

Mindfulness and Suppression as Emotion Regulation Strategies for Sadness

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Abstract

The primary purpose of this study was to explore how emotion regulation impacts memory, and how depression might moderate these effects. I recruited 53 participants through Appalachian State's SONA system. Participants consisted of 13 males and 40 females, all undergraduate students at Appalachian State University, ages 18-25. Each participant completed practice sessions in emotional suppression and mindfulness before viewing a series of photographs intended to elicit happiness or sadness emotions. Participants were instructed to use different emotion regulation strategies (mindfulness, suppression, and natural) while viewing each section of images, and rated how similar they felt, emotionally, to the people in the pictures. Next, participants completed questionnaires measuring depression, emotion regulation, and mindfulness before completing a surprise recall test of the images they viewed previously. Although there was no significant effects of either depression or emotion regulation on memory, depression was associated with other variables. Results showed that individuals with higher levels of depression were more likely to identify with the photographs while suppressing their emotions, and that two facets of mindfulness, nonjudging and acting with awareness, were associated with decreased levels of depression.

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People deal with their feelings in different ways. Whether it's playing an instrument, exercising, or just watching a sad movie and crying, these are all ways in which people express their emotions. No matter how expressive we are, however, not everyone will express every emotion they feel at the exact moment they feel it. People typically exert control their emotions, using strategies that influence the strength and type of emotions they feel (Gross, 2013). There are many strategies for emotion regulation, and some are thought to be healthier, or more effective, than others (Aldao, Nolen-Hoeksema, & Schweizer, 2010).

Sometimes people use acceptance to regulate their emotions, and express their feelings as they come. Acceptance has been found to be lower in people with mental health problems like anxiety and depression, and is therefore targeted by some kinds of psychotherapy (Aldao et al., 2010). Acceptance, however, is not simple and effortless. People typically must practice different techniques that help them accept their emotions. Mindfulness is one method of emotional acceptance that has gained popularity in recent years, due to its effect on stress reduction (Kabat-Zinn, 1982). Through mindfulness techniques, people learn how to be more aware of their feelings and become more understanding of their emotional reactions (Williams, 2008).

Other times, people choose strategies that are thought to be less healthy, such as hiding one's feelings from other people (expressive suppression) or repetitively thinking about negative emotions and their causes (rumination). The use of both of these strategies is associated with higher levels of depression (Aldao et al., 2010; Nolen-Hoeksema, 2000), and both are thought to be cognitively demanding (Joormann, 2010; Richards & Gross, 2000)

The current study has two goals. First, I will investigate the impact of both suppression and mindfulness on memory for sad pictures. Second, I will investigate whether depression moderates this effect. Because depression has been associated with increased use of suppression and decreased mindfulness, I will also replicate this finding, and investigate how depression is associated with different facets of mindfulness.

Depression

Major depressive disorder, more commonly known as depression, is often referred to as the “common cold” of mental disorders. It is an incredibly prevalent disorder not only in the United States but all over the world. The DSM V defines depression as five or more of the following symptoms for a period of two or more weeks: Depressed mood, less interest in activities, insomnia/hypersomnia, weight loss/gain, agitation/retardation, loss of energy, feelings of worthlessness/guilt, inability to concentrate, and recurrent thoughts of death, suicidal ideation, or suicide attempt (American Psychiatric Association, 2013). There are numerous causes for depression, however, the most well known include biochemistry, or chemicals in the brain, genetics, personality factors, and environmental factors such as abuse and neglect (Zeman, 1996). Depression can be treated through prescribed medication such as selective serotonin reuptake inhibitors (SSRIs), serotonin-norepinephrine reuptake inhibitors (SNRIs) and other antidepressants, through psychotherapy, such as cognitive behavioral therapy or interpersonal therapy, and, in extreme cases, electroconvulsive therapy (Greenberg & Goldman, 2009). There is a large amount of debate over the effectiveness of antidepressant medication, and most psychologists recommend some form of psychotherapy for their clients (Greenberg & Goldman, 2009).

A traditional treatment used for depression is cognitive-behavioral therapy (CBT). CBT focuses on the connections between a client's thoughts, feelings, and behaviors, and teaches clients how to best manage these (Meichenbaum, Carlson, & Kjos, 2007). Autonomy is an important aspect of CBT, and the client typically has an active role in therapy. The therapist may engage the client in cognitive reconstructing, stress inoculation training, problem solving, relaxation training, and more (Meichenbaum et al., 2007). Common goals for CBT include developing coping skills, taking credit for changes, and preventing relapse (Meichenbaum et al., 2007). Not only is CBT used to treat depression, but also anxiety disorders, PTSD, eating disorders, substance abuse, and other mental illnesses. Some people prefer to use medications in the absence of therapy, however, there has been much discourse over whether or not medication alone is an effective treatment for depression, as well as whether it does more harm than good in regards to mood and other side-effects (Greenberg & Goldman, 2009). One study found that the magnitude for the effect size of certain antidepressant medications was much lower than the market advertises (Ioannidis, 2008). This study also found that drug-placebo differences were only significant in a small portion of participants, who suffered from more severe depression than the majority of participants. Overall, many people believe that antidepressants help their overall wellbeing, but most psychologists believe that therapy combined with medication is a much more effective treatment.

The effects of suppression on depressive symptoms have been measured in various studies. Five longitudinal studies focused on the effects of both suppression and expression on daily interactions (Cameron & Overall, 2017). Participants in these studies completed daily journals, similar to writing in a diary, for ten to twelve days, and completed a follow-up questionnaire three months later. Results indicated that suppression was strongly associated with

depressed mood, fatigue, low self-esteem, and less life satisfaction both during the writing period as well as the three month follow up. Suppression also affected the participants' relationships, and was related to lower rates of perceived acceptance, relatedness, and increased distancing from others. Expression was not significantly related to depressed mood or life satisfaction, however, it did have a positive association with self-esteem, as well as with interpersonal experiences like acceptance and relatedness. It is likely that the negative effects of suppression on relationships also contributes to depressive symptoms, as social support is important to general well-being and can impact depression.

Another way that depression may manifest itself is through constant focus on negative thoughts, or rumination. This leads to less distractions from negative mood, and is also related to suicidal ideation (Liverant, Kamholz, Sloan, & Brown, 2010). Previous research has suggested that rumination leads to depressive symptoms, through use of the Ruminative Responses Scale (McLaughlin, 2011). Those who use rumination as a means of emotional regulation may also drive loved ones if they exhibit a constant negative attitude, and this isolation or perceived isolation can also contribute to feelings of depression. Rumination has also been linked to other mental disorders such as generalized anxiety disorder, post-traumatic stress disorder, and social anxiety disorder.

Research suggests that depression has negative effects on both prospective and retrospective memory. Prospective memory refers to the future, as opposed to retrospective memory which refers to the past. The emotion-cognition interaction theory of depression suggests that depressed mood affects attentional control when performing a task (especially cognitive tasks), and this, in turn, impairs prospective memory (Zhou et al., 2017). The prefrontal cortex and temporal cortex have both been linked to prospective memory. Studies have found

that dysfunctions in these areas of the brain are also associated with depression. A meta-analysis composed of 10 case-controlled studies examined impairment of prospective memory in people with depression compared to healthy individuals (Zhou et al., 2017). Those who did not suffer from depression had better rates of time-based prospective memory, as well as event-based prospective memory. Researchers also found that prospective memory was actually worse in people with moderate depression compared with those with severe depression, suggesting that depression severity does not affect prospective memory.

Another study focused on the effects of depression on retrospective memory. In-patients suffering from depression were compared with a healthy control group. All participants completed interviews in which they chose two memories, including one emotionally meaningful memory, and attempted to recall specific details and state whether the memory was emotionally positive or negative (Biedermann et al., 2017). The purpose of this study was to analyze temporal distributions of memory and determine which life periods had more significant memory deficits. Individuals with depression reported significantly less specific episodes and details of their memories, as well as significantly less positive memories during childhood and recent years. Memories of primary school through early adulthood years were typically more impaired than memories of early childhood and recent years. Severity of depression was also positively correlated with memory impairment (Biedermann et al., 2017).

Overall, depression is linked to cognitively demanding emotion regulation strategies, as well as poor memory. It is possible that suppressing one's emotions and ruminating on negative experiences may be an underlying factor in impaired memory among depressed individuals. Holding everything in can be draining and tiresome, and can have numerous negative repercussions when paired with other symptoms of depression.

Emotional Suppression

While there are many forms of emotional regulation, it can be best described with two main categories: Antecedent-focused and response-focused (Liverant, Brown, Barlow, & Roemer, 2008). Antecedent-focused regulations modify the emotional response before it starts, whereas response-focused do so only after the response has already started. Emotional suppression is an example of a response-focused mechanism, and evidence has suggested that suppression can have negative effects on memory as well as social relationships (Liverant et al., 2008). Consistent findings also show that expressive suppression leads to increased negative emotions (Gross & John, 2003; John & Gross, 2007). Not only has previous research demonstrated the effect of suppression on memory and emotional well-being, but there is also physiological evidence that suppression affects stress levels, such as constriction of blood vessels (Richards & Gross, 1999).

Research provides evidence for effects of suppression on emotional affect, social functioning, and general well-being. A set of five correlational studies measured these relationships by having participants respond to numerous questionnaires, such as the Emotion Regulation Questionnaire, the Beck Depression Inventory, the Big Five Inventory, and more (Gross & John, 2003). The third, fourth, and fifth studies focused on the aforementioned principles. Results for the third study revealed that suppression was related to less positive emotion and expression, as opposed to reappraisal which was related to more positive emotion and expression, and less negative emotion and expression. The fourth study measured sharing of positive and negative emotions, avoidance of attachment, relationship closeness, social support, and liking among peers. Those who suppressed were less likely to share their emotions, both positive and negative, more likely to show avoidance in relationships, and experienced less

social support than their reappraising counterparts. Lastly, researchers measured depressive feelings, self-esteem, and life satisfaction (Gross & John, 2003). Results of this study revealed that suppression is linked to low self-esteem, life satisfaction, optimism, and general well-being, as well as increased symptoms of depression. Conversely, reappraisal was correlated with less depressive symptoms, and more positive functioning, life satisfaction, optimism, self-esteem, and positive relations with others. One explanation of suppressions relationship with depression may be its positive relationship with rumination.

There is also substantial research on the effects of suppression on memory. In one such study, three separate experiments tested the effects of suppression, and reappraisal on memory, as well as how these emotion regulation techniques play out in everyday life (Richards & Gross, 2000). Participants watched a film clip intended to promote negative emotions, but first, they were randomly assigned into two groups. One group was told to refrain from expressing their emotions during the film (the suppression group), while the other group was given no such instructions (the watch group). After the film clip, participants in both groups answered questions about details in the clip. The watch group answered the questions more accurately than the suppression group, and the suppression group also had less confidence in their answers than the watch group (Richards & Gross, 2000).

The second experiment in this study examined effects of suppression as well as reappraisal on memory. Participants viewed slides intended to elicit different levels of negative emotion. Similar to the first experiment, the suppression group was instructed to maintain a neutral face expression and refrain from reacting to the slides. The reappraisal group was instructed to view the slides analytically instead of emotionally, changing their experience of their emotions. Both groups answered questions about the slides afterwards. Findings were

consistent with the first experiment, the suppression group showed poorer memory than the reappraisal group, and the reappraisal group actually demonstrated improved memory (Richards & Gross, 2000).

There is strong evidence to suggest a relationship between suppression and symptoms depression. Not only can suppression lead to lower life-satisfaction and self-esteem, but it can also affect interpersonal relationships. It is unclear whether suppression leads to depression or vice versa, but there is a definite correlation between the two. Suppression has also been linked to impaired performance on memory tasks, while reappraisal has been linked to improved performance. This leads to the question of the effects of mindfulness on both depression and memory.

Mindfulness

Origins of mindfulness lie in Eastern-Asian and Buddhist traditions. Mindfulness can be achieved through meditation, and is believed to increase awareness, insight, wisdom, compassion, and calmness (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). The word mindfulness is derived from the Buddhist Sanskrit word dharma, which means lawfulness, or the way things are (Kabat-Zinn, 2003). While mindfulness is not limited to Buddhism, the practices of Buddhism have helped to develop a strategy to learn how to be in touch with one's emotions. Buddhists believe that, in order to be happy, one must train their mind. Meditation is used to look within and examine the nature of the world as well as the mind (Kabat-Zinn, 2003).

The art of mindfulness has recently made its way into Western medicine. Mindfulness is defined as a state of awareness and is practiced by paying attention to moments as they take place, by taking note of one's reactions to these moments, and by acting with compassion in response to these reactions (Williams, 2008). Mindfulness based therapies are used for a variety

of conditions, such as reducing chronic pain, as well as psychological disorders, specifically borderline personality disorder. There are five different aspects of mindfulness: Nonreactivity, observing, acting with awareness, describing, and nonjudging (Baer et al., 2006). These facets of mindfulness often guide mindfulness-based therapies. For example, dialectical behavior therapy (DBT), which is used to treat mood disorders, makes use of these facets through patients voicing their emotions and experiences, and refraining from reacting and judging (Baer et al., 2006).

Dialectical behavior therapy, along with acceptance and commitment therapy (ACT) use short mindfulness practices, and focus on the idea of mindfulness as a skill to develop. On the other hand, mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT) rely heavily on meditation. (Baer et al., 2006). As this paper focuses on the effects of mindfulness on depression, I will primarily be describing MBCT, the most common mindfulness-based therapy used for mood disorders. There are multiple techniques used in MBCT, and clients can practice these at home to reduce stress. One exercise is the three-minute breathing space. Clients spend the first minute answering the question “How am I doing right now?”, the second minute on breathing, and the third minute on being aware of breathing as well as physical sensations (Ackerman, 2017). Another exercise is called a body scan. Clients lie down on their backs and focus their awareness on their breathing, then on their toes, and move their awareness to different parts of their body, moving upwards until they reach the top of their head (Ackerman, 2017). Other techniques include stretching, yoga, and mindfulness in everyday activities, such as eating and showering.

Evidence supports the proposition that mindfulness has positive effects on depression. One study observed trait mindfulness in sixteen year old twins, and its relationship with depression and anxiety sensitivity (Waszczuk et al., 2015). Measures of these traits included the

Mindful Attention Awareness Scale, the Short Mood and Feelings Questionnaire, and the Children's Anxiety Sensitivity Index. This study found that mindfulness has a negative relationship with anxiety sensitivity and depression, and genetic information predicted problems in cognitive control to be strongly linked to depression. This gives reason to believe that mindfulness therapy, which can improve cognitive control, would in turn have a positive effect on depression. The researchers suggest that mindfulness could be extremely effective in treating depression through improving attention control in adolescents and young adults, due to increased brain plasticity during this period in life (Waszczuk et al., 2015).

While there are a variety of mindfulness therapies, mindfulness-based cognitive therapy (MBCT) is used to treat patients with Major Depressive Disorder. Multiple studies analyze the positive effects of MBCT on wellbeing. Mindfulness is positively correlated with the ability to let go of negative thoughts and the ability to see these thoughts as controllable, and negatively correlated with avoidance, rumination, and depressed mood (Williams, 2008). MBCT is focused on reducing depression relapse in a similar way to cognitive behavioral therapy, by changing thought patterns that lead to a depressed mood. It has also been proven to reduce attention problems. Although this has previously been considered a "less serious" indicator of depression, one that will get better with time, new evidence shows that it may be a recurring factor of depression (Williams, 2008). This is important to our study and the effects of depression on memory, and how mindfulness interacts with this relationship.

Various studies have obtained mixed results about the effects of mindfulness on memory. One randomized control trial did yield positive outcomes. In this study, adolescent students completed either mindfulness meditation or hatha yoga in their gym classes for a period of four weeks (Quach, Jastrowski Mano, & Alexander, 2015). Students also completed baseline

assessments for child acceptance and mindfulness, child anxiety and related disorders, stress, and an automated operation span test. Results showed that students in the mindfulness condition demonstrated a significant increase working memory capacity, as opposed to students in the yoga condition (Quach et al., 2015). Another study administered assessments of mindfulness, emotion regulation, and an automated operation span test to 80 nursing students. The results found that mindfulness impacted emotional reappraisal as well as working memory capacity (Dubert, Schumacher, Locker, Gutierrez, & Barnes, 2016).

The Current Study

The current study measured the effects of emotional suppression and mindfulness on memory of photographs intended to elicit happiness or sadness. I hypothesized that depression would moderate the effects of suppression and mindfulness on memory. I expected participants to recall more photographs from the mindfulness condition than the suppress condition, in line with prior research that mindfulness improves memory but suppression impairs it. I also expected participants with high depression scores to recall fewer photographs overall, but more positive photographs from the mindfulness condition than the suppress condition, because mindfulness may help increase positive feelings in people who are depressed. I also hypothesized that participants who scored higher on the depression questionnaire would report score lower on a questionnaire designed to measure mindfulness, and higher on a questionnaire designed to measure suppression.

Method

Design

The experimental portion of the study was a 3 (Instruction: Mindful vs. Natural vs. Suppress) x 2 (Picture Valence: Happy vs. Sad) within-subjects design.

Participants

This study included 53 participants, (13 men, 40 women), ages 18-25. All participants were undergraduate students at Appalachian State University, and received course credit for their participation.

Materials

Suppression Practice Video. Prior to viewing the photographs, participants viewed a short video clip in which they were instructed to refrain from showing any emotions through their facial expressions. The video was a 3 minute, 47 second commercial for MetLife, about a father who works hard to provide for his daughter (MetLife Hong Kong, 2015). The daughter explains that her father is a good dad, but he lies about how much money he makes in order to make her happy. The video was intended to induce sadness among the participants.

Mindfulness Exercise. Participants completed a 12 min exercise in mindfulness, excerpted from a longer CD by Kabat-Zinn (2005). The video (BetterListen & WisdomFeed, 2017) was a guided mindfulness meditation exercise led by Kabat-Zinn, intended to introduce the practice to new practitioners. Participants used headphones while viewing the video in order to minimize distractions and maximize their experience.

Photographs. Participants viewed 32 photographs taken from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2008), which were chosen to elicit happiness or sadness. All photos included people, and most were used previously in a similar study by Emery and Hess (2008). The photos were selected so that happy and sad pictures had the same normed arousal ratings ($M = 4.77$ for happy pictures; $M = 4.72$ for sad pictures) but different normed valence ratings ($M = 7.25$ for happy pictures, $M = 2.72$ for sad pictures). The happy photographs depicted positive content such as love, friendship, and families and the sad

photographs depicted negative content such as poverty, war, and death. The list of photographs used, along with their IAPS-normed arousal and valence ratings, are presented in Appendix A.

Picture Ratings. In order to encourage self-relevant processing of the photographs, participants were asked to rate each picture they viewed using the prompt: “The way the people in this picture felt is:”. The ratings were made on a 1-6 scale, with 1 = “Not at all like me” and 6 = “A lot like me”.

Depression Anxiety Stress Scale-21 (DASS-21). The Depression Anxiety Stress Scale-21 (Henry & Crawford, 2005) was used to assess symptoms of anxiety, depression, and overall stress. This is a shortened version of the original Depression Anxiety Stress Scale (Lovibond & Lovibond, 1995), consisting of three 7-item self-report scales (21 items total, 7 for each subscale). Participants rated their agreement to various statements on a scale of 0 to 3. Previous research has found the scale to be a reliable measure of these constructs (Henry & Crawford, 2005). In the current study, the Chronbach’s alphas were .82 for depression, .80 for anxiety, and .78 for stress. Scores for the DASS were summed and doubled, to make the scale equivalent to the original DASS.

Emotion Regulation Questionnaire (ERQ). The ERQ measures two forms of emotion regulation: expressive suppression and cognitive reappraisal (Gross & John, 2003). This measure uses a 10-item Likert-Type scale in which participants rate their agreement from 1 (strongly disagree) to 7 (strongly agree) on their use of emotion regulation techniques. Suppression statements (4 items) focus on not expressing emotion, and reappraisal statements (6 items) focus on changing one’s feelings about a situation. No items used reverse scoring. In the current study, the Chronbach’s alphas were .76 for suppression and .78 for reappraisal.

Five Facet Mindfulness Questionnaire (FFMQ). This 39-item questionnaire measures five factors of mindfulness: Observing, describing, acting with awareness, non-judging of inner experiences, and non-reacting to inner experiences (Baer et al., 2006). Participants rated how often different statements apply to them on a scale of 1 (never or very rarely true) to 5 (very often or always true). Examples of statements include “I watch my feelings without getting lost in them,” and “I find myself doing things without paying attention.” In the current study, Chronbach’s alphas were .79 for Observing, .87 for Describing, .83 for Acting with Awareness, .86 for Non-Judging, and .65 for Non-Reacting.

Procedure

All procedures were approved by the Appalachian State IRB on 2/23/2018 (Appendix B). Experimenters began the study by briefly explaining the experiment procedure to the participant, and obtained proper informed consent before continuing to the experiment (Appendix C). Participants completed the procedure individually in a quiet testing room with one experimenter present. The full script used by the experimenters is included in Appendix D

After the informed consent, experimenters explained mindfulness and suppression instructions to the participants before they completed the “practice sessions” using the suppression practice video and the mindfulness exercise described above. After these initial practice sessions, experimenters started video recording the participant to ensure the participant was following instructions (videos will be analyzed at a later date). Participants then completed a practice session via E-Prime 2.0 (Psychology Software Tools, 2012) to ensure they understood the procedures before moving on to the experiment. During the experiment, participants viewed six blocks of six pictures each; two blocks for each instruction set (mindful, natural, and suppress), with one block of happy and one block of sad pictures within each instruction set.

Prior to each block, participants were presented with either the word “MINDFUL”, “NATURAL” or “SUPPRESS”, with a short, one-sentence reminder of what each instruction meant. Within a block, each picture was presented one at a time for 10 seconds each. After each picture, participants made their “Like Me” rating. Both the blocks, and the pictures within each block, were presented in a different random order for each participant.

Once participants finished the E-Prime portion of the study they completed the DASS-21, the FFMQ, and the ERQ. These questionnaires served a dual purpose: To measure depression, mindfulness, and emotion regulation, as well as serve as a distractor. After finishing the questionnaires, participants completed a surprise memory test in which they attempted to write down as many details as they could about the photographs they saw. Finally, participants were debriefed about the true purpose of the study and were able to ask any questions before leaving.

Results

DASS-21 Depression Scores

Participants generally scored low on the DASS depression scale ($M= 9.81$, $SD= 8.08$), but scores ranged from 0 - 34. Of the 53 participants, 12 scored in the moderate to severely depressed range, and the remaining participants scored in the normal range.

Picture Ratings

The average picture ratings may be seen in Figure 1. The Picture Ratings were analyzed using a 3 (Instruction: Mindful vs. Natural vs. Suppress) x 2 (Picture Valence: Happy vs. Sad) Analysis of Covariance (ANCOVA), with DASS-21 Depression scores as a continuous covariate. There was a main effect of Picture Valence, with participants rating the positive photographs as more similar to themselves than the negative photographs, $F(1, 51) = 144.56$, $p < .001$, $\eta_p^2 = .74$. There was also a main effect of Instruction, such that when participants were

suppressing their emotions, they rated the people in the photographs as less similar to themselves than in the other two conditions, $F(2,102) = 3.58, p = .03, \eta_p^2 = .07$. This effect was moderated by participants' levels of depression, $F(2,102) = 4.43, p = .01, \eta_p^2 = .08$. Follow-up tests suggested that in the suppression condition, participants who were depressed rated the people in the photographs as more similar to themselves than did people who were not depressed, $F(1,51) = 4.01, p = .05, \eta_p^2 = .07$. This effect was not present in the mindfulness, $F(1,51) = 0.01, p = .93, \eta_p^2 < .001$, or natural conditions, $F(1,51) = 0.12, p = .73, \eta_p^2 = .002$. No other effects were statistically significant.

Recall

The average recall scores (plotted as proportion of pictures recalled) may be seen in Figure 2. As with the picture ratings, recall scores were analyzed using a 3 (Instruction: Mindful vs. Natural vs. Suppress) x 2 (Picture Valence: Happy vs. Sad) Analysis of Covariance (ANCOVA), with DASS-21 Depression scores as a continuous covariate. I had hypothesized two findings for recall: (1) that participants would recall more photographs in the mindful than in the suppress condition, and (2) that people high on the depression scale would remember fewer photographs overall, but more positive photos in the mindful than the suppress condition. However, there were no significant effects of any of the independent variables on recall (all F 's < 1.9 , all p 's $> .15$). Specifically for the hypotheses, there was no main effect of Instruction, $F(2,102) = 0.15, p = .86, \eta_p^2 = .003$, no main effect of depression, $F(1,51) = 0.40, p = .53, \eta_p^2 = .008$, and no Instruction x Valence x Depression interaction, $F(2,102) = 0.11, p = .90, \eta_p^2 = .002$. Of particular note, the participants varied widely in terms of how many photographs they recalled ($M = .23, SD = .13, \text{Range} = .00-.64$), which may have made it difficult to detect any experimental impact on memory.

Questionnaires

Because prior research suggests that depression is associated with emotion regulation, I compared participants' DASS depression scores with their scores from the ERQ and FFMQ. I had hypothesized that DASS depression scores would be positively correlated with ERQ-Suppression scores, and negatively correlated with FFMQ scores. Depression was positively correlated with ERQ-Suppression scores, but the correlation did not quite reach statistical significance with this sample size, $r = 0.27, p = 0.06$. For FFMQ scores, two facets were negatively correlated with depression: the nonjudging facet, $r = -0.42, p = 0.002$, as well as acting with awareness, $r = -0.50, p < 0.001$. Unexpectedly, depression was positively correlated with the observing facet of mindfulness, however, this finding was not statistically significant, $r = 0.27, p = 0.06$. Neither non-reacting, $r = -.08, p = .58$, nor describing, $r = -.19, p = .18$, were correlated with depression.

Discussion

In this study, I investigated the impact of emotion regulation strategy and depression on memory for happy and sad photographs. Based on previous research, I hypothesized that engaging in mindfulness while viewing the photographs would generally improve memory while engaging in suppression would generally be harmful to memory. I also expected self-reported depression symptoms to moderate these effects, such that people with high DASS-21 depression scores would remember fewer photographs overall, but would have increased recall for positive photographs when they were encoded under mindfulness instructions. Although I was able to replicate past research on the correlations between depression and emotion regulation strategy use, there was no impact of experimentally induced emotion regulation on memory for pictures. In addition, engaging in suppression had an unexpected effect of reducing participants' emotional

identification with people in the photographs, an effect that was moderated by people's DASS-21 scores.

The fact that I found no relationship between either experimentally induced emotion regulation or participants' depression symptoms on memory contradicts several prior findings. Prior research has found that both expressive suppression (Liverant et al., 2008; Richards & Gross, 2000) and depression (Zhou et al., 2017; Biederman et al., 2017) impair memory. Participants generally recalled a low proportion of photographs overall, and the descriptions were highly variable with respect to detail. This affected the statistical significance of my findings through floor effects and between-subject variability. Utilizing a recognition test instead of, or in conjunction with a recall test may accommodate for this problem in the future.

Although my findings regarding recall were not statistically significant, my hypotheses about depression and emotion regulation were supported. Participants who scored high in two facets of mindfulness, nonjudging and acting with awareness, were significantly less likely to score high in depression. This finding was in line with prior research on mindfulness as way to combat depression (Waszczuk et al., 2015; Williams 2008). Another study measuring the relationship between FFMQ and DASS responses also found that depression, anxiety, and stress were all significantly negatively correlated with nonjudging, acting with awareness, and describing in college-aged students. (Medvedev, Norden, Krageloh, & Siegert, 2018). Specifically, nonjudging and acting with awareness had the strongest relationship with depression, consistent with the findings from the current study.

Scores for the observing facet of mindfulness were positively correlated to depression scores, although this finding was not quite statistically significant. This result was also similar to the study mentioned above: researchers found no significant correlations between observing and

any aspects of the DASS scale (Medvedev et al., 2018). This may be due to rumination, an emotion regulation tactic common among people with depression and anxiety. Rumination involves repetitive thinking about a negative emotional experience. If participants with high depression are spending a large amount of time observing their negative emotions, as well as judging themselves, this may cancel out any advantages that observing confers.

I found three significant results for the similarity ratings. First, both depressed and nondepressed participants were more likely to rate the positive photographs as “more similar to me” than the negative photographs. Second, participants were less likely to identify with a photograph if they were suppressing their emotions. Third, an unexpected finding from this study is the interaction between depression and similarity ratings. Participants who scored higher on depression were more likely to rate the photographs as “similar to me” during the suppress condition, despite whether the photograph was positive or negative. One potential determinant of this finding may be the base suppression scores amongst the depressed participants. Prior research shows that there is a strong relationship between suppression and depressive symptoms (Cameron & Overall, 2017; Gross & John, 2003). Perhaps these participants felt more natural while suppressing their emotions, and this influenced the likelihood of identifying with the photographs. This finding was the opposite for non-depressed participants; during the suppress condition, they rated the photographs as “less similar to me.” It is possible that these participants felt less connected to their emotions while completing the suppress conditions, and this may have influenced their likelihood of rating the pictures as similar to themselves.

Limitations and Future Directions

Due to the correlational nature of portions of this study, and the lack of significant findings of the experimental manipulation on memory, I am not able to determine any causal

relationships between mindfulness, memory, emotion regulation, and depression. This study was completed with a relatively small, nonrandom sample. All participants were students in a psychology course with the same goal of receiving course credit. This could imply that the participants were similar to each other and may reduce generalizability of the findings. Some of the findings were also based off self-report data. Factors such as social desirability bias and the participants' moods may have influenced the questionnaire responses. There was also low variability in the depression scores, only 22% of participants scored in the "moderate to high" range of depression. Students with higher rates of depression may have been less interested in completing a study and less motivated to receive credit. A potential solution would be to prescreen for depression and invite participants in the high and low categories to complete the study, perhaps including a financial reward instead of ELC's. Finally, based on experimenter observation, participants may have encountered some confusion on the differences between the mindful and natural conditions while completing the E-PRIME. Mindfulness is a learned skill, so more practice for this condition could potentially improve these findings.

Overall, there is certainly some connection between depression and suppression that affects how participants related to the photographs. This finding should be investigated in future experiments while incorporating strategies above to improve data collection. Future research should also consider the negative relationships between nonjudging and acting with awareness on depression, and how focusing on these may improve mindfulness-based therapies. The relationship between observing and depression should also be explored further to determine if there may be a positive significant correlation, or no relationship at all, and whether or not rumination may play a role in moderating the effects of mindfulness on symptoms of depression. In addition to this, future research should also study the relationship between suppression and

connectedness or empathy in depressed individuals to potentially explain why depressed individuals rate pictures as more similar to them while suppressing their emotions.

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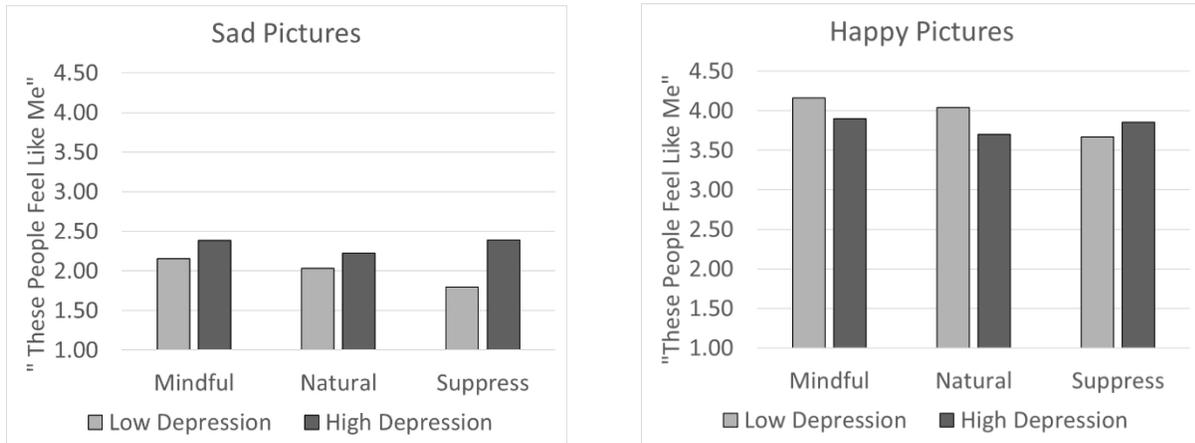


Figure 1. Negative and positive photo similarity ratings. Plots were derived from parameter estimates with DASS-21 scores at +/- 1 standard deviation from the mean.

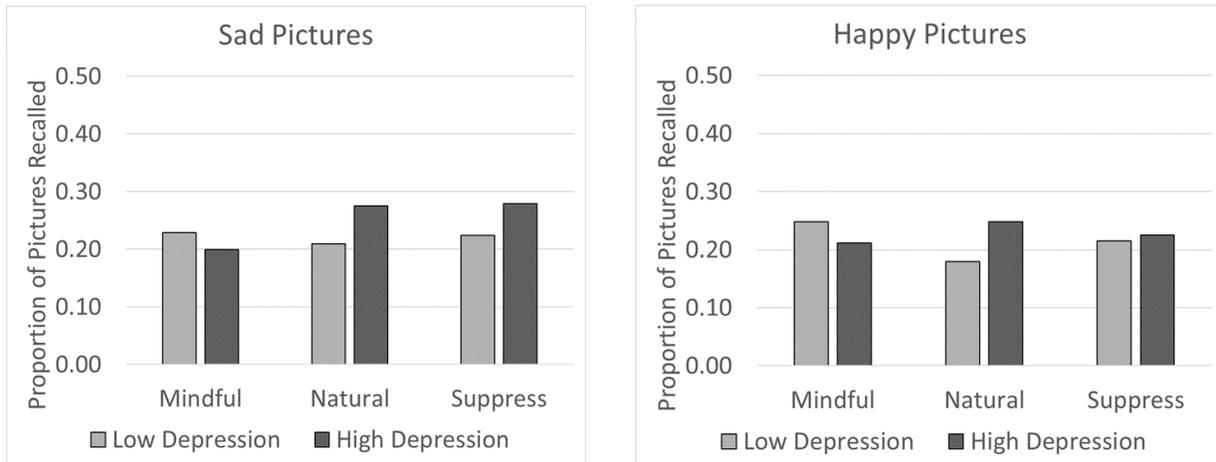


Figure 2. Negative and positive photo recall. Plots were derived from parameter estimates with DASS-21 scores at +/- 1 standard deviation from the mean.

.IAPS Pictures

Happy Pictures				Sad Pictures			
IAPS Description	IAPS #	IAPS Valence	IAPS Arousal	IAPS Description	IAPS #	IAPS Valence	IAPS Arousal
Women	1340	7.13	4.75	Toddler	2095	1.79	5.25
Children	2216	7.57	5.83	Hospital	2205	1.95	4.53
Family	2299	7.27	3.95	Girl	2276	2.67	4.63
Family	2360	7.7	3.66	KidCry	2301	2.78	4.57
Girl&Dog	2362	6.74	4.6	Woman	2375.1	2.2	4.88
Kids	2388	7.44	3.77	Boy	2410	4.62	4.13
Teens	2389	6.61	5.63	SadGirls	2455	2.96	4.46
Boy	2391	7.11	4.63	Woman	2700	3.19	4.77
Family	2395	7.49	4.19	DrugAddict	2710	2.52	5.46
Child	2655	6.88	4.57	Bum	2750	2.56	4.31
Romance	4597	6.95	5.91	DisabledChild	3300	2.74	4.55
Wedding	4626	7.6	5.78	InjuredChild	3301	1.8	5.21
Watermelon	7325	7.06	3.55	Athlete	8121	4.63	4.14
Athlete	8120	7.09	4.85	ScaredChild	9041	2.98	4.64
Athletes	8380	7.56	5.74	Cemetery	9220	2.06	4
Tubing	8420	7.76	5.56	Handicapped	9415	2.82	4.91
HappyTeens	8461	7.22	4.69	Soldier	9421	2.21	5.04
CarnivalRide	8497	7.26	4.19	Kids	9520	2.46	5.41

Appendix B

IRB Approval

To: Mary Zweig
Psychology
CAMPUS EMAIL

From: Dr. Andrew Shanely, IRB Chairperson

Date:

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

Agrants #:

Grant Title:

STUDY #: 18-0152

STUDY TITLE: Mindfulness and Suppression as Emotion Regulation Strategies for Sadness

Submission Type: Initial

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

Approval Date: 2/23/2018

Expiration Date of Approval: 2/22/2019

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

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

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

Approval Conditions:

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

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

Modifications and Addendums: IRB approval must be sought and obtained for any proposed modification or addendum (e.g., a change in procedure, personnel, study location, study instruments) to the IRB approved

protocol, and informed consent form before changes may be implemented, unless changes are necessary to eliminate apparent immediate hazards to participants. Changes to eliminate apparent immediate hazards must be reported promptly to the IRB.

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

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

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

Websites:

1. PI responsibilities: <http://researchprotections.appstate.edu/sites/researchprotections.appstate.edu/files/PI%20Responsibilities.pdf>
2. IRB forms: <http://researchprotections.appstate.edu/human-subjects/irb-forms>

CC:
Lisa Emery, Psychology

Appendix C

Consent Form

Consent to Participate in Research
*Information to Consider About this Research**Mindfulness and Suppression as Emotion Regulation Strategies for Sadness*

Principal Investigator: Mary Zweig Mindfulness and Suppression as Emotion Regulation Strategies for Sadness

Department: Psychology

Contact Information: 289 Ambling Way, Boone, NC 28607. (703) 999-4000.

Faculty advisor: Lisa Emery, 828-262-8941; email: EmeryLJ@appstate.edu

You are being invited to take part in a research study about *emotion regulation strategies, such as mindfulness and expressive suppression, and how they relate to sadness*. If you take part in this study, you will be one of about 50 people to do so. By doing this study we hope to learn *which emotion regulation strategies are more common in people with higher and lower rates of sadness*.

The research procedures will be conducted at *Appalachian State University*.

You will be asked to *view photographs that may elicit feelings of happiness or sadness while using emotion regulation strategies such as expressive suppression and mindfulness*. You will receive *brief training beforehand in order to best complete these procedures*. Your face will be *videotaped, so that the researchers can better assess your emotional reactions*. Only the *researchers will have access to your videotape, they will not be shared outside of the lab*. You will also be asked to *complete questionnaires measuring your levels of mindfulness, depression, and emotion regulation*.

You cannot volunteer for this study if are under 18 years of age or over 25 years of age.

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

You may feel emotional reactions to the photographs used, however, to the best of our knowledge, the risk of harm for participating in this research study is no more than you would experience in everyday life.

What are the possible benefits of this research?

There may be no personal benefit from your participation but the information gained by doing this research may help others in the future by demonstrating how emotion regulation strategies can either minimize or increase the symptoms of depression.

Will I be paid for taking part in the research?

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

How will you keep my private information confidential?

This study is confidential. We will make every effort to prevent anyone who is not on the research team and faculty advisor, Dr. Emery, from knowing that you gave us information or what that information is. Your name will be replaced with a number to identify your data. Your reactions will be filmed; however, this data will be stored in a password protected file. Your data will be protected under the full extent of the law.

Data and video recordings will be stored for seven years following the study. Identifying information will be removed from the data.

Who can I contact if I have questions?

The people conducting this study will be available to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator at (703) 999-4000 or email at zweigmk@appstate.edu, or the Faculty Advisor at 828-262-8941 or through email at emerylj@appstate.edu. If you have questions about your rights as someone taking part in research, contact the Appalachian Institutional Review Board Administrator at 828-262-2692 (days), through email at irb@appstate.edu or at Appalachian State University, Office of Research and Sponsored Programs, IRB Administrator, Boone, NC 28608.

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

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

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

This study was approved on: February 23, 2018

This approval will expire on February 22, 2019 unless the IRB renews the approval of this research.

If you have read this form, had the opportunity to ask questions about the research and received satisfactory answers, and want to participate, then sign the consent form and keep a copy for your records.

Participant's Name (PRINT)

Signature

Date

Appendix D

Experimenter Script

EXPERIMENTER SCRIPT

Turn on computer and pull up mindfulness and “My Daddy is a Liar” videos (they are bookmarked in the upper right hand corner). Pull up E-Prime.

How to find E-Prime: Library -> Documents -> EXPERIMENTS -> ZWEIG_HONORS_SP18 -> ZWEIG_HONORS_SP18.ebs2

Move the “Experiment in Progress” magnet to the whiteboard on the door.

INFORMED CONSENT PROCEDURE

Thank you for participating in this study! In order to ensure that we treat everyone the same way, I must read these instructions to you word for word. In this experiment, you will be asked to view a series of images while using different emotion regulation strategies. You will also be asked to complete some questionnaires.

The images you will see will be similar to what you would experience in your daily life. These images should not cause any significant distress, however, if you feel unable to continue the study please let me know and we will end the session. Do you have any questions so far?

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

Hand participant consent form and pen

This form will tell you about what we are studying in this experiment. Please read through the form and let me know if you have any questions. When you are finished reading, sign your name, write down today’s date, and let me know that you have finished.

Wait for participant to complete consent form

We are now ready to begin the study. If it is not already, we would like for you to turn off your phone and put it away, in order to minimize any distractions during the study.

MINDFULNESS AND SUPPRESSION TRAINING

This experiment focuses on different emotion regulation strategies. Emotion regulation is the way that we control and express our emotions. Some people choose to hide their emotions while

others choose to express them fully. In this study we will be examining two strategies: suppression and mindfulness.

Expressive suppression is the process of holding back your emotions, and refusing to physically show what you are feeling. For example, if you try not to cry or laugh during a movie, you are suppressing your emotions.

To help you get used to using suppression, I will now show you a short video clip and ask that you refrain from showing any emotions while viewing. This video should not cause any distress, however, if at any point you feel unable to continue, please let me know.

Play "My dad is a liar" video

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

I will now ask you to complete a 12 minute exercise in mindfulness. After you put on the headphones, I will play the video and ask that you follow the instructions. When you are done, remove the headphones and we can continue with the study.

Play mindfulness clip. Try to be quiet while the participant is viewing in order to minimize distractions.

So now that you have completed the training, you are now ready to begin the study. Do you have any questions? Then we can start.

PICTURE VIEWING

Turn on webcam, pull up E-Prime, enter participant number and session number (always 1).

Again E-Prime can be found under Library -> Documents -> EXPERIMENTS -> ZWEIG_HONORS_SP18 -> ZWEIG_HONORS_SP18.ebs2

You will now view a series of images. Each section of images will be preceded by a screen labeled natural, suppress, or mindful. This is the emotion regulation strategy we would like you to use while viewing this series of images.

Press space bar

During the natural condition, do not try to regulate your emotions in any way. Just react the same way you would if you were watching television.

Press space bar

During the suppress condition, try to hide any emotions you may be feeling. Try your best to refrain from showing any facial expressions.

Press space bar

And during the mindful condition, try to be aware of your emotions as they occur, without trying to change them.

After each image, you will be asked to rate how similar you feel, emotionally, to the people in the photographs. A score of 1 indicates that this person is not like you, and a score of 6 indicates that this person is very similar to you.

You will also be asked to rate how often you followed the emotion regulation instructions.

For the natural condition, indicate how often you viewed the pictures as if you were watching television, 1 indicating never and 6 indicating always.

Press a number

For the suppress condition, indicate how often you held back your emotions.

Press a number

And for the mindful condition, indicate how often you paid attention to your emotions without trying to change them.

Press the spacebar

First, you will complete a quick practice session to get used to the instructions. Let me know when you've completed the practice session and we can continue to the study.

Wait for participant to finish practice

Now that you've completed the practice session, do you have any questions about the study? Ok great! You can start the session whenever you're ready, and let me know once you've finished.

Wait for participant to complete E-Prime

Once participant finishes, turn off webcam and close E-Prime

QUESTIONNAIRES

I will now ask you to complete three questionnaires about your emotions. Please follow the instructions on each one, and let me know if you have any questions. You do not have to write your name on the questionnaires. Take as much time as you need, and once you're finished, put the questionnaires in the envelope.

Give participant questionnaires

RECALL

Earlier in the session, I had you view a series of pictures on the computer screen. I would like you to think back and try to remember any of the pictures that you saw.

(GIVE PARTICIPANT THE RECALL SHEET AND A PEN)

Take a few minutes and write down a brief, one or two sentence description of any pictures you can remember. Write your description so that someone else who saw the pictures would recognize which picture you were describing.

Take as much time as you need and let me know when you have recalled all of the pictures you can remember.

Wait for participant to finish. Make sure they take at least 5 MINUTES. Do not tell the participant that you are timing them

You have now completed the study! The purpose of this study was to measure the effects of mindfulness and suppression on emotion and memory. We also wanted to see how these effects were modified by levels of depression. Do you have any questions about the study? I will grant you your ELC's within the next 24 hours.

Thank you for your participation!

Grant 2 ELC's, move "Experiment in Progress" sign off door. File participant folder under "Zweig Completed Participants" in top right file drawer.

Save webcam video by pulling up Logitech, click on the video, click "Go to File", save as "KZParticipant ___", move to "Zweig_HN_Thesis" folder