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The Impact Of A Brief Mindfulness Exercise On Autobiographical Memory Specificity In Trauma-Exposed College Students

Katie Thomas

THE IMPACT OF A BRIEF MINDFULNESS EXERCISE ON AUTOBIOGRAPHICAL MEMORY SPECIFICITY IN TRAUMA-EXPOSED COLLEGE STUDENTS

by

Katie Beth Thomas
Bachelor of Arts, University of Wisconsin Oshkosh, 2009
Master of Arts, University of North Dakota, 2011

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This dissertation, submitted by Katie Thomas in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

John-Paul Legorski (Chair)

Joelle Ruthig (Committee Member)

Heather Terrell (Committee Member)

Alan King (Committee Member)

Kara Wettersten (Committee Member)

This dissertation is being submitted by the appointed advisory committee as having met all of the requirements of the School of Graduate Studies at the University of North Dakota and is hereby approved.

Wayne Swisher
Dean of the School of Graduate Studies

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Title	The Impact of a Brief Mindfulness Exercise on Autobiographical Memory Specificity in Trauma-Exposed College Students
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ABSTRACT

When comparing performance on the Autobiographical Memory Task (AMT) between individuals who have been exposed to traumatic events and those who have not, individuals exposed to traumatic events tend to provide autobiographical memories that are more often characterized as being overgeneral with relatively fewer memories that reference a particular date or time. Studies have found that post-traumatic stress symptoms (PTSS) may be particularly responsible for this effect. Researchers have posited that this effect may be due to cognitive overload from avoiding negative memories, or from shallow retrieval of the memory in order to avoid further emotional discomfort. Mindfulness training, which encourages acceptance of one's emotions, has been associated with improvements in memory and attention, as well as with reductions in PTSS. The current study utilized an experimental design that randomly assigned 133 participants into two conditions (a brief mindfulness exercise group or control condition) to determine whether exposure to a brief mindfulness exercise prior to completing the AMT moderated the association between PTSS and memory specificity. Although the brief mindfulness exercise condition did produce higher mean scores in state mindfulness, analyses of covariance results showed that neither study condition nor PTSS was shown to impact specificity. Implications and limitations are discussed.

Keywords: autobiographical memory, mindfulness, trauma

CHAPTER I

INTRODUCTION

Traumatic exposure has been associated with impairment in a variety of domains of memory, including working memory (Schweizer & Dalgleish, 2011), long-term recall (Bremner et al., 1993), and recognition (Jelinek et al., 2006). A considerable amount of research on memory and trauma has focused on autobiographical memories because many believe that these types of memories have a role in psychopathology and posttraumatic adjustment (e.g., Pennebaker & Beall, 1986; Rubin, Boals, & Bernsten, 2008). Autobiographical memory refers to a combination of episodic memories and semantic memories that are specific to an individual's life and can be evaluated along a number of different domains (Greenhoot, Johnson, & McCloskey, 2005; Williams et al., 2008), including the authenticity and accuracy of the information recalled, the perspective of the autobiographical event (i.e., first-person vs. third-person perspective), the internal states used when describing these memories (e.g., use of emotion or cognitive terms), and the specificity of the memories. One tool used to measure these aspects of autobiographical memory is the Autobiographical Memory Test (AMT; Williams & Broadbent, 1986). When administered the AMT, participants are presented positive and negative emotion cue words and asked to describe specific personal experiences these word elicit (Williams & Broadbent, 1986; Williams & Scott, 1988).

Many researchers have used the AMT with individuals exposed to traumatic events to examine the variability in the specificity of their autobiographical memories. Specific memories are defined as memories that refer to an event that lasted one day or less and occur at a specific date and time (Williams & Broadbent, 1986). A specific memory is in contrast to an over-general memory (OGM), in which a specific time and place cannot be identified (Schonfeld, Ehlers, Bollinghaus, & Rife, 2007; Williams & Broadbent, 1986). One example of OGM might be "Breaking up with my girlfriend was rough" in contrast to the more specific, "I was sad the night my girlfriend called me on the phone and broke up with me." When comparing performance on the AMT between individuals who have been exposed to traumatic events and those who have not, individuals exposed to traumatic events tend to provide autobiographical memories that are more often characterized as being overgeneral (Schonfeld et al., 2007). These findings suggest that OMGs may be associated with traumatic exposure and posttraumatic stress symptoms (PTSS).

Mindfulness, or having awareness and a stance of nonjudgment, nonreaction, and acceptance towards one's experiences (Brown & Ryan, 2003), has been shown to moderate the associations between traumatic exposure and PTSS (for a review see Thompson, Arnkoff, & Glass, 2011), depression (Smith et al., 2011), and alcohol problems (Vujanovic, Bonn-Miller, & Marlatt, 2011). However, no studies to date have examined the associations between traumatic exposure, autobiographical memories, and mindfulness. The proposed study will explore whether a brief mindfulness exercise given before the AMT can moderate the associations between traumatic exposure and

autobiographical memory specificity. A review of the literature of traumatic exposure, autobiographical memories, and mindfulness is provided below.

Autobiographical Memory Problems Associated with Trauma Exposure

The study of OGM using the AMT originated in depression research, which has shown that many individuals diagnosed with depression have a tendency to display OGMs (Nandrino, Pezard, Posté, Réveillère, & Beaune, 2002). Later this research expanded to the study of autobiographical memory among individuals with trauma exposure (Schonfeld et al., 2007). The tendency to provide OGMs has been found among studies on a variety of different types of traumatic exposure, including child abuse (Crane & Duggan, 2009; Valentino, Toth, & Cicchetti, 2009), childhood sexual abuse (Kuyken & Brewin, 1995), emotional abuse (Raes, Hermans, Williams, & Eelen, 2005) and exposure to family violence (Johnson, Greenhoot, Glisky, & McCloskey, 2005). Depressive symptoms are often associated with traumatic exposure (Kessler, Davis, & Kendler, 1997), which raises a number of questions regarding the association between traumatic exposure of OGMs. Can OGMs best be explained by traumatic exposure accompanying PTSS or the co-morbid depressive symptoms accompanying them? Or do traumatic exposure, PTSS, and depressive symptoms each have unique contributions to OGMs?

Adequately addressing these questions presents some challenges, given that many of the studies linking OGMs and trauma exposure have failed to control from PTSS (Mowlds et al., 2010; Schlachter, Weiner, & Nash, 2009; Valentino, Toth, & Cicchetti, 2009). Studies that have included measures of PTSS have found associations between OGMs and PTSS (Bunnell & Greenhoot, 2012; Hauer, Wessel, Geraerts, Merckelbach, &

Dagleish, 2008; Schonfeld et al., 2007), and these associations have shown to remain when controlling for depressive symptoms (Aglan, Williams, Pickles, & Hill, 2010). However, some studies have failed to find the trauma exposure-OGMs association For instance, McNally and colleagues (2006) found that PTSD symptoms had no effect on memory specificity. Additional studies have found similar results (Mowlds et al., 2010; Strokes, Dritschel, & Bekerian, 2008).

Possible Mechanisms Underlying Trauma's Effects on Memory

Researchers have identified several possible explanations for the associations between memory difficulties and traumatic exposure. One possible reason is that stress damages the hippocampus, resulting in episodic memory problems (Sapolsky, 1996), although there have been inconsistencies among the empirical support for this theory (Johnson et al., 2005; McNally et al., 2006; Mowlds et al., 2010). Another possible explanation, based on information processing models, has been discussed by Johnson and colleagues (2005). They suggest that many individuals exposed to traumatic events may seek to retrieve autobiographical memories of an event while encountering distressing details associated with them. This creates a difficult balancing act between the specific details of an event and the emotions that surround them, thus resulting in a cognitive overload that disrupts recall and produces memory deficits.

A third explanation is that some individuals may not properly encode information during a traumatic event, being unable to fully process the information from short-term memory into long-term memory storage (Baddeley, Eysenck, & Anderson, 2009). This may be due to peritraumatic dissociation, in which trauma survivors experience dissociative symptoms during the trauma (Bedard-Gilligan & Zoellner, 2012). Another

possibility is simply that the trauma event was difficult to process cognitively. Traumatic events can often be overwhelming and confusing emotionally, which may interfere with one's ability to encode information in a conceptual and holistic manner with meaning and context (Ehlers & Clark, 2000).

A fourth explanation is called the affect regulation hypothesis (Williams et al., 2007). This explanation is based on the conceptualization of memory retrieval as a top-down process, in which the search for a particular memory begins at the top and keeps delving down until it is retrieved (Conway & Pleydell-Pearce, 2000). As the search uncovers a distressing event, individuals with trauma history may be more likely to stop the search while it is still at an abstract level, as opposed to delving deeper for more details (Conway & Pleydell-Pearce, 2000). Trauma-exposed individuals may stop their search earlier as an avoidant coping strategy to regulate negative affect.

A number of research findings support the emotion regulation hypothesis. First, non-traumatized people who report efforts to regulate negative emotions or stress tend to provide OGMs on autobiographical memory tasks (Hermans, Defranc, Raes, Williams, & Eelen, 2005). Second, when differentially comparing the PTSD symptom clusters, avoidance symptoms are more strongly negatively correlated with poorer memory specificity than re-experiencing and hyperarousal symptoms (Bunnell & Greenhoot, 2012). This suggests that individuals with more severe avoidant PTSS have a greater tendency to provide more OGMs than individuals with less severe avoidant symptoms.

Further, Bunnell and Greenhoot (2012) found that working memory had a significant main effect on OGM, indicating that cognitive overload may also be a contributing factor. Additional research suggested that PTSS, particularly avoidance

symptoms, accounted for the lower specificity rather than traumatic exposure (Bunnell & Greenhoot, 2012). The same study also found that giving participants unlimited time to retrieve OGMs resulted in no difference between participants with and without abuse histories on specificity. Furthermore, the authors found a positive relationship between abuse and specificity on positive emotion-cued memories. The authors posited that participants showing more specificity in the untimed condition indicate that these memories are actually encoded, but participants are unable or unwilling to retrieve them in certain contexts. These studies provide support for the emotion regulation hypothesis as a mechanism that contributes to the memory patterns observed in trauma-exposed participants. Unlike hypotheses that emphasize memory difficulties as a function of disrupted encoding of information, the emotion regulation hypothesis implies that memory specificity should improve as emotional avoidant symptoms subside, although this is an area researchers have yet to explore.

Mindfulness

Mindfulness, often conceptualized as the opposite of avoidance, may have important implications for trauma research in this area. Mindfulness is defined as the practice of awareness and nonjudgmental acceptance of one's experience in the present, facilitating nonjudgmental awareness of one's actions or surroundings (Brown & Ryan, 2003; Chambers, Lo, & Allen, 2008). It is viewed as both a set of skills that can be developed through practice (Baer & Krietemeyer, 2006), and a trait in the extent that individuals differ in their disposition towards mindfulness (Brown & Ryan, 2003). Mindfulness is associated with psychological well-being (Falkenstrom, 2010), presumably because it facilitates acceptance of internal experiences (Brown & Ryan,

2003). It is considered to be the opposite of experiential avoidance, which refers to attempts to change or avoid one's inner experiences and has been implicated in PTSS (Thompson & Waltz, 2010). In other words, mindfulness may be viewed as in opposition to the avoidant coping mechanisms often characteristic of PTSS.

Research studies have also linked mindfulness with attention and memory. A key component of mindfulness is awareness, as emphasis during mindfulness practice is placed on paying attention to experiences without being distracted by judgments or thoughts that are unrelated to the present moment (Chambers, Lo, & Allen, 2008). In this manner, both state and trait mindfulness are thought to enhance cognitive flexibility by assisting the individual to recognize when information is irrelevant, leading to improved sustained attention and executive functioning (Carmody, Baer, Lykins & Olendzki, 2009). Also, cognitive flexibility promoted by mindfulness may decrease reactivity and interference from irrelevant mental processes, thereby producing more efficient memory retrieval (Carmody et al., 2009). Numerous studies indicate that mindfulness training is associated with better attention and more efficient cognitive processing (*e.g.*, Jha, Krompinger & Baime, 2007; Valentine & Sweet, 1999; van den Hurk, Giommi, Gielen, Speckens, & Barendregt, 2010).

Mindfulness has also shown to be negatively associated with PTSS (Brown & Ryan, 2003; Smith et al. 2011). Thompson and Waltz (2010) found that trait mindfulness, particularly the ability to hold a nonjudgmental stance towards one's experiences, accounts for a unique portion of PTSS. Furthermore, studies have shown that development of mindfulness-based skills coincide with reductions in PTSS. Chensey and Berman (2010) found that completing a mindfulness-based therapy program,

Mindfulness-Based Stress Reduction (MBRS), as well as practicing mindfulness at home, reduced PTSD scores in child abuse survivors. Of these scores, those measuring avoidance and numbing were the most reduced (Kimbrough et al., 2010). Supporting these findings, Polusny et al. (2011) found that experiential avoidance mediated the relationship between exposure to a series of tornadoes and PTSD in both adolescents and their parents. Similar findings by Miller, Bradley, Legerski, and Herting (2012) have also indicated that mindful attention and awareness is highly correlated with PTSS in college-age students. These findings indicate that mindfulness is negatively related to PTSS, particularly with respect to avoidance of distressing thoughts and emotions.

Mindfulness and Memory

With research on the effects of mindfulness on memory and cognition just emerging, there is some evidence that brief mindfulness meditation training is associated with improvements in performance on measures of visuo-spatial processing, working memory, long-term memory, and executive functioning (Bonamo, Legerski, & Thomas, 2014; Zeidan, Johnson, Diamond, David, & Goolkasian, 2010). Two studies have found a moderating relationship between mindfulness and memory specificity, although this research has been with depressed participants. Williams, Teasdale, Segal, and Soulsby (2000) discovered that receiving Mindfulness-Based Cognitive Therapy (MBCT; Segal, Williams, & Teasdale, 2002) improved autobiographical memory specificity in depressed patients. Heeren, Van Broeck, & Philippot (2009) examined the impact of mindfulness on autobiographical memory specificity as well as executive functioning in depressed individuals using MBCT. Their study found that participants who engaged in the MBCT program had increased autobiographical memory specificity, increased cognitive

flexibility, and greater ability to inhibit irrelevant information (Heeren et al., 2009). Further analyses indicated that increased cognitive flexibility was the biggest factor in this improvement (Heeren et al., 2009). This result supports the theory that the cognitive flexibility associated with mindfulness may result in more efficient memory retrieval and improved executive functioning. These findings also support the notion that specificity in autobiographical memory may be due to depleted cognitive resources that make memory retrieval more difficult and less efficient.

To this date, research has not examined whether this moderating effect mindfulness training can have of specificity can be replicated in trauma-exposed individuals. Because mindfulness has been negatively associated with avoidance related to PTSS, mindfulness-based training may have the potential to moderate the association between trauma and autobiographical memory specificity by a) reducing the avoidance tendencies that contribute to more general memory retrieval, b) reducing the negative reactivity to memories and thoughts related to the trauma through its promotion of acceptance and nonjudgment, and/or c) improving executive functioning efficiency.

The Current Study

The purpose of the current study was to examine whether or not a brief mindfulness training exercise can moderate the AMT responses of college students with and without PTSS. The author hypothesizes the following:

H1: Due to previous findings that mindfulness increases specificity on an AMT task (Williams et al., 2000; Heeren et al., 2009), I hypothesized that there would be a main effect of mindfulness on memory specificity with participants exposed to the

mindfulness exercise producing more specific memories than participants exposed to the control condition.

H2: I also hypothesized that there would be a main effect of PTSS on specific memories, with participants with lower levels of PTSS providing significantly more specific memories on the AMT than those with higher PTSS. I made this hypothesis based on research that individuals with PTSS show less specificity in general (e.g., Bunnell & Greenhoot, 2012).

H3: Due to research indicating that mindfulness is associated with more efficient memory retrieval (Heeren et al., 2009), as well as fewer PTSD avoidance symptoms (Thompson & Waltz, 2010), I hypothesized that there will be an interaction effect of mindfulness and PTSS. Specifically, individuals with PTSS in the mindfulness condition will provide significantly more specific memories than individuals with PTSS in the control condition.

The results of this study have possible implications for the study of trauma, PTSS, and AMT research. First, this study contributed to the field's understanding of the causes of OGM among trauma-exposed individuals. If mindfulness training were to improve specificity, this would provide evidence for the avoidance argument and evidence against the encoding argument. Second, with research already demonstrating that memory specificity is related to improved psychological outcomes (Park, Goodyear, & Teasdale, 2002), finding that brief mindfulness training may enhance memory specificity should have important implications to the treatment of PTSS.

CHAPTER II

METHOD

Participants

Participants consisted of 136 students enrolled in Psychology courses at a medium-sized public university located in the midwestern region of the United States. Three participants were not included in analyses due to incomplete data, resulting in a final sample of 133. Sample size was calculated using G*Power version 3.1 to detect a medium effect size (f = 0.25) at a power of .80 for four groups with six covariates. Alpha was set at .01 after a Bonferroni correction to account for multiple comparisons. Participants signed up for the study using the online SONA Systems experiment management system (SONA Systems, Ltd, Version 2.72; Tallinn, Estonia), to which they have access through the psychology department. Depending on their preference, participants received course credit or $10 in cash for their participation, and only four participants (.03%) electing for the cash option.

Of the 133 participants, 3% self-identified as African-American, 3.8% as Asian-American or Pacific Islander, 88% as Caucasian, 2.3% as Hispanic/Latino, and 3% as Native American. The majority of participants reported being female (78.9%). The average participant age was 19.91 (SD = 2.588).

Measures

Post-traumatic stress symptoms. Symptoms of PTSD were assessed using the Post-Traumatic Stress Disorder Checklist - Civilian Version (PCL-C; Weathers et al., 1994). The 17-item PCL-C asks individuals to rate the occurrence of PTSD symptomology, such as "repeated, disturbing dreams of a stressful experience," on a 5 point Likert scale ranging from “not at all” to “extremely” (Weathers et al., 1994). Adkins, Weathers, McDevitt-Murphy, and Daniels (2008) found test-retest reliability for this measure to be .87. Internal consistency for the subscales has been found to be 0.935 for Cluster B, .820 for Cluster C, and 0.839 for Cluster D (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996). In the current study, internal consistency was .873 for Cluster B, .847 for Cluster C, and .767 for Cluster D. Internal consistency for the total scale was .928.

Trauma exposure. Trauma history was assessed via the Trauma History Questionnaire (THQ; Green, 1996), a widely used self-report measure of lifetime trauma (Hooper, Stockton, Krupnick, & Green, 2011). For a self-report trauma measure, it has adequate reliability and validity (Hooper et al., 2011). According to Green (1996), test-retest correlations have been found to range from .54 to .92. The THQ asks participants to endorse their experiences with regards to four different types of traumatic events: (a) property crimes (such as mugging and robberies); (b) disaster-related trauma (such as accidents and natural disasters); (c) death and illness-related trauma (such combat experience, experiencing serious injury, seeing a loved one injured or killed); and (d) sexual or physical abuse (such as rape or physical assault). Participants also are asked how often and at what age they had each traumatic experience. If participants endorsed

the event, they were given a score of 1 for the item. If they did not endorse it, they were given a score of 0. Total THQ scores were calculated by adding up each type of traumatic experience endorsed by participants. Internal consistency for the measure in the current study was calculated as .995, which is consistent with results from other published studies (Hooper et al., 2011).

Depressive symptoms. In order to control for the effects of depression on the AMT, the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) was given to participants. The measure is 20 items and asks participants to endorse how often they have felt depressive symptoms during the past week. The questionnaire asks about symptoms such as "I was bothered by things that usually don't bother me" and "I did not feel like eating; my appetite was poor" (Radloff, 1977). Each item is rated between 0 and 3, with scores ranging between 0 and 60, and higher scores representing more severe depressive symptomology. The measure has been found to have good internal consistency at .85 in the general population and .90 in the clinical population (Radloff, 1977). In the current study, internal consistency was calculated as .987.

Autobiographical memory task. The written version of the autobiographical memory task (AMT; William & Broadbent, 1986) was used to obtain participants' autobiographical memories. The task consists of words printed on cards, given in random order to participants. Participants were given 120 seconds to verbally provide an autobiographical memory associated with the word on the page in response to a cue card shown by the experimenter. Participants were first given four practice cues to help them understand the necessity of providing a specific memory. These cue words were persistent, cautious, proud, and thrifty. They were next shown the experimental cue

words, which consisted of 10 positive emotional cues and 10 negative emotional cues. These cues were: friendly [Positive=P], lazy [N=Negative], loyal [P], distrustful [N], happy [P], hostile [N], open-minded [P], selfish [N], honest [P], ashamed [N], intelligent [P], guilty [N], self-disciplined [P], cowardly [N], helpful [P], jealous [N], kind [P], rude [N], humorous [P], and cruel [N]). The practice cues were taken from McNally et al. (1995) and the 20 AMT cues were taken from Williams and Broadbent (1986). The AMT cue words and instructions can be seen in the Appendix.

Trait mindfulness. Trait mindfulness was assessed using the Five Facets Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins Krietemeyer, & Toney, 2006), a 39-item self-report measure that uses a 5-point Likert scale ranging from "never or very rarely true" to "very often or always true." The measure differentiates aspects of trait mindfulness along 5 scales: *Observe*, *nonreact*, *nonjudgment*, *describe*, and *act with awareness*. Observe refers to the ability to notice experiences, nonreact refers to the ability to experience without necessarily reacting. Nonjudgment refers to the ability to accept experiences without judging them, describe refers to the ability to discuss experiences without negatively labeling them, and act with awareness refers to the ability to focus awareness on what the individual is doing in the moment (Baer et al., 2006). One example of an item on the FFMQ is "When I take a shower or bath, I stay alert to the sensations of water on my body" (Baer, 2006). The FFMQ subscales have good internal consistency, ranging from .71 to .95 (Baer et al., 2006). One study (Isenberg, 2009) found test-retest reliabilty to range from .66 to .86. Internal consistency in the current study was calculated at .889

State mindfulness. To assess state mindfulness, participants were asked to fill out the 13-item Toronto Mindfulness Scale (TMS; Lau et al., 2006), which uses a 4-point Likert scale ranging from "not at all" to "very much." The TMS was developed to measure state mindfulness and is concerned with two particular aspects of state mindfulness: 1) curiosity, which refers to awareness to the present moment with some degree of curiosity, and 2) decentering, which refers to awareness of the present moment without being carried away by the thoughts and feelings one experiences during it (Lau et al., 2006). The questionnaire asks specific questions about the individual's experience during the mindfulness exposure, such as "I was curious to see what my mind was up to from moment to moment" (Lau et al., 2006). The questionnaire showed good internal consistency at .95 (Lau et al., 2006). In the current study, internal consistency was .867.

State affect. To control for the effects of affect at the time of the study, participants filled out the 20-item version of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS is a 20-item self-report with two subscales (the positive affect subscale and negative affect subscales) that measure current positive and negative emotion along a 5-point Likert scale ranging from "very slightly or not at all" to "extremely." Higher scores indicate higher levels of the affect measured by the subscale. The PANAS lists specific emotions such as "anger," "joy," and "surprise," and asks individuals to rate to what degree they are currently experiencing that emotion (Watson et al., 1988). Research indicates that both PANAS subscales have good internal consistency, as Cronbach's alpha = 0.86 to 0.90 for the Positive Affect subscale and 0.84 to 0.87 for the Negative Affect subscale (Watson et al., 1988). The two subscales are correlated at -0.23. Scores from the PANAS also correlate well with

other measures of affect (Watson et al., 1988). In the current study, internal consistency for the final administration of the PANAS was .901 for positive affect and .820 for negative affect.

Executive functioning. Executive functioning was assessed by administering the Wisconsin card sorting task (WCST; Heaton, 2003). In this test, individuals have to sort cards under a rule that they are not given (such as color or shape). After a few trials, the rule is changed, which the individual must now use to sort the cards. This task requires executive or frontal lobe functioning and abstract reasoning ability. The computerized research version of the WCST (Heaton & PAR Staff, 2003) was administered using a computer by research assistants who have been trained in how to administer the task. The test provided a control for executive functioning, which has been implicated as one of the possible factors underlying OGM (Bunnell & Greenhoot, 2012). The WCST has shown to have generalizability coefficients ranging from .39 to .72, with an average of .57 and a median of .60 (Heaton, Cheuline, Talley, Kay, & Curtiss, 1993). It has also shown good concurrent validity with other cognitive tests, including a measure of Piagetian formal operations (Shute & Huertas, 1990).

Procedure

The study was run with one participant at a time with participants randomly assigned to either the mindfulness or control condition prior to their in-person participation. Initially, the study consisted of two phases. In the first phase, participants completed the PCL-C, CES-D, FFMQ, and THQ using Qualtrics survey software, and in the second phase they presented for in-person participation. Due to a significant number of participants who completed the first phase of the study and opted not to respond to

requests to complete the second phase, the study procedure was later changed to consist of a single, in-person phase. In the one phase version, participants filled out the online measures using a computer in the laboratory prior to continuing the rest of the study. Seventy-nine participants (54.9%) completed the study in two phases (online and in-person), and 59 completed the study in one phase (in-person only).

After filling out the Qualtrics measures, participants completed the WCST and then the PANAS. Participants in the mindfulness condition next participated in a ten-minute mindfulness body scan exercise. Participants in the control condition listened to a natural history lecture. Both the mindfulness body scan exercise and the control condition have been used in published mindfulness studies (*e.g.*, Cropleyet al., 2007; Ostafin & Kassman, 2012). Following either the mindfulness exposure or the control condition (depending on their group assignment), they completed the TMS and a second PANAS. They were then administered the AMT task by the researcher. The entire administration time of the AMT and the companying measures was approximately 60 minutes for the two-phase study procedure and 90 minutes for the one phase procedure.

Coding and Inter-rater Reliability

Oral responses on the AMT were transcribed by a research assistant, and checked for accuracy by a second research assistant. Specificity on the AMT was coded dichotomously as specific or over-general, as has been done in previous research using the AMT (Bunnell & Greenhoot, 2012). A memory was coded as specific if it referenced an event that was experienced firsthand by the participant and lasted for less than one day and coded as overgeneral-categoric if it described a category of events or overgeneral-extended if it described a longer-lasting event (Williams, 1992). Two graduate students

who had been trained in this coding procedure coded the data. Cohen's Kappa was calculated for 20% overlap of the raters' responses to determine if adequate inter-rater reliability was achieved. Results indicated that kappa for coding a response as a memory or non-memory fell into the "outstanding" category at .918 (Landis & Koch, 1977).

Kappa for coding a response as specific, overgeneral-categoric, or overgeneral-extended was also outstanding at .873 (Landis & Koch, 1977). Total specificity scores were calculated by determining the proportion of specific memories to total memories provided per participant.

CHAPTER III

RESULTS

Data Pre-screening

Missing data was analyzed for missing data patterns (Tabachnik & Fidell, 2007). Little's MCAR test indicated that there are no identifiable patterns to the missing data, X^2 = 7618.707 (df = 8764; p = 1.00). Case-wide deletion was used to exclude missing data from the rest of the analyses. Two participants' audio-recorded responses on the AMT were garbled and therefore they were excluded from any analyses involving Total Specificity, resulting in a sample size of 131.

The relevant variables were screened to determine if assumptions for ANCOVA analyses were met. Visual analysis of data indicated that most of the variables to be used in analyses met assumptions of normality. Z-scores for kurtosis and skewness also fell below the cut-off of 3.3 (Tabachnick & Fidell, 2007). Although the Kolmogorov-Smirnov test indicated that the CES-D was not normally distributed (p > .001), the measure's skewness (.437, *SE* = 210) and kurtosis (-1.336, *SE* = .417) as well as a visual analysis of the data's the Normal Q-Q plot indicated that normality was not skewed enough to significantly violate ANCOVA assumptions (Tabachnick & Fidell, 2007). However, results did indicate that the PCL-C scores were positively skewed (1.386, SE = .210), with a kurtosis of 2.330 (*SE* = .417). Additionally, WCST Raw Errors were also positively skewed (1.762, *SE* = .211; kurtosis = 3.611, *SE* = .419), as were WCST

Preseverative Errors ((1.194, *SE* = .211; kurtosis = 1.295, *SE* = .419) and PANAS Negative Affect scores (1.281, *SE* = .210; kurtosis = 1.903, *SE* = .417). Results also indicated that Total Specificity scores were significantly negatively skewed (skewness = -.1.771, *SE* = .212; kurtosis = 3.278; *SE* = .420).

A logarithmic (base 10) transformation was conducted on PCL-C scores, and results as well as a visual analysis of the Normal Q-Q plot indicated that this data met assumptions of normality). For WCST Total Errors, WCST Perseverative Errors, and PANAS Negative Affect scores, an inverse transformation was performed. A square root arc sin transformation was performed on total specificity scores, as the data were proportional. According to a visual analysis of data, all of the transformed variables met normality assumptions. Skewness and kurtosis values also indicated that normality assumptions were now met for Total Specificity scores (skewness = -.398, *SE* = .212; kurtosis = -.269, *SE* = .420), PCL-C scores (skewness = .171, *SE* = .210; kurtosis = .865, *SE* = .417), PANAS Negative Affect (skewness = .148, *SE* = .210; kurtosis = -.765, *SE* = 417), WCST Total Errors (skewness = .109, *SE* = .211; kurtosis = .765, *SE* = .419), and WCST Perseverative Errors (skewness = .280, *SE* = .211; kurtosis = -.442, *SE* = .419).

Outliers were assessed by calculating the z-scores for each case, using a cut-off of 3.3. No outliers were found for the CES-D, THQ, FFMQ TMS, or Total Specificity scores using this criterion. Outliers were found for the PCL-C, PANAS B Negative Affect, WCST Total Errors, and WCST Perseverative Errors; however, these were resolved with the above transformations, as the transformed scores were not found to have any outliers.

Visual analyses of scatter plots indicated that the data, including the transformed PCL-C scores, met the assumption of homoscedasticity. Levene's test was conducted for each main analysis. P-values ranged from .225 to .979, indicating that the assumption of homogeneity of variance was met.

Descriptive and Correlational Analyses

With regards to trauma exposure, descriptive analyses indicated that the mean THQ score was 19.35, *SD* = 20.01. 94.7% (*n*=125) of the sample endorsed having exposure to at least one type of traumatic event on the THQ. Concerning psychological symptoms related to trauma, the mean PCL-C score for the sample was 30.81, *SD* = 11.67, with a median score of 28. The mean CES-D score was 31.71, *SD* = 25.15. With regards to mindfulness, the mean TMS score was 34.29, *SD* = 8.63 and the mean FFMQ score was 122.31, *SD* = 11.96.

Prior to conducting main analyses, a correlation matrix was first used to identify uncorrelated predicted covariates. Uncorrelated covariates were removed from subsequent analysis. As can be seen in Table 1, study method (in-person and online versus in-person only) was significantly positively correlated with scores on the THQ and CES-D, and Total Specificity ($p < .05$), such that individuals who completed the first half of the study only tended to have higher rates of trauma exposure and depression, and were more specific in their autobiographical memories.

Additionally, condition was significantly correlated with PCL-C scores, with members of the mindfulness condition reporting higher PTSS than members of the control condition. CES-D scores were also significantly positively correlated with THQ scores and Total Specificity scores, with individuals scoring higher on depression

measures scoring higher on total specificity and trauma exposure.. THQ scores were positively correlated with Total Specificity at $p < .05$, with individuals endorsing high rates of trauma exposure also showing higher specificity. PCL-C scores were negatively correlated with FFMQ scores, but were not correlated with either Total Specificity ($p = .936$) or THQ scores ($p = .166$), indicating that lower PTSS scores were associated with higher trait mindfulness and were unrelated to total specificity or trauma exposure. PANAS Positive Affect scores were positively correlated with trait and state mindfulness scores, and PANAS Negative Affect scores were negatively correlated with FFMQ scores and positively correlated with PCL-C scores. This result suggests that individuals scoring high on trait and state mindfulness also endorsed high positive emotions and low negative emotions. Additionally, participants who endorsed high negative emotions also endorsed high PTSS and low trait mindfulness scores. Gender was negatively correlated with PANAS Positive Affect, $p = .001$, indicating that male participants endorsed high scores on positive emotions. WCST Total Errors and Perseverative Errors were not significantly correlated with any of the other variables, suggesting that executive functioning was not associated with any of the other variables measured in the current study.

Table 1. Variable intercorrelations.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Condition	-	-	-	-	-	-	-	-	-	-	-	-	-
2. Method	.006	-	-	-	-	-	-	-	-	-	-	-	-
3. Gender	.107	-.099	-	-	-	-	-	-	-	-	-	-	-
4. Total Specificity	-.125	.186*	.094	-	-	-	-	-	-	-			
5. PANAS Negative Affect	.076	.062	-.055	.084	-	-	-	-	-	-	-	-	-
6. PANAS Positive Affect	-.150	-.020	-.296**	.137	.055	-	-	-	-	-	-	-	-
7. WCST Total Errors (Inverse)	-.150	-.049	.048	.003	.139	-.017	-	-	-	-	-	-	-
8. WCST Perseverative Errors (Inverse)	-.060	-.033	.042	-.045	.092	-.003	.802**	-	-	-	-	-	-
9. PCL-C Total	-.176*	-.136	.044	.010	-.242**	.007	-.029	-.033	-	-	-	-	-
10. THQ Total	.009	.994**	-.093	.196*	.067	-.032	-.048	-.031	-.117	-	-	-	-
11. TMS Total	-.254**	.050	-.021	.165	-.135	.415**	-.067	-.088	.179*	.065	-	-	-
12. CES-D Total	-.096	.929**	-.084	.195*	-.062	-.051	-.048	-.044	.119	.926**	.102	-	-
13. FFMQ Total	.105	.054	-.001	-.145	.249**	.178*	.097	.090	-.388**	.044	.020	-.067	-

Note. $^{**}p < .01$, $^{*}p < .05$. PANAS = Positive and Negative Affect Schedule; WCST = Wisconsin Cart Sorting Test; PCL = Posttraumatic Stress Disorder Checklist – Civilian Version; THQ = Trauma History Questionnaire; TMS = Toronto Mindfulness Scale; CES-D = Center for Epidemiologic Studies Depression Scale; FFMQ = Five Facets Mindfulness Questionnaire.

Manipulation Check

In order to determine if the study manipulation was successful, an ANOVA was conducted to compare mindfulness (n = 67) and control (n = 66) groups on state mindfulness, as measured by TMS scores. FFMQ scores were not included as a covariate because they were not significantly correlated with TMS scores, r (131) = .020, p = .821. However, PANAS Positive and Negative Affect scores were included due to their significant correlations with TMS scores. ANOVA results indicated that there was a significant effect of study condition on state mindfulness, F (1, 131) = 14.267, p < .001, with the PANAS Positive Affect value of 26.316 and the transformed PANAS Negative Affect value of .0703. Results also indicated that PANAS Positive Affect was a significant covariate, F (1, 131) = 25.065, p < .001. Mean state mindfulness scores for the mindfulness condition were 36.742 (SE = .913), compared to a mean of 31.808 (SE = .920) for the control condition. A graph of results can be seen in Figure 1.

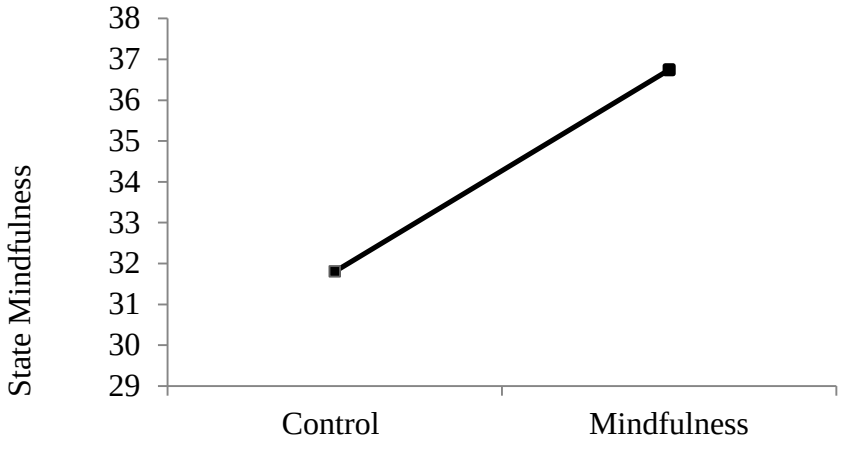

Figure 1. Main effect of study condition on state mindfulness, as measured by TMS scores.

Main Analyses

The main study hypotheses were tested using three Analyses of Covariance (ANCOVA).

H1: The current study's first hypothesis was tested by examining the main effect of study condition on memory specificity. Given their correlations with Total Specificity, CES-D scores, and THQ scores were included as covariates in the analyses. Results indicated that the main effect of study condition was not significant, $F(1,130) = 1.849$, $p = .176$. Neither of the covariates reached significance, with $F(1,131) = .000$, $p = .982$ for the CES-D and $F(1, 131) = .645$, $p = .423$ for the THQ.

H2: My second hypothesis was tested by examining the main effect of PTSS on memory specificity. If PTSS significantly decreases memory spec1ificity, this would provide further evidence that PTSS symptoms are associated with OGM. The Veteran's Affairs National Center for PTSD recommends using PCL-C cut-off scores ranging from 30 to 35 when screening for PTSD in populations where the estimated prevalence of PTSD is 15% or lower (VA National Center for PTSD, 2014). The cut-off for the current study was set at 30 in order to produce the most equal sample sizes, with 54% of participants' scores falling below the cut-off and 45% at or above the cut-off. It should also be noted that this study did not have enough information to deny or confirm PTSD in participants, and that this cut-off represents PTSS severity as opposed to a clinical diagnosis. Research indicates that PTSD rates in undergraduate non-clinical samples range from 9% to 12% (Bernat et al., 1998; Vrana & Lauterbach, 1994; Watson & Haynes, 2007), indicating that a 30-35 cut-off is appropriate for a college sample (Frazier et al., 2009).

Due to their correlation with the PCL-C, FFMQ scores were included as a covariate in the analysis, along with CES-D and THQ scores. Results demonstrated that the main effect of PTSS group was not significant with regards to Total Specificity scores, $F(1,130) = .580$, $p = .448$. The covariates were also not significant, $p > .05$.

To examine the impact of composite trauma on specificity regardless of PTSS, a regression analysis was conducted using total THQ scores as the predictor variable. The model was significant, $R^2 = .038$, $F(1, 130) = 5.153$, $p = .025$. THQ scores were a significant positive predictor, $\beta = .196$, $t(130) = 2.70$, $p = .025$, such that individuals who endorsed greater trauma history tended to provide greater levels of specific responses on the AMT.

H3: The third hypothesis was tested by examining the interaction effect between state mindfulness and PTSS. If individuals with PTSS have higher specificity in the trait mindfulness condition versus the control condition, this will provide support for the emotion regulation hypothesis of OGM in traumatized individuals, as well as evidence that mindfulness training may be beneficial in increasing memory specificity in people with PTSS. Results were not significant for any of the variables, with $F(1,131) = .535$, $p = .466$ for PTSS group and $F(1,131) = 1.715$, $p = .193$ for study condition. The interaction of PTSS group x study condition was also not significant, $F(1,131) = .003$, $p = .656$. CES-D, FFMQ, and THQ scores were included as covariates but were not significant, $p > .05$.

Post-Hoc Analyses

Given the correlation between state mindfulness scores and total specificity, a regression analysis was conducted. The model was not significant, $R^2 = .027$, $F(1, 130) =$

3.601, $p = .06$. Within the model, TMS scores were not a significant positive predictor, $\beta = .165$, $t(130) = 2.70$, $p = .060$, indicating that state mindfulness was unrelated to total specificity.

Additional correlation analyses were conducted examining the proportions of specific memories for positive and negative memories separately. Because these variables were significantly negatively skewed, they were transformed using two reflect and inverse transformations for positive memory specificity and three reflect and inverse transformations for negative memory specificity. Results indicated that the transformed positive memory specificity was positively correlated with THQ scores, $p < .05$ and that the transformed negative memory specificity was negatively correlated with FFMQ scores, $p < .05$. This implies that participants with high trauma exposure provided greater specific responses on the AMT when given positive emotion cues and participants with high trait mindfulness provided fewer specific responses on the AMT when given negative emotion cues.

In order to examine the relationships between specific aspects of trait mindfulness and autobiographical memory specificity, correlations were performed with the individual FFMQ subscales. Results indicated that Act with Awareness was negatively correlated with positive memory specificity, negative memory specificity, and total specificity, $p < .05$. In other words, the skill of focusing awareness on one's present experiences was associated with lower specificity for memories prompted by both negative and positive emotional cue words.

CHAPTER IV

DISCUSSION

Results demonstrate that the mindfulness manipulation was successful in raising state mindfulness. This finding indicates that a ten minute mindfulness exercise is sufficient for experimentally manipulating mindfulness, and that the effects of this exercise are significantly different than that achieved by the control, a ten minute audio lecture. This finding is also consistent with results obtained by previous studies, such as Ostafin and Kassman (2012) and Bonamo, Legerski, and Thomas (2014). Specifically, the current study found an estimated 4.93 point difference in state mindfulness scores, where as Bonamo et al (2014), which also used the TMS scores as the dependent measure, found a difference of 3.68 points. In general, it appears that it is not necessary to use longer mindfulness practices in experimental settings, which is helpful as using a shorter manipulation reduces time costs for both experimenters and participants.

My results did not support the first hypothesis with regards to the impact of a brief mindfulness exercise on total autobiographical memory specificity,. There are two possible reasons for this finding. First, it is possible that state mindfulness has no impact on specificity. Results examining the association between state mindfulness and specificity were mixed. There was a positive correlation between the two, with individuals reporting higher state mindfulness tending to also provide a greater frequency of specific memory; however, the correlation was small and the association was not

significant when included with additional variables in the regression analysis. Second, it is possible that state mindfulness does have an impact, but that the control condition was equally effective at increasing specificity. For instance, listening to an audio lecture regardless of content might have improved specificity through its activating other cognitive processes relevant to memory retrieval.

Study condition also was shown to be correlated with PTSS, but in a positive direction. Given that PTSS scores were obtained prior to exposure to the study manipulation, this result is difficult to explain. The most likely explanation is that participants randomly assigned into the mindfulness condition had higher PTSS scores than participants randomly assigned into the control condition.

The second hypothesis, which predicted that PTSS would have a main effect on specificity, was also not supported. This finding is inconsistent with several previous studies, which have generally found an association between memory specificity and trauma. However, it is consistent with other studies that failed to find a link between trauma and specificity (McNally et al., 2006; Mowlds et al., 2010; Strokes et al., 2008). It is possible that the study did not have enough participants with sufficient PTSS frequency and severity criteria to have an impact on memory specificity. Composite trauma exposure did appear to be a significant predictor of PTSS. However, contrary to prediction, trauma exposure was positively associated with specificity. Overall, research does indicate that the relationship between trauma exposure and specificity is less consistent when participants do not have a diagnosis of PTSD (*e.g.*, Johnson et al., 2005; Strokes, Dritschel, & Bekerian, 2008). It is therefore possible that results would have been different had the sample contained more participants with higher levels of PTSS or

PTSD diagnoses. Additionally, Bunnell and Greenhoot (2012) found that allowing an unlimited response time on the AMT resulted in no difference between trauma-exposed and non-trauma-exposed participants. The current study allowed 120 seconds for a response, whereas several previous studies have allowed 30 or 60 seconds (Bunnell & Greenhoot, 2012). It is possible that using a shorter cutoff in the current study might have resulted in differences between trauma-exposed and non-trauma-exposed groups.

The third hypothesis was also not supported, which predicted that there would be an interaction between PTSS and specificity, when accounting for study condition. Neither study condition nor PTSS appear to have had an impact on the proportion of specific memories to total memories. Again, it is possible that the study did not have enough participants with PTSS to demonstrate a significant effect on specificity either way.

Contrary to previous research, results also indicated that specificity was associated with poorer outcomes. For instance, specificity was associated with high levels of trauma and depression. This is similar to a result obtained by Bunnell and Greenhoot (2012), who found that abuse severity was positively related to specificity in the untimed administrations of the AMT. The authors explained this result by suggesting that the relationship between specificity and trauma exposure may be explained by trauma-related psychopathology, as opposed to trauma exposure. Furthermore, they posited that the extent to which individuals overly focus or under focus on trauma-related information may rely on the context in which the information is retrieved. Specifically, the time constraints on the AMT may cause more stress and challenges to participants, and therefore more likely to prompt an avoidant coping response (Bunnell & Greenhoot,

2012). Therefore, as the current study allowed longer time for AMT responses, it might have resulted in less stress for participants, precluding participants with both depression and trauma symptomology from engaging in maladaptive cognitive strategies.

Another possible explanation for these contrary findings might be the sample used. Both the current study and the study by Bunnell & Greenhoot (2012) used data collected from students currently enrolled at a college university. Although PTSS were present in both samples, more severe symptomology found in clinical samples may be needed to identify an association between OGM and trauma exposure.

Another possible explanation for the lack of support for the three main study hypotheses is that the study results were influenced by extraneous variables. One peculiar finding that was not included in the study hypotheses was the significant relationship between study method, i.e., how the data was collected, and total specificity. Due to initial difficulty with recruitment, the research team decided to forgo the initial online data collection procedure, and all the data was collected in a single session. Although in both methods, the AMT was conducted in person, individuals who participated in the initial mixed online and in-person version of the study provided fewer specific memories than individuals who participated in an in-person-only version. One possibility is that participants who completed all of the measures in person became more comfortable with the experimenter, having spent more time with them, and felt more comfortable during the AMT. Another is that the experimenters became more skilled at instructing participants to retrieve specific memories as the study progressed, however, research assistants were encouraged to closely following written instructions for the AMT during each administration.

Study method was also significantly associated with measures of adjustment. This finding was also unexpected and is difficult to explain. It is possible that the participants who signed up for the in-person-only study were different from the participants who signed up for the online and in-person-only version of the study. This may have been due to depression and/or trauma influencing participants' decisions regarding which types of studies to complete. Additionally, participants with trauma exposure or depression may have been more likely to opt out of completing the second part of the study in the mixed data collection method, resulting in there being less participants with higher levels of depression and trauma in that sample compared to the sample obtained in the online only data collection method.

Implications, Limitations, and Conclusions

The current study showed evidence that a brief mindfulness task can influence self-report ratings of state mindfulness. This has important implications for research aimed at exploring the cognitive and clinical benefits of brief mindfulness practice. Due to the lack of support for various relationships, and possible methodological issues, additional implications of results for this study are extremely limited. As PTSS did not have a significant impact on specificity, the exact mechanisms behind a potential relationship cannot be discussed. Once again, it is possible that a relationship between trauma and OGM is due to PTSS, but the current study did not have enough participants with high levels of PTSS to fully determine this. Therefore, the role of encoding issues versus emotion regulation in the relationship between PTSS and OGM was not supported in the current study. Additionally, the current study found a positive association between

trauma exposure and specificity, which only poses further questions about the relationships between these variables.

In addition to the issues discussed above, the study sample was mostly Caucasian, female, and consisted entirely of college students. Therefore, results may not be generalizable to other groups. Additionally, participants' data was obtained through self-report measures and may therefore be less reliable or clinically meaningful than more objective forms of data. For instance, levels of depressive symptoms and PTSS reported by participants may not have been clinically significant or diagnosable.

In future studies, researchers may want to consider testing the same manipulation with different sample characteristics. It would likely be more helpful to look at the study variables in a sample containing more participants with clinically significant levels of PTSS. It may be most helpful to obtain data from a clinical sample or conduct clinical interviews with participants to ensure the presence of a PTSD diagnosis. It may also be beneficial to look at the impact of long-term mindfulness training on specificity, as the current study had mixed support for a relationship between state mindfulness and specificity. Finally, researchers may want to examine the influence of study design on specificity, given the differences in specificity found in participants in the one-session and two-session conditions. The current study's use of two different data collection procedure presents a limitation, as selection bias or other differences between the two methods may have influenced results. Examining the impact that different data collection procedure, and characteristics of participants who sign up for these studies, may shed further light on variability in specificity of autobiographical memories.

Given the finding between trauma exposure and study method, it may be useful to further examine how study design can influence study participation and sample recruitment. For instance, the current study's findings suggest that screening for trauma prior to an experiment may decrease the likelihood of participants with more lifetime trauma choosing to participate in a study, perhaps due to emotional distress or trauma-related avoidance. Future research could examine these variables in a methods-based study to determine if study design influences participation in trauma research.

As discussed, the study results were not supportive of hypotheses. However, other factors might have been influencing these results, such as extraneous variables and participant differences that were not due to the study manipulation. Given this possibility, the current study's results cannot conclusively indicate the presence or nature of the relationships between OGM, trauma, and mindfulness. However, replicating the study design while addressing these issues could be helpful in further exploring the nature of autobiographical memory and post-traumatic stress.

APPENDIX

Appendix A

Autobiographical Memory Task

Researcher: "*This is an autobiographical memory experiment, and the procedure is very straightforward, and goes as follows. For the first part of this task, the examiner will give you 20 note cards that each has a word on them. Each word is the name of a trait or personal characteristic. Most of us exhibit or display each of these traits at one time or another. When you see each word, what you are to do is to think of a time when you exhibited or displayed the trait in question. The memory you retrieve should be very specific. That is, it should refer to a particular occurrence when you displayed the trait. So, for example, if the trait word were excitable, you might state, "I was really excited last Sunday when I was watching the football game on TV." That would be a specific personal memory because it referred to a particular event on a particular day when you displayed the trait. If you had stated, "I always get excited when I watch football on TV" you would not have stated a specific personal memory because the memory did not refer to any specific event but rather to "watching football games in general".*

So, for each word, we want you to think of a specific personal memory – a time when you displayed the trait in question. Although we want you to answer as quickly as you can, the most important thing is to answer with a specific memory, not a general memory."

1. Persistent
2. Cautious
3. Proud
4. Thrifty

These 4 practice terms are administered orally in an interview format. The next word is not presented until the participant has retrieved a specific personal memory in response to the previous word. During this practice phase, provide the participant with as much time as he or she needs, and prompt the participant as required. For example, the researcher might provide the following encouragement, "*Remember, we want you to think of a specific personal memory – a time when you displayed the trait in question. Although we want you to answer as quickly as you can, the most important thing is to answer with a specific memory, not a general memory*."

(After practice administration)

Researcher: *"Each notecard will contain one word. As soon as you think of a specific instance that the word reminds you of, I want you to describe it out loud, briefly. I'll be*

timing how quickly you can recall a specific memory with this stopwatch. I'll be giving you up to 2 minutes for each word. I'll also record your responses with an audio recorder. Be sure you say the word out loud before providing your memory.
When you've finished providing your memory, or if we have run out of time for the word and I say to move on, we will move on to the next card. It can be very difficult for me to be sure that you have finished providing a memory, so if I move on to the next card and you were still thinking about adding anything you can feel free to complete your thoughts. I will only start the timer for the next word when you say the next word out loud. Do you have any questions?"

The AMT words are printed on randomly-ordered notecards that the participant reads. The participant is given two minutes for each response.

1. Friendly
2. Lazy
3. Loyal
4. Distrustful
5. Happy
6. Hostile
7. Open-minded
8. Selfish
9. Honest
10. Ashamed
11. Intelligent
12. Guilty
13. Self-disciplined
14. Cowardly
15. Helpful
16. Jealous
17. Kind
18. Rude
19. Humorous
20. Cruel

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