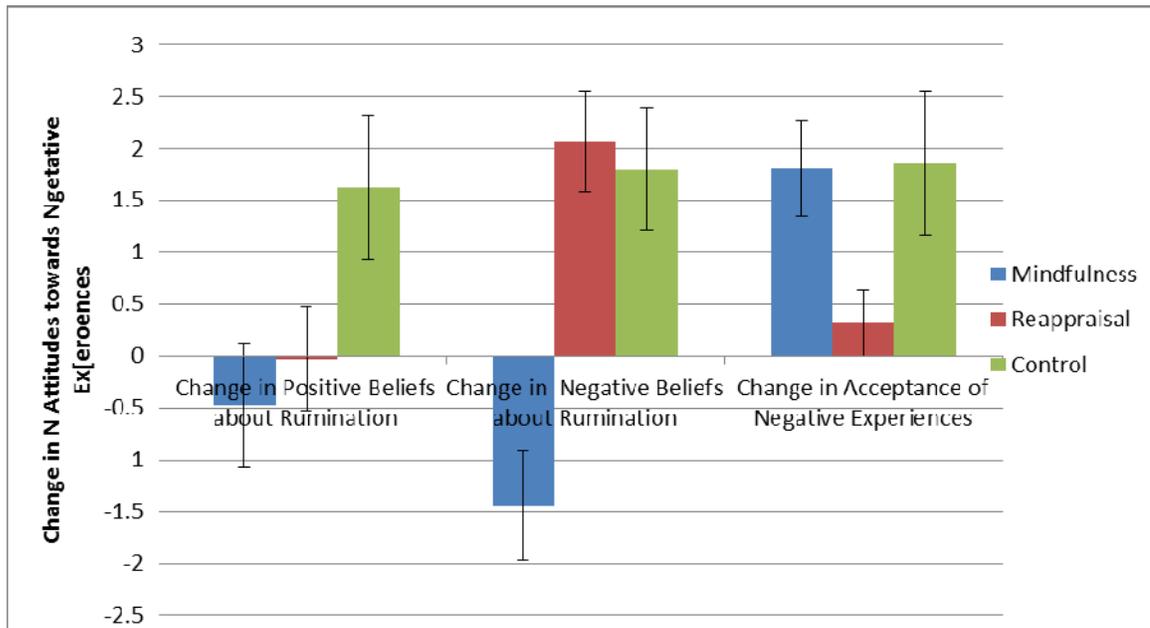
Figure 4: Changes in attitudes towards negative experiences across conditions

3.3 Ancillary analyses

A series of mixed-model ANOVAs with sadness ratings from T2 through T12 as a within-subjects factor, and with severity of depression, rumination, and fear of emotion each entered as a between-subjects factor in separate analyses, indicated no significant interaction between time and any of the variables for either the mindfulness group or the reappraisal group, suggesting that none of these variables (depression severity, rumination, and fear of emotion) moderated the effects of mindfulness or reappraisal training on changes in sadness ratings from pre- through post-regulation.

4. Discussion

The present study investigated the relative effects of mindfulness and reappraisal in down-regulating sad mood and compared the extent to which execution of these regulation strategies entails cognitive resources in an analogue depressed sample. The study also examined individual differences in trait mindfulness and habitual tendency to engage in reappraisal as potential moderators of the effectiveness of both strategies. Further, changes in attitudes towards negative experiences were evaluated as a potential psychological mechanism on which mindfulness and reappraisal differ. Consistent with the hypothesis, the study found that, compared to no instruction, both mindfulness and reappraisal resulted in significantly greater decreases in sad mood induced through negative autobiographical recall. Mindfulness and reappraisal showed equivalent effects on reductions in sad mood, with a slight variation in their relative effects within the last minute of the regulation period. Also, as hypothesized, the reappraisal group demonstrated significantly higher Stroop interference scores compared to the mindfulness group. The prediction that individual differences in trait mindfulness would moderate the effects of mindfulness and reappraisal was partially supported. Specifically, higher trait mindfulness predicted greater reductions in sadness in the reappraisal group, but not in the mindfulness group. Habitual reappraisal did not moderate the effects of either mindfulness or reappraisal. The hypothesis that changes in attitudes towards negative experiences would be an effect unique to the mindfulness

61

group was largely supported. Mindfulness resulted in significantly greater decreases in negative beliefs about rumination and increases in acceptance of negative experiences relative to reappraisal, and significantly greater decreases in both positive and negative beliefs about rumination compared to no instruction.

The finding that mindfulness was more effective than no instruction in reducing sadness is consistent with previous studies showing that brief mindfulness training, relative to no training, reduced the intensity of negative affect in the context of negative autobiographical recall (in a sample of remitted depressed patients; Singer & Dobson, 2007) and watching an affectively mixed film clip (in a sample of individuals with elevated difficulties with emotion regulation; Erisman & Roemer, 2010). Another study, however, showed no difference in the effects of acceptance versus no training on the intensity of negative affect elicited by emotional film clips among both individuals with and without a diagnosis of GAD (Aldao & Mennin, 2012). The inconsistency in the findings may be due to differences in sample characteristics, as well as in the conceptualization and training of acceptance across these studies. For example, the acceptance instructions provided in Aldao and Mennin's study emphasized only the acceptance aspect of mindfulness and were briefer than the mindfulness instructions provided in the current study. This study's instructions, like the instructions given in Singer and Dobson (2007)'s and Erisman and Roemer (2010)'s studies, included a rationale for engaging in mindfulness and a practice mindfulness exercise. It remains to

be empirically demonstrated whether more elaborate mindfulness or acceptance instructions would lead to a stronger intervention effect. The finding that reappraisal resulted in greater decreases in sadness than control is in line with Gross (1998)'s finding that reappraisal, compared to no instruction, resulted in decreased experiential and behavioral signs of disgust in response to a disgust-inducing film clip. Whereas prior studies have examined the emotional effects of reappraisal, most compared reappraisal to strategies that have been identified as potentially maladaptive (e.g., expressive suppression [Gross, 1998], rumination [Grisham et al., 2009; Ray et al., 2008]), and few examined the efficacy of reappraisal relative to a no instruction condition. Also, the effects of reappraisal have mostly been demonstrated in non-clinical as opposed to clinical samples (e.g., Grisham et al., 2009; Gross, 1998; Ray et al., 2008). Further, because reappraisal is often conceptualized as an antecedent-focused regulation strategy (Gross, 1998), there has been little research examining its effectiveness in the context of regulating already-heightened emotional situations. To the author's knowledge, this is the first study that demonstrated the superiority of reappraisal to no training in down-regulating sadness in an analogue depressed sample.

In this study, mindfulness participants and reappraisal participants reported comparable decreases in sad mood. Differences in their effect emerged only within the last minute of the regulation period, with reappraisal and mindfulness each associated with greater decreases in sadness within the first and the second half of the minute,

63

respectively. This result corresponds to Wolgast et al. (2011)'s finding that acceptance

and reappraisal had equivalent effects on reductions in distress during exposure to

sadness- and fear-inducing film clips in a non-clinical sample. However, the finding

stands in contrast to other laboratory studies' findings that reappraisal was more

effective than acceptance at down-regulating subjective anxiety (Hofmann et al., 2009),

anger (Szasz et al., 2011), and negative affect (Aldao & Mennin, 2012). As noted earlier,

the discrepancies in the findings may arise in part from differences in how acceptance is

conceptualized in these studies versus the present study and the fact that the acceptance

instructions provided in some of these studies (e.g., Aldao & Mennin, 2010; Hofmann et

al., 2009; Szasz et al., 2011) are relatively limited compared to the instructions provided

in this study. The findings may also point to a picture of emotion regulation that is more

complicated than previously assumed. As Gross (1998) proposed, the effectiveness of

emotion regulation strategies may vary as a function of participant characteristics,

regulatory processes, and types of emotions being regulated. One speculation is that

reappraisal may be more effective than acceptance at down-regulating high-arousal

negative emotions such as anxiety and anger (Hofman et al., 2009; Szasz et al., 2011) but

is comparable to acceptance in its effects in reducing sadness. Further research is needed

to elucidate the relative effects of acceptance (or mindfulness) and reappraisal in a way

that takes into account potential differential effects arising from factors such as

participant characteristics (e.g., clinical vs. non-clinical samples), elaborateness of training instructions, and types of regulated emotions.

The finding that Stroop interference at post-regulation was significantly higher in the reappraisal group than in the mindfulness group, to the author's knowledge, provides the first evidence for lower cognitive costs associated with use of mindfulness versus reappraisal as a regulation strategy. From an ego depletion theory's perspective, the result suggests that awareness- or mindfulness-based emotion regulation strategies may incur fewer cognitive or inhibitory control resources compared to cognitive change-based strategies that involve actively reframing already-established cognitive content or interpretations. This finding is consistent with traditional and contemporary accounts of mindfulness as a practice of relaxed, open awareness (Rosch, 2007; Salmon et al., 2004), as well as with previous research that showed that reappraisal, when implemented as an online regulation strategy to down-regulate negative emotions, consumes cognitive resources (Sheppes & Meiran, 2008; Sheppes & Meiran, 2009; Urry et al., 2009). An alternative explanation of the finding is that engagement in mindfulness may directly improve attentional functioning, particularly conflict monitoring, an aspect of attention recruited in the Stroop task (Botvinick, Cohen, & Carter, 2004). Whereas this explanation has empirical basis in research showing that mindfulness training is associated with improved conflict monitoring (e.g., Cozza, 2010; Jha at al., 2007; Tang et al., 2007; Wenk-Sormaz, 2005), it is unlikely accounting for the present study's finding. In this study, the

level of Stroop interference demonstrated by the mindfulness group did not differ from that of the control group, suggesting that the observed cognitive effect of mindfulness is likely due to increased cognitive load associated with reappraisal rather than improved attentional functioning associated with mindfulness. The finding, however, does not preclude the possibility that the cognitive benefits resulting from mindfulness training somehow helps protect against depletion of cognitive resources when mindfulness is applied to cope with emotionally challenging situations. Future research should replicate this finding, as well as clarify the mechanisms accounting for the varying cognitive costs associated with mindfulness and reappraisal.

The study also found that higher trait mindfulness predicted greater decreases in sadness among reappraisal participants, suggesting that trait mindfulness may facilitate more effective engagement in reappraisal. Consistent with this finding, a recent fMRI study (Modinos, Ormel, & Aleman, 2010) demonstrated a positive correlation between trait mindfulness and the level of activity in dorsomedial prefrontal cortex, a brain region underlying reappraisal, while university students were instructed to reappraise negatively-valenced pictures. This result also corroborates recent theoretical work proposing that mindfulness supports the ability to decenter from existing thoughts, emotions, or interpretations of an event (a process that has also been referred to as "reperceiving"; see Shapiro et al., 2006), which may in turn assist the process of generating more positive or adaptive appraisals of the event (Garland et al., 2009).

Unlike Huffziger and Kuehner (2009)'s study, which found evidence for moderation of mindfulness' effects by individual differences in trait mindfulness in a depressed sample, this study did not find that trait mindfulness moderated the effect of mindfulness on sad mood. It is difficult to reconcile the differences in these findings. One possibility to consider is that the mindfulness training provided in this study, which involved verbal, face-to-face instructions and a mindful experiential exercise, may have produced a stronger effect than the training used in Huffziger and Kuehner (2009)'s study, which instructed participants to read written statements prompting a mindful approach to thoughts and emotions. The stronger training effect in this study might have masked any effect arising due to individual differences in trait mindfulness.

The lack of moderating effect by habitual reappraisal in the reappraisal condition is also contrary to prediction but is consistent with the finding of a recent laboratory study (Wolgast et al., 2011) that showed that individual differences in habitual use of reappraisal did not interact with the subjective effects of reappraisal. One interpretation of the finding is that greater habitual use of reappraisal *per se* may not reflect more effective implementation of reappraisal, which itself may be a better predictor of emotion regulation success. As suggested above, however, the lack of moderation effect may also be due to the effect of reappraisal training outweighing the effect of individual differences in habitual reappraisal. In this study, there was also a lack of significant interaction between habitual reappraisal and mindfulness' effects, consistent with

Wolgast et al. (2011)'s finding that individual differences in reappraisal did not moderate the effects of acceptance training.

The finding that mindfulness training resulted in improvements in attitudes towards negative experiences supports theoretical work proposing that mindfulness facilitates emotional acceptance (Hayes et al., 1999; Segal et al., 2002) and contributes to a growing empirical literature emphasizing the role of mindfulness in increasing willingness to tolerate negative emotions (e.g., Arch & Craske, 2006; Eifert & Heffner, 2003; Levitt et al., 2004) and decreasing the extent to which behaviors are regulated by negative aversive experiences (Wolgast et al., 2011). In agreement with Singer and Dobson (2007)'s study, the study found that mindfulness, compared to reappraisal and no instruction, resulted in significantly greater decreases in negative beliefs about rumination. However, unlike Singer and Dobson, who did not find any between-group differences in positive beliefs about rumination or acceptance of negative experiences, this study demonstrated greater reductions in positive beliefs about rumination among mindfulness participants relative to control participants, and greater increases in acceptance of negative experiences in the mindfulness group versus the reappraisal group. Variations in sample characteristics (e.g., higher depression severity and lower baseline acceptance of negative experiences in this sample versus Singer & Dobson's sample) and/ or other methodological factors may have contributed to the discrepancy in the findings. Overall, these findings highlight changes in attitudes towards negative

68

experiences as a potential mechanism of change that differentiates mindfulness from reappraisal. Even though both strategies are not mutually exclusive (see introduction section) and produced comparable effects on sad moods in this study, they differed in the extent to which they led to changes in negative beliefs about rumination and acceptance of negative experiences. Notably, these changes resulted from relatively brief (i.e., ten minutes) sessions of training. These findings have important clinical implications in that they underscore the utility of mindfulness in modifying maladaptive cognitive styles associated with depression (Papageorgiou & Wells, 2003).

This study can be noted for several strengths, including use of a randomized experimental design and control for experimenter effects and participants' adherence to manipulation instructions. Further, the sample is ethnically diverse: A little more than half of the sample are Caucasians (53%), followed by Asians/ Asian Americans (22%), African Americans (15%), American Indians (6%), and Hispanics/ Hispanic Americans (4%). Such diversity might have been driven by the fact that the study recruited from both Durham and the broader Triangle area, as well as the Duke undergraduate population, which consisted of students of diverse ethnic backgrounds.

There are several limitations to the study. First, although the study is designed to maximize its internal validity (via having strict control of the experimental setting, the manipulated variables, and dependent variables), the tradeoff is that there is limited external validity. It is unknown the extent to which the results are generalizable to

69

coping with negative situations generally in daily life. For example, the type of stressor

employed in this study was self-generated, personally relevant autobiographical stimuli;

it is unclear if the prescribed strategies would help individuals cope with other kinds of

stressors encountered in daily life in similarly effective ways. One way to examine the

effects of mindfulness versus reappraisal as implemented in daily life would be to

employ an ecological momentary assessment approach, which involves repeatedly

sampling people's behavior and experiences in real time, in their own natural

environment (Shiffman, Stone, & Hufford, 2008). The training instructions provided in

the study also serve only as rough approximations of how mindfulness and reappraisal

are actually taught in the context of psychotherapy, although effort was made to make

the training instructions as comprehensive as possible (e.g., by incorporating an

experiential/ practice component in the training instructions for both conditions) within

the time limit of the experiment session.

Another limitation of the study is its reliance on self-report methods to assess

emotional experience. The findings speak to how mindfulness and reappraisal affect

subjective sadness, but not how they impact the physiological and behavioral aspects of

the emotional experience. It is not uncommon that studies employing multimodal

assessment of emotions find differential effects of a regulation strategy on multiple

emotional domains. For example, Erisman and Roemer (2004) demonstrated that

mindfulness, relative to no instruction, reduced subjective negative affect in response to

an affectively-mixed film clip but found no differences between these strategies in their effects on physiological responses (skin conductance and heart rate). It is therefore important that future studies examine the effects of mindfulness and reappraisal using multiple modes of assessment (e.g., self-report, behavioral, and physiological) to better understand how these strategies affect the overall emotional experience. Lastly, the study recruited an analogue depressed sample, which limits the generalizability of the results to a full clinical sample. It is notable, though, that the present sample as a whole might resemble a clinical sample, as suggested by the fact that participants had an average BDI score of 16 (which falls within the range of moderate depression), and the fact that the percentage of the sample having received therapy and taken psychotropic medications was 43% and 34%, respectively. Although the findings cannot be fully generalized to a clinically depressed sample, studies comparing the phenomenology of depression between analogue and depressed samples have shown that differences in the nature of depression between these two samples are primarily quantitative (i.e., the difference lies mainly in the severity of depression) rather than qualitative (Cox, Enns, Borger, & Parker, 1999; Enns, Cox, & Borger, 2001). Further, a previous review on the suitability of utilizing analogue depressed samples in clinical studies found evidence in favor of generalizing findings obtained from analogue depressed samples to a clinical sample (Vredenburg, Flett, & Krames, 1993). Despite these findings, however, the effects

71

of mindfulness and reappraisal on coping with stressors in the context of depression cannot be fully ascertained until they are assessed in a clinically depressed sample.

The present study points to several worthwhile directions for future research. First, as noted earlier, emotion regulation is a complex process, and many factors may influence the effectiveness of a particular emotion regulation strategy. These factors encompass individual differences, such as levels of a particular symptomatology, personality, and presence of other habitual regulation strategies in an individual's behavioral repertoire (e.g., see Aldao & Nolen-Hoeksema, 2011), as well as contextual factors, such as timing of the initiation of an emotion regulation strategy (e.g., see Sheppes & Gross, 2011), kinds of stressors encountered, and intensity or types of emotions being regulated. Future empirical work should examine ways in which these variables modulate the effectiveness of an emotion regulation strategy. Research has also proposed the idea that psychological health may be dependent more on the ability to *flexibly* implement a variety of emotion regulation strategies in accordance with situational demands than the prescribed use of any particular regulation strategy (Bonanno, Papa, Lalande, Westphal, & Coifman, 2004; Blanchard-Fields, 2007). Considering this proposal and the idea that the effects of a regulation strategy may be context-dependent, a valuable research direction may be to investigate the extent to which flexibility in engaging in various regulation strategies (including mindfulness and

reappraisal) according to situational demands contributes to emotional health, above and beyond the effects of implementing a particular emotion regulation strategy.

Future research should also examine common and unique processes that mediate the outcome of mindfulness versus reappraisal. Although the study identified changes in attitudes towards negative experiences as a process unique to mindfulness, it is unknown whether and to what extent these changes accounted for the emotional and/or cognitive effects of mindfulness. These questions would be addressable through a larger scale intervention trial with temporal assessments of key outcome and mediating variables. In addition, the study highlights cognitive differences between mindfulness and reappraisal as an area of research worth further inquiry. This study provided evidence for reduced cognitive depletion associated with implementation of mindfulness versus reappraisal, but mindfulness and reappraisal may differ on other cognitive domains as well. The time-limited nature and design of this study make it difficult to assess the cognitive effects of a regulation strategy in more than one task at a time. As previous research suggested, an emotion regulation strategy may have divergent cognitive costs. One study, for example, showed that distraction resulted in better Stroop performance but less accurate memory for emotional stimuli than reappraisal (Sheppes & Meiran, 2008). It remains to be examined if mindfulness may lead to differential outcomes in other cognitive domains such as memory for emotional events, compared to reappraisal and other regulation strategies.

73

To conclude, the present study showed that brief trainings in reappraisal and mindfulness produced comparable effects in reducing subjective sadness induced through autobiographical memory recall in a sample of adults with elevated symptoms of depression. Both strategies however incurred different amounts of cognitive costs: Relative to mindfulness, reappraisal resulted in greater Stroop interference, reflecting greater expenditure of self-control resources. Greater trait mindfulness predicted more effective emotion regulation by reappraisal, suggesting that mindfulness may promote greater flexibility in engagement with cognitive content. Lastly, the study demonstrated changes in attitudes towards negative experiences as an effect potentially unique to mindfulness, highlighting the clinical utility of mindfulness in altering maladaptive metacognitive attitudes and beliefs associated with depression.

Appendix A

Mindfulness Training Instructions

Now I am going to train you on how to use a strategy for dealing with negative emotions. We call this technique "mindfulness".

What this technique involves is to simply be aware of your thoughts, emotions and experiences in a nonjudgmental manner, to allow them to be as they are in the present moment, without engaging in thinking about them or pushing them away.

Typically, our natural tendency when experiencing difficult thoughts and emotions is that we tend to think about them over and over again, judge them as good or bad, or we try to push them away and not want to deal with them. The technique of mindfulness is to avoid these two opposites, so instead of engaging with our thoughts and emotions or pushing them away, we practice being aware of them as simply thoughts and emotions, and watching them come and go, as if they are waves in the ocean (or clouds against the sky).

One good way of understanding what mindfulness is is via doing an experiential exercise.

Now, close your eyes, if that feels comfortable for you, and allow the body to relax… (PAUSE)… the first step is being aware, really aware, of what is going on with you right now. (PAUSE)…. Notice if there are any physical sensations in the body… tightness.. or tension in any part of the body… (PAUSE).. any thoughts you are having…(PAUSE)… any emotions you are feeling.. (PAUSE)… When you are ready I would like you to tell me what are you noticing now about your present experience……(PAUSE)……..   What physical sensations are you feeling? (PAUSE)……….What emotions are you feeling? (PAUSE)…….. What thoughts are running through your mind (PAUSE) ……….

If you like, you can think of thoughts as if they were projected on the screen at the cinema. You sit, watching the screen, waiting for the thoughts or images to arise. When they do you pay attention to them so long as they are there ''on the screen'' and then let them go as they pass away.

If you like, you can acknowledge the presence of these thoughts and images, perhaps saying 'Ah, there you are, that's how it is right now' without judging them as good or bad. And similarly with sensations in the body 'Are there sensations of tension,

of holding or whatever?' And again, awareness of them, simply noting them. 'OK, that is how it is right now.'

[The experimenter emphasizes nonjudgment of the experiences noted in the exercise.]

To summarize, the purpose of this technique is to bring your attention back to your direct, present experience, rather than engaging in thinking about them (or what they might mean) or turning your attention away from them. The idea is to notice and allow your present experience, including your thoughts and emotions, in a nonjudgmental manner.

At this point, do you have any questions about the technique or how to use it?

What I would like you to do later is to use this technique to cope with your negative mood when you receive the instruction to do so. Before we move on to the next part of the training, may I know what are the typical things you do when you feel upset?

So what I would like you to do is to try to refrain from using these other techniques to help yourself feel better; instead I would like you to engage in this technique as much as possible when you are instructed to cope with your mood.

Word count: 564 words

Appendix B

Reappraisal Training Instructions

Now I am going to train you on how to use a strategy for dealing with negative emotions. We call this technique "reappraisal".

What this technique involves is to change our thoughts or interpretations about events that upset us—meaning—to change the way we think about the event.

Typically, the reason we experience difficult thoughts and emotions is that we tend to have very negative interpretations about the event that triggers them. The technique of reappraisal is to change the way we interpret the event, so that we feel less negatively about it. It's the attempt to develop a more positive interpretation about a situation that at first glance, may appear very negative to us.

There are many ways one can change one's interpretations about a situation. One can start, for example, by asking 'Is this the only way I can think about the event or the situation?' 'Is there a more positive way of construing the event so that I feel less negatively about it?' 'What could be another way to look at what happened?' If you like, you can also challenge your negative thoughts or interpretations of an event, disprove them by reasoning or by drawing from your other experiences, and replace them with more positive interpretations.

Let's do a practice exercise to demonstrate how this technique works. Let's say you have a colleague, with whom you have a fairly good relationship, who would always smile at or say hi to you each time you run into her. However, there is this one time when you ran into her and she wasn't smiling at you. What might be some thoughts that you have about that in that moment?

[at this point, the experimenter works with the participant to come up with various possible interpretations, and demonstrate how each interpretation might lead to a different emotional experience. Finally, the experimenter works with the participant to come up with an interpretation that will lead to less negative positive emotions.]

As you can see, adopting a different interpretation of a negative situation might change how we feel about it.

Another way to reappraise an event is by thinking about the event from a perspective other than one's own, say an impartial observer or a third person. For

example, one can ask: 'If a friend of mine were to face a similar situation, what would I tell him or her? What sort of advice would I give him or her?'

Also, one can try to think of some positive aspects of the event, such as lessons that you have learned and ways you can improve in the future if the same event or situation was to occur again. Think of whether there is any positive meaning that you can derive from the incident.

To summarize, the purpose of this technique is to think about the situation that upsets us in a different way, or cast it in more positive light, so that we are less emotionally impacted by it.

At this point, do you have any questions about the technique or how to use it?

What I would like you to do later is to use this technique to cope with your negative mood when you receive the instruction to do so. Before we move on to the next part of the training, may I know what are the typical things you do when you feel upset?

So what I would like you to do is to try to refrain from using these other techniques to help yourself feel better; instead I would like you to engage in this technique as much as possible when you are instructed to cope with your mood.

Word count: 563 words

Appendix C

Manipulation Check Questions

1. On a scale of 0-7, to what extent were you trying to notice your thoughts and emotions as they are, in a nonjudgmental manner just now?

2. On a scale of 0-7, to what extent were you trying to change the way you think about the situations that you recalled just now?

3. On a scale of 0-7, to what extent were you trying to distract yourself by
   a. thinking about other positive things just now?
   b. planning or thinking about other things?

4. On a scale of 0-7, to what extent were you trying to think over and over again about the situations that you thought about just now?

5. On a scale of 0-7, to what extent were you trying to suppress your thoughts and emotions just now?

Appendix D

Questions Assessing Experimenter Effects

1. On a scale of 0-7, to what extent do you think the experimenter is credible?

2. On a scale of 0-7, to what extent do you think the experimenter is enthusiastic?

Appendix E

Beck Depression Inventory

On this questionnaire are groups of statements. Please read each group of statements carefully. Then pick out the one statement in each group which best describes the way you have been feeling the PAST WEEK, INCLUDING TODAY. Circle the number beside the statement you picked. If several statements in the group seem to apply equally well, circle each one. Be sure to read all the statements in each group before making your choice.

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

2. 0 I am not particularly discouraged about the future.
      1 I feel discouraged about the future.
      2 I feel I have nothing to look forward to.
      3 I feel that the future is hopeless and that things cannot
         improve.

3. 0 I do not feel like a failure.
      1 I feel I have failed more than the average person.
      2 As I look back on my life, all I can see is a lot of failures.
      3 I feel I am a complete failure as a person.

4. 0 I get as much satisfaction out of things as I used to.
      1 I don't enjoy things the way I used to.
      2 I don't get real satisfaction out of anything anymore.
      3 I am dissatisfied and bored with everything.

5. 0 I don't feel particularly guilty.
      1 I feel guilty a good part of the time.
      2 I feel guilty most of the time.
      3 I feel guilty all of the time.

6. 0 I don't feel I am being punished.
      1 I feel I may be being punished.
      2 I expect to be punished.

3   I feel I am being punished.

7.   0   I don't feel disappointed in myself.
      1   I am disappointed in myself.
      2   I am disgusted with myself.
      3   I hate myself.

8.   0   I don't feel I am any worse than anybody else.
      1   I am critical of myself for my weaknesses or mistakes.
      2   I blame myself all the time for my faults.
      3   I blame myself for everything bad that happens.

9.   0   I don't have any thoughts of killing myself.
      1   I have thoughts of killing myself, but I would never carry
          them out.
      2   I would like to kill myself.
      3   I would kill myself if I had the chance.

10.   0   I don't cry any more than usual.
      1   I cry more now than I used to.
      2   I cry all the time now.
      3   I used to be able to cry, but now I can't cry even though I
          want to.

11.   0   I am no more irritated now than I ever am.
      1   I get annoyed or irritated more easily than I used to.
      2   I feel irritated all the time now.
      3   I don't get irritated at all by the things that used to irritate
          me.

12.   0   I have not lost interest in other people.
      1   I am less interested in other people than I used to be.
      2   I have lost most of my interest in other people.
      3   I have lost all of my interest in other people.

13.   0   I make decisions about as well as I ever could.
      1   I put off making decisions more than I used to.
      2   I have greater difficulty in making decisions than I used to.
      3   I can't make decisions at all anymore.

14. 0 I don't feel I look any worse than I used to.
    1 I am worried that I am looking old or unattractive.
    2 I feel that there are permanent changes in my appearance
      that make me unattractive.
    3 I believe that I look ugly.

15. 0 I can work about as well as before.
    1 It takes an extra effort to get started at doing something.
    2 I have to push myself very hard to do anything.
    3 I can't do any work at all.

16. 0 I can sleep as well as usual.
    1 I don't sleep as well as I used to.
    2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
    3 I wake up several hours earlier than I used to and cannot get back to sleep.

17. 0 I don't get more tired than usual.
    1 I get tired more easily than I used to.
    2 I get tired from doing almost anything.
    3 I am too tired to do anything.

18. 0 My appetite is no worse than usual.
    1 My appetite is not as good as it used to be.
    2 My appetite is much worse now.
    3 I have no appetite at all anymore.

19. 0 I haven't lost much weight, if any, lately.
    1 I have lost more than 5 pounds.
    2 I have lost more than 10 pounds.
    3 I have lost more than 15 pounds.

I am purposely trying to lose weight by eating less.   Yes ___   No ___

20. 0 I am no more worried about my health than usual.
    1 I am worried about physical problems such as aches and
      pains; or upset stomach; or constipation.
    2 I am very worried about physical problems and it's hard to
      thing of much else.
    3 I am so worried about my physical problems that I cannot
      think about anything else.

21. 0 I have not noticed any change in my interest in sex.
    1 I am less interested in sex than I used to be.
    2 I am much less interested in sex now.
    3 I have lost interest in sex completely

Appendix F

Southampton Mindfulness Questionnaire

Usually when I experience distressing thoughts and images…

0-----------------2-----------------3-----------------4-----------------5-----------------6
strongly disagree   neutral   strongly agree

1. I am able just to notice them without reacting.

2. They take over my mind for quite a while afterwards.

3. I judge the thought/image as good or bad.

4. I feel calm soon after.

5. I am able to accept the experience.

6. I get angry that this happens to me.

7. I notice how brief the thoughts and images really are.

8. I judge myself as good or bad, depending on what the thought/image is about.

9. I 'step back' and am aware of the thought or image without getting taken over by it.

10. I just notice them and let them go.

11. I accept myself the same whatever the thought/image is about.

12. In my mind I try and push them away.

13. I keep thinking about the thought or image after it's gone.

14. I find it so unpleasant I have to distract myself and not notice them.

15. I try just to experience the thoughts or images without judging them.

16. I lose myself in the thoughts/images.

Appendix G

Emotion Regulation Questionnaire

We would like to ask you some questions about your emotional life, in particular, how you control (that is, regulate and manage) your emotions. We are interested in two aspects of your emotional life. One is your <u>emotional experience</u>, or what you feel like inside. The other is your <u>emotional expression</u>, or how you show your emotions in the way you talk, gesture, or behave. Although some of the following questions may seem similar to one another, they differ in important ways. For each item, please answer using the following scale:

1-----------------2-----------------3-----------------4-----------------5-----------------6-----------------7
strongly   neutral   strongly
disagree   agree

1. _____ When I want to feel more *positive* emotion (such as joy or amusement), I *change what I'm thinking about*.

2. _____ I keep my emotions to myself.

3. _____ When I want to feel less *negative* emotion (such as sadness or anger), I *change what I'm thinking about*.

4. _____ When I am feeling *positive* emotions, I am careful not to express them.

5. _____ When I'm faced with a stressful situation, I make myself *think about it* in a way that helps me stay calm.

6. _____ I control my emotions by *not expressing them*.

7. _____ When I want to feel more *positive* emotion, I *change the way I'm thinking* about the situation.

8. _____ I control my emotions by *changing the way I think* about the situation I'm in.

9. _____ When I am feeling *negative* emotions, I make sure not to express them.

10. _____ When I want to feel less *negative* emotion, I *change the way I'm thinking* about the situation.

Appendix H

Ruminative Responses Scale

People think and do many different things when they feel depressed. Please read each of
the items below and indicate whether you never, sometimes, often, or always think or
do each one when you feel down, sad, or depressed. Please indicate what you *generally*
do, not what you think you should do.

     1 = Never
     2 = Sometimes
     3 = Often
     4 = Always

1. ___ Think about how alone you feel.

2. ___ Think "I won't be able to do my job if I don' snap out of this."

3. ___ Think about your feelings of fatigue and achiness.

4. ___ Think about how hard it is to concentrate.

5. ___ Think "What am I doing to deserve this?"

6. ___ Think about how passive and unmotivated you feel.

7. ___ (When you are sad) analyze recent events to try to understand why you are sad.

8. ___ Think about how you don't seem to feel anything anymore.

9. ___ Think "Why can't I get going."

10. ___ Think "Why do I always react this way?"

11. ___ Go away by yourself and think about why you feel this way.

12. ___ Write down what you are thinking and analyze it.

13. ___ Think about a recent situation wishing it had gone better.

14. ___ Think "I won't be able to concentrate if I keep feeling this way."

15. ___ Think "Why do I have problems other people do not have?"

16. ___ Think "Why can't I handle things better?"

17. ___ Think about how sad you feel.

18. ___ Think about all your shortcomings, failings, faults, mistakes.

19. ___ Think about how you don't feel up to doing anything.

20. ___ Analyze your personality and try to figure out why you are so depressed.

21. ___ Go someplace alone and think about your feelings.

22. ___ Think about how angry you are with yourself.

Appendix I

Affective Control Scale

Please rate the extent of your agreement with each of the statements below by circling the appropriate number below each statement.

1 very strongly disagree
2 strongly disagree
3 disagree
4 neutral
5 agree
6 strongly agree
7 very strongly agree

1.   I am concerned that I will say things I'll regret when I get angry.

2. I can get too carried away when I am really happy.

3. Depression could really take me over, so it is important to fight off sad feelings.

4. If I get depressed, I am quite sure that I'll bounce right back.

5. I get so rattled when I am nervous that I cannot think clearly.

6. Being filled with joy sounds great, but I am concerned that I could lose control over my actions if I get too excited.

7. It scares me when I feel "shaky" (trembling).

8. I am afraid that I will hurt someone if I get really furious.

9. I feel comfortable that I can control my level of anxiety.

10. Having an orgasm is scary for me because I am afraid of losing control.

11. If people were to find out how angry I sometimes feel, the consequences might be pretty bad.

12. When I feel good, I let myself go and enjoy it to the fullest.

13. I am afraid that I could go into a depression that would wipe me out.

14. When I feel really happy, I go overboard, so I don't like getting overly ecstatic.

15. When I get nervous, I think that I am going to go crazy.

16. I feel very comfortable in expressing angry feelings.

17. I am able to prevent myself from becoming overly anxious.

18. No matter how happy I become, I keep my feet firmly on the ground.

19. I am afraid that I might try to hurt myself if I get too depressed.

20. It scares me when I am nervous.

21. Being nervous isn't pleasant, but I can handle it.

22. I love feeling excited -- it is a great feeling.

23. I worry about losing self-control when I am on cloud nine.

24. There is nothing I can do to stop anxiety once it has started.

25. When I start feeling "down," I think I might let the sadness go too far.

26. Once I get nervous, I think that my anxiety might get out of hand.

27. Being depressed is not so bad because I know it will soon pass.

28. I would be embarrassed to death if I lost my temper in front of other people.

29. When I get "the blues," I worry that they will pull me down too far.

30. When I get angry, I don't particularly worry about losing my temper.

31. Whether I am happy or not, my self-control stays about the same.

32. When I get really excited about something, I worry that my enthusiasm will get out of hand.

33. When I get nervous, I feel as if I am going to scream.

34. I get nervous about being angry because I am afraid I will go too far, and I'll regret it later.

35. I am afraid that I will babble or talk funny when I am nervous.

36. Getting really ecstatic about something is a problem for me because sometimes being too happy clouds my judgment.

37. Depression is scary to me -- I am afraid that I could get depressed and never recover.

38. I don't really mind feeling nervous; I know it's just a passing thing.

39. I am afraid that letting myself feel really angry about something could lead me into an unending rage.

40. When I get nervous, I am afraid that I will act foolish.

41. I am afraid that I'll do something dumb if I get carried away with happiness.

42. I think my judgment suffers when I get really happy.

Appendix J

Attitude towards Negative Experiences Scale

This questionnaire is concerned with the attitudes people have towards negative experiences. Listed below are a number of these beliefs. Please read each statement carefully and indicate how much you agree with each one. Please circle the number that best describes your answer. Please respond to all items.

> 1 = Strongly Disagree
> 2= Disagree
> 3 = Neither agree or disagree
> 4 = Agree
> 5 = Strongly Agree

1. Thinking a lot about my feelings of sadness helps me to cope with it.

2. Dwelling on my problems makes me feel more depressed.

3. When something bad happens, it is best to acknowledge and accept the thoughts that come to mind.

4. Thinking a lot about my problems helps me to find answers to them.

5. It is safer to avoid negative thoughts and feelings.

6. I believe that negative thoughts and feelings are simply passing events that occur in the mind.

7. When feelings of depression arise, dwelling on those feelings help to make sense of them.

8. When something bad happens, I try to avoid and control the depressive thoughts that come to mind.

9. Remaining mindful of the present moment is helpful in reducing depressing feelings.

10. It is best to carefully evaluate negative thoughts.

11. I prefer to distract myself from depressing thoughts and feelings.

12. When a problem arises, I try to focus my attention on the present moment and let go of my thoughts of the past and future.

13. Focusing my attention on negative experiences helps me to find solutions.

14. Thinking about my negative experiences should be carefully controlled.

15. It is acceptable to feel depressed every now and then.

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