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Encoding Style of Positive Autobiographical Memories: Relationship to Mood Repair, Memory Functioning, and Depression

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by

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ABSTRACT

The recall of positive autobiographical memories is an effective strategy for improving negative mood among healthy persons, yet individuals with a history of depression often fail to derive emotional benefits. Depressed and depression-vulnerable individuals also exhibit deficits in their autobiographical memory characteristics. Scholars have implicated deficits during autobiographical memory retrieval as a cause of mood repair and memory impairments, however the role of memory encoding has largely been overlooked. The current study manipulated encoding style to examine subsequent effects on mood repair efficacy, memory characteristics, and memory accuracy. Fifty-five formerly depressed and 68 never-depressed participants were assigned to employ either a concrete or natural encoding style while engaging in a positive event staged in the laboratory. After a negative mood induction, participants were given the opportunity to improve their moods by recalling details of the positive event. Results failed to support the hypothesized interaction of depression status and encoding style. Interpretations of the null findings are provided and implications of the study are discussed.

ENCODING STYLE OF POSITIVE AUTOBIOGRAPHICAL MEMORIES: RELATIONSHIP TO MOOD REPAIR, MEMORY FUNCTIONING, AND DEPRESSION

Affect regulation, or the "processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (Gross, 1998, p. 275), is an important skill. In fact, successful affect regulation is a hallmark of good mental health (Gross & Munoz, 1995). Not surprisingly, difficulties in affect regulation are implicated in many disorders, including depression. Scholars have noted that the core symptoms of depression—prolonged sad affect and diminished positive affect (American Psychiatric Association, 2013)—may reflect poor affect regulation and contribute to the development, maintenance, and recurrence of depressive episodes (Gross & Munoz, 1995; Joormann & Gotlib, 2010). Congruent with this notion, Teasdale (1988) theorized that while all people encounter negative events and experience negative affect, depressed individuals and those vulnerable to depression are not able to successfully downregulate their negative affect relative to their healthy, non-vulnerable counterparts.

In other words, individual differences in affect regulation can be a risk toward or protective factor against depression (Teasdale, 1988). Indeed, empirical evidence supports this idea. For example, Kovacs, Rottenberg, and George (2009) examined the use of various *mood repair* strategies, or strategies that lessen the intensity and duration of negative affect (Isen, 1985; Josephson, Singer, & Salovey, 1996), and found that individuals with a history of depression were more likely to employ *ineffective* rather than *effective* mood repair strategies compared to healthy individuals.

Positive Autobiographical Memory and Mood Repair

The recall of positive autobiographical memories (PAMs) is one type of effective mood repair strategy that depressed individuals are less likely to employ (Kovacs et al., 2009). PAM refers to a specific category of episodic memory characterized by positively valenced events involving the self (Roediger & Marsh, 2003). The typical paradigm used in studies of PAM and affect regulation involves inducing participants into a sad/negative mood via film clips or music, followed by spontaneous or instructed PAM recall. Results indicate that unlike dysphoric individuals, healthy individuals intentionally recall PAMs in response to sad affect (Josephson et al., 1996). Moreover, healthy individuals derive emotional benefits from recalling PAMs (as indexed by a reduction in sad affect), whereas dysphoric individuals and those with a history of depression do not reap similar emotional benefits from recalling PAMs (Joormann & Siemer, 2004; Joormann, Siemer, & Gotlib, 2007; Kovacs et al., 2015).

Furthermore, when asked to generate PAMs (both with and without a prior negative mood induction), individuals with varying levels of depression vulnerability, including at-risk, dysphoric, formerly and currently depressed, exhibit memories that are less robust, as seen in differences in self-report ratings of memory characteristics and ratings from independent judges. For instance, compared to healthy controls, depressed and depression-vulnerable individuals recall PAMs that are judged to be superficial and lacking in contextual detail, a phenomena known as *overgeneral memory* (for meta-analysis and review, see van Vreeswijk & de Wilde, 2004 and Williams et al., 2007, respectively).

Additionally, depressed and depression-vulnerable individuals have a harder time retrieving PAMs (Begovic et al., 2016; Goddard, Dritschel, & Burton, 1996; Joormann & Siemer, 2004), and when they do, their PAMs are judged to be less vivid (Werner-Seidler &

Moulds, 2011), less positive and more negative (Begovic et al., 2016), and recalled from an emotionally detached visual perspective (Nelis, Debeer, Holmes, & Raes, 2013). These deficits in PAM characteristics among individuals with a history of depression have been observed with different memory elicitation paradigms, including the use of single word cue-words (Williams et al., 2007) and memory interviews (Begovic et al., 2016; Lemogne et al., 2006; Rottenberg, Hildner, & Gotlib, 2006).

Retrieval of Positive Memories

Scholars have proposed several hypotheses that implicate impairments in the retrieval stage of memory to explain why depressed and depression-vulnerable individuals are unsuccessful in improving their moods via PAM recall. One such hypothesis implicates the quality of memory characteristics at recall. More specifically, scholars (e.g., Joormann et al., 2007; Werner-Seidler & Moulds, 2011) have suggested that healthy individuals' ability to recall PAMs rich in sensory-perceptual characteristics may facilitates greater mood improvement, whereas the inability of depressed and depression-vulnerable individuals to recall similar rich PAMs may hinder their mood repair success. Research suggests that rich memory characteristics may aid in re-creating and re-experiencing a positive event, and through this process, positive affect is amplified (Dalgleish & Werner-Seidler, 2014; Joormann et al., 2007; Werner-Seidler & Moulds, 2011, 2012).

Although this explanation seems plausible, Joormann and colleagues (Joormann & Siemer, 2004; Joormann et al., 2007) found that mood repair difficulties emerged among dysphoric individuals and individuals with a history of depression despite recalling PAMs that were judged to be similar in memory characteristics to those recalled by control participants. Even when group differences do emerge, PAM characteristics explain a negligible amount of

variance in participants' moods after recalling PAMs (Begovic, 2014). These findings suggest that impoverished memory characteristics may not be the sole reason for the ineffectiveness of PAM-based mood repair in depression.

Another more promising hypothesis implicates maladaptive affect regulatory responses when a PAM is recalled. Williams et al. (2007) hypothesized that recalling impoverished memories serves an *avoidance* function by blocking access to sensory-perceptual details, and thus minimizing the emotions likely to be evoked or associated with the past event. Several studies provide support for this idea (e.g., Hermans, Raes, Iberico, & Williams, 2006; Raes, Hermans, Williams, & Eelen, 2006; Sumner et al., 2014). Avoidance of PAMs may seem counterintuitive, given that individuals are generally strongly motivated to experience positive affect (Sirgy, 2012). Among depressed individuals, however, this avoidance may stem from fear of positive emotions (Beblo et al., 2012) and/or not feeling worthy of experiencing positive feelings (Parrot, 1993) Alternatively, Joormann and Siemer (2004) and Joormann et al. (2007) suggested that recalling PAMs induce inward focus, which then activates rumination about the discrepancy between the depressed individuals' current negative mood state and the positive feelings associated with a past positive event. As a result, PAM recall has the unintended effect of maintaining or worsening mood, rather than repairing it (Joormann & Siemer, 2004; Joormann et al., 2007).

Role of Self-Focus

Although self-focus in the context of depression can prompt an unhealthy thinking style (i.e., rumination) and subsequently negatively impact mood, research indicates that not all forms of self-focus have deleterious effects. For instance, scholars (Watkins, 2004, 2008; Watkins & Moulds, 2005; Watkins & Teasdale, 2004) have suggested that thinking about self-relevant

information negatively impacts mood only when it is done in an abstract manner; in contrast, adopting a concrete thinking style—characterized by mindful attention to moment-to-moment experiences—confers positive mood benefits.

To better understand the relationship between self-focus and mood repair outcomes of PAM recall in depression, Werner-Seidler and Moulds (2012) compared two forms of self-focus in currently and formerly depressed individuals. After being induced into a negative mood, participants were asked to recall PAMs; subsequently, participants were instructed to process their PAM in one of two ways: using an abstract (ruminative) or a concrete processing mode. Participants in the abstract processing mode condition were instructed to *evaluate* their PAM by "consider[ing] the causes, meanings and consequences of what happened," whereas participants in the concrete processing mode condition were instructed to *reflect* on their PAM by "play[ing] the scene over in your head like you are replaying a movie of how the event unfolded" (Werner-Seidler & Moulds, 2012, p. 473).

In line with their hypothesis, Werner-Seidler and Moulds (2012) found that both currently and formerly depressed participants successfully repaired their sad moods when they processed their PAMs in a concrete manner, but neither group derived emotional benefits when using the abstract processing mode. The effectiveness of the concrete processing mode may stem from its similarity to mindfulness, as both promote a reflective, nonjudgmental orientation (Kabat-Zinn, 2003), and thus is antithetical to rumination (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008).

Encoding of Positive Events

The extant studies suggest that maladaptive affect regulation strategies during memory retrieval impact the efficacy of PAM recall in repairing negative moods among depressed and

depression-vulnerable individuals. However, a major limitation of the previous studies examining autobiographical processes in depression is that memory is confounded by the variety of idiosyncratic life events that have occurred outside the laboratory. In other words, it is not clear if the observed PAM deficits and mood repair difficulties among depressed and depression-vulnerable individuals are due to disruptions during memory retrieval (or another stage of memory) or if these individuals simply have less vivid or a fewer number of positive life events to drawn upon. Evidence suggests that depressed individuals do indeed encounter fewer positive events compared to their healthy counterparts (Peeters, Nicolson, Berkhof, Delespaul, & deVries, 2003).

Even when objectively positive events are encountered, it is possible that depressed and depression-vulnerable individuals may engage in faulty processing of these events when they initially occur. In line with this notion, researchers have found that depressed and depression-vulnerable individuals exhibit biases with regards to the processing of positively valenced material (see Carl, Soskin, Kerns, & Barlow, 2013 for review). Research also indicates that depressed individuals engage in maladaptive affect regulation, such as dampening and suppression, in response to positive stimuli (Beblo et al., 2012; Campbell-Sills, Barlow, Brown, & Hofmann, 2006; Werner-Seidler, Banks, Dunn, & Moulds, 2013).

In light of these findings, the observed deficits in PAM during retrieval may reflect poor encoding of PAMs—that is, when information about a positive, self-relevant event is initially acquired (Roediger & Marsh, 2003). More specifically, depressed and depression-vulnerable individuals may poorly encode PAMs due to a lack of attention directed toward the positive event when it first occurs, as well as initial maladaptive regulation of emotions elicited by the positive event. Following this premise, directing attention toward a positive event and engaging

in adaptive regulation of positive emotions during the encoding phase of a positive event should result in changes in the retrieval phase—specifically, successful mood repair, retrieval of rich memory characteristics, and accuracy of details recalled. In other words, intervening during the encoding phase may reverse the mood repair difficulties and deficits in memory functioning previously observed in depressed and depression-vulnerable individuals.

To test this premise, it is crucial to examine autobiographical processes in a controlled setting. The staging of an autobiographical event in the laboratory is particularly advantageous in that all participants encounter the same objective event. As such, not only is it possible to infer how individuals naturally encode an event based their retrieval, but also to manipulate an individual's encoding style and subsequently examine its impact on memory retrieval.

While no studies have directly examined or manipulated encoding style in depressed or depression-vulnerable individuals in the context of PAM and mood repair, findings from related studies shed light on the natural encoding style in this population, as well as the impact of affect regulation during encoding on subsequent memory retrieval.

Several studies have demonstrated the relationship between faulty processing of positive stimuli and memory recall among depressed and depression-vulnerable individuals. For example, depressed individuals are less likely to encode positive adjectives and also exhibit a tendency toward incorrectly encoding positive interpersonal feedback, both of which lead to memory retrieval deficits (Derry & Kuiper, 1981; Gotlib, 1983). Work by Gross and colleagues also demonstrate the impact of affect regulation on memory encoding and retrieval. For example, Richards and Gross (2000/2006) found that participants who spontaneously or deliberately engaged in maladaptive affect regulation (specifically suppression) during the encoding of an event that involved watching a movie, recalled fewer details about the movie during retrieval.

Similar studies examining rumination and dampening during encoding are currently lacking, but it is plausible that these affect regulation strategies might lead to similar impairments, as suppression, rumination, and dampening all prompt an evaluative, self-directed focus.

In contrast, affect regulation strategies employed during encoding that focus attention outward and encourage reflection should facilitate better encoding, and hence retrieval. Mindfulness is an affect regulation strategy that may be particularly beneficial, as it promotes a reflective and nonjudgmental, moment-to-moment awareness of the environment (Kabat-Zinn, 2003). Given the positive impact of mindfulness on memory retrieval (i.e., concrete processing; Werner-Seidler & Moulds, 2012), mindfulness may have a similar effect on memory encoding. Indeed, some studies lend support for this idea. In a study by Bonamo, Legerski and Thomas (2015), for example, an unselected sample of participants engaged in a mindfulness exercise (brief or extended) or no exercise prior to learning (i.e., encoding) novel words. Results indicated that participants randomized to the mindfulness exercise exhibited better encoding (as indexed by a greater number of words recalled during retrieval) than participants who did not partake in the mindfulness exercise. In addition to improving cognitive processes, such as attention and memory (Chiesa, Calati, & Serretti, 2011), mindfulness also confers emotional benefits. For example, research has shown that mindfulness-based therapies are effective in increasing self-reported positive affect (Erisman & Roemer, 2010; Jimenez, Niles, & Park, 2010) and decreasing rumination (Jain et al., 2007; Ramel et al., 2004).

These findings have several important implications for PAM and mood repair. Given the evidence that individuals with a history of depression respond to positive events and positive emotions elicited by these events in a maladaptive manner, employing an encoding style characterized by a present-focused, nonjudgmental orientation when first encountering such

positive stimuli could lead to beneficial outcomes. For instance, adopting a mindful, nonjudgmental stance about one's emotions toward a positive event can serve to up-regulate positive affect (Carl et al., 2014). Adaptive regulation of positive affect during encoding of a positive event can consequently lead to retrieval of richer memory characteristics, as several studies indicate that positive affect helps broaden visual attention and facilitate encoding of information in the environment (Rowe, Hirsh, & Anderson, 2007; Vanlessen, Rossi, De Raedt, & Pourtois, 2014; Yegiyan & Yonelinas, 2011). Furthermore, research suggests that one's emotional state at encoding will *match* one's affect at retrieval, particularly when strong retrieval cues are used (Buchanan, 2007). In line with this finding, it would be expected that if depressed individuals effectively process and experience the positive emotions elicited by a positive event during encoding, these same positive emotions should be experienced upon retrieving the memory.

Current Study

The aim of the study was to understand the role of memory encoding on PAM-based mood repair outcomes and memory functioning in individuals with a history of depression. In order to better understand autobiographical processes and to address the limitations of previous studies examining memory in depression, a positive autobiographical event was staged in the laboratory. Such a design provides several advantages. First, all participants are exposed to the same event. Second, with common events it is possible to examine memory accuracy for the event. Third, it is possible to manipulate how the event is encoded. Accordingly, the present study manipulated the encoding style of formerly and never-depressed participants. Participants randomized to the *concrete encoding style* condition were instructed to adopt an encoding style characterized by reflective and nonjudgmental, moment-to-moment awareness of the

environment; participants in the *natural encoding style* condition did not receive any instruction, and thus it was assumed that they would employ their habitual encoding style. Given the literature, it was expected that individuals with a history of depression would naturally devote less attention toward the positive event and engage in more maladaptive regulation of the emotions elicited by the positive event than never-depressed individuals. Following the manipulation, participants engaged in a staged positive event. After a delay of 30-minutes, participants underwent a negative mood induction and were subsequently given the opportunity to repair their moods by recalling details of the earlier event.

Based on the previously reviewed literature, we predicted a group by condition interaction. More specifically, whereas never-depressed participants in the natural encoding style condition would successfully improve their moods by recalling details of the staged positive event and would recall rich memory characteristics, formerly depressed participants would not successfully repair their moods and would recall deficient memory characteristics relative to never-depressed persons. Importantly, these group differences would not be evident in the concrete encoding style condition. We also examined whether memory deficits (specifically with regards to memory accuracy) in formerly depressed individuals emerge for all material or are exclusive to positively valenced material. If difficulties in positive affect regulation do indeed interfere with the encoding of PAMs as the literature suggests, formerly depressed individuals would recall more inaccurate details pertaining to the staged positive event (i.e., positively valenced material) compared to neutral material (e.g., details about previous tasks completed, objects in the experimental room, etc.).

METHOD

Participants

One hundred and twenty-seven[1] (72 never-depressed and 55 formerly depressed) female undergraduate students participated in the study between April 2015 and April 2016, and were compensated with points for course credit. This sample size was selected based on a power analysis, which indicated that a sample size of approximately 50 participants per depression group was required (25 participants per each of the four cells) to detect a moderate effect (.35) with an alpha of .05 and a power of .80.

Participants were recruited from an undergraduate research participant pool (SONA) at the University of South Florida. Inclusion criteria consisted of the following: (1) absence of depression history *or* past (but not current) depression; (2) female; (3) at least 18 years old; (4) native English speaker; (5) have normal color vision; and (6) have normal hearing.

Depression status was determined using the Inventory to Diagnose Depression (IDD, Zimmerman & Coryell, 1987a) and the Inventory to Diagnose Depression-Lifetime version (IDD-L, Zimmerman & Coryell, 1987b). Participants were classified as *formerly depressed* if they were not currently in a major depressive episode, but met criteria for a lifetime history of depression; participants who did not meet criteria for current major depression nor a lifetime history of depression were classified as *never-depressed*.

[1] This sample size reflects the number of eligible participants who completed the entire study. One hundred and thirty-seven patients initially consented to participate in the study. Eight participants did not meet inclusion criteria, and thus were dismissed. Two participants withdrew from the study prior to completion.

The choice to exclusively recruit female participants was due to the probable sex differences in many of the processes under investigation. For instance, depression is more common among females, females tend to ruminate more often than men (Butler & Nolen-Hoeksema, 1994; Nolen-Hoeksema, Larson, & Grayson, 1999), and females are more likely to elaborately encode and recall memories (Sutin & Robins, 2007).

Two SONA recruitment strategies were used. First, the current study was listed in SONA as a "laboratory study", and all eligible individuals had the opportunity to sign up. Second, to supplement recruitment of formerly depressed participants, an online study was posted on SONA, which entailed providing demographic information and completing the IDD and IDD-L on Survey Monkey. Participants who met criteria for lifetime depression but not current depression (along with other inclusion criteria) were invited to participate in the laboratory study. Among the 238 individuals who completed the online study, 38 met inclusion criteria and were invited to the laboratory study; 18 agreed to participate in the laboratory study. The invited participants accounted for 14% of the total sample of laboratory study completers.

Measures

Demographics

A demographics questionnaire asked general background information such as age, sex, race/ethnicity, native language, and year in college.

Affect Ratings

Participants self-rated their affect at four time points over the course of the study: Baseline (Time 1), after the staged positive event (Time 2), after the negative mood induction (Time 3), and after PAM recall (Time 4). Participants provided ratings for 16 affective states on each occasion using a 9-point Likert scale ranging from 0 (not at all) to 8 (very much). Ratings

for *sad*, *nervous*, *distracted*, *depressed*, *angry*, *upset*, *irritable*, and *guilty* were averaged for a composite rating of negative affect. Ratings for *happy, concentrated, proud, interested, excited, determined, enthusiastic*, and *surprised* were averaged for a composite rating of positive affect. Composites for negative and positive affect indicated good reliability (α = .79-.89) in the present sample.

Inventory to Diagnose Depression

The Inventory to Diagnose Depression (IDD; Zimmerman & Coryell, 1987a) is a self-report measure used to diagnose current major depression. There are 22 groups of items with five corresponding statements; each item group represents one depressive symptom and the five statements (scored 0-4) reflect increasing severity. The first statement in each group reflects no disturbance (score of "0"), the second statement reflects subclinical severity (score of "1"), and statements two to four indicate that the symptom is present (score of "2" to "4"). Each symptom is also assessed for duration. For the current study, one item concerning suicidal ideation was removed due to concerns raised by USF's Institutional Review Board.

In order to meet criteria for current major depression, criteria A and B needed to be satisfied, as per the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5; American Psychiatric Association, 2013). Criteria A was satisfied if participants (a) endorsed a severity rating of 2 or more on the "low mood" item ***or*** (b) endorsed a severity rating of 3 or more on the "decreased pleasure" or "decreased interest" items; ***and*** (c) indicated that the symptom had been present for more than two weeks. Criteria B was satisfied if participants (a) endorsed a severity rating of 2 or more on at least four additional depressive symptoms ***and*** (b) indicated that each symptom has been present for more than two weeks. The IDD has

demonstrated acceptable psychometric properties (Zimmerman & Coryell, 1987a). In the present sample, the IDD indicated acceptable reliability (α = .78).

Depressive Symptom Severity

Current depressive symptom severity was assessed using the IDD. Total scores were derived by summing scores across the 21 items, regardless of symptom duration. Scores range from 0 to 84, with higher scores indicating greater severity. The IDD-based measure of depressive symptom severity indicated good reliability (α = .84) in the present sample.

Inventory to Diagnose Depression-Lifetime

The Inventory to Diagnose Depression-Lifetime (IDD-L; Zimmerman & Coryell, 1987b) is a self-report measure used to diagnosis a lifetime history of major depression. Like the IDD, there are 22 groups of items with five corresponding statements; each item group represents one depressive symptom and the five statements (scored 0-4) reflect increasing severity. Each symptom is also assessed for duration. Participants were instructed to endorse the rating that "best describes the way he/she felt during the week in his/her life that he/she felt the most depressed" (p. 496). In order to meet criteria for a lifetime history of major depression, Criteria A and B (see above) needed to be satisfied. Among college samples, the IDD-L has demonstrated acceptable diagnostic accuracy (70% sensitivity and 87.5% specificity) when a structured clinical interview was used as the criterion (Goldston, O'Hara, & Schartz, 1990). In the present sample, the IDD-L indicated good reliability (α = .88).

Temporal Experience of Pleasure Scale

The Temporal Experience of Pleasure Scale (TEPS; Gard, Gard, Kring, & John, 2006) is an 18-item, multidimensional self-report measure that assesses anticipation and in-the-moment experience of pleasurable events. Items were rated on a 6-point scale ranging from 1 (very false

for me) to 6 (very true for me). The TEPS consists of two subscales: *anticipatory* and *consummatory*. In addition to the subscales scores, the TEPS also produces a total score. The TEPS has demonstrated acceptable psychometric properties (Gard et al., 2006). In the present sample, the TEPS indicated acceptable reliability (alpha coefficients of .74, .71. and .67 for the TEPS *total score,* and *anticipatory* and *consummatory* subscales, respectively).

Ruminative Response Scale-Short Version

The 10-item Ruminative Response Scale-Short Version (RRS; Treynor, Gonzalez, & Nolen-Hoeksema, 2003), a shortened version of the Ruminative Response Scale originally developed by Nolen-Hoeksema (1991), measures rumination in response to feelings of sadness or depression. The RRS consists of two subscales—*brooding* and *reflection*—which have different consequences for depression. Specifically, brooding has been viewed as a maladaptive form of rumination and is associated with negative outcomes, whereas reflection has been viewed as an adaptive form of rumination and is associated with positive outcomes (Treynor et al., 2003). Items were rated on a 4-point scale ranging from 1 (almost never) to 4 (almost always). The 10-item RRS has demonstrated acceptable psychometric properties (Treynor et al., 2003). In the present sample, the RRS indicated acceptable reliability (alpha coefficients of .77 for both the *brooding* and *reflection* subscales).

Responses to Positive Affect

The Responses to Positive Affect (RPA; Feldman, Joormann, & Johnson, 2008) is a 17-item, multidimensional self-report measure assessing the regulation of positive affect. Items were rated on a 4-point scale ranging from 1 (almost never) to 4 (almost always). The RPA consists of three subscales: *emotion-focused positive rumination*, *dampening*, and *self-focused positive rumination*. The RPA has demonstrated acceptable psychometric properties (Feldman et al.,

2008; Johnson, McKenzie, & McMurrich, 2008). The RPA indicated good reliability in the present sample (alpha coefficients of .82, .79, and .85 for the *emotion-focus*, *dampening*, and *self-focus* subscales, respectively).

Savoring Beliefs Inventory

The Savoring Beliefs Inventory (SBI; Bryant, 2003) is a 24-item, multidimensional self-report measure that assesses one's ability to savor positive events at three different time points (before, during, and after the event). Items were rated on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). The SBI consists of three subscales: *anticipating, savoring the moment,* and *reminiscing*. In addition to the subscales scores, the SBI also produces a total score. The SBI has demonstrated acceptable psychometric properties (Bryant, 2003). In present sample, the SBI indicated excellent reliability (alpha coefficients of .97, .93, .91, and .95 for the SBI *total score*, and *anticipating*, *savoring the moment*, and *reminiscing* subscales, respectively).

Affective Control Scale

The Affective Control Scale (ACS; Williams, Chambless, & Ahrens, 1997) is a 42-item, multidimensional self-report measure of fear associated with experiencing intense emotions. Items were rated on a 7-point scale ranging from 1 (very strongly disagree) to 7 (very strongly agree). The ACS consists of four subscales: *anger*, *positive affect, depressed mood,* and *anxiety*. The ACS has demonstrated acceptable psychometric properties (Williams et al., 1997). Given our interest in positive and negative affect, participants in the present study only completed the *positive affect* and *depressed mood* subscales. In the present sample, the two subscales indicated good reliability (alpha coefficients of .86 and .89 for the *positive affect and depressed mood* subscales, respectively).

Rosenberg Self Esteem Scale

The Rosenberg Self Esteem Scale (RSES; Rosenberg, 1965) is a 10-item measure of self-esteem. Items were rated on a 4-point scale ranging from 1 (strongly disagree) to 4 (strongly agree). Total scores range from 10 to 40, with higher scores representing higher self- esteem. The RSES has demonstrated acceptable psychometric properties (Corwyn, 2000; Rosenberg, 1965). The RSES indicated excellent reliability in the present sample ($\alpha = .90$).

Ten Item Personality Inventory

The Ten Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann; 2003) is a 10-item self-report measure that assesses the Big Five Personality dimensions. The TIPI consists of five subscales: *extraversion*, *agreeableness*, *conscientiousness*, *emotional stability*, and *openness to experience*. Items were rated on a 7-point scale ranging from 1 (disagree strongly) to 7 (agree strongly). The TIPI has demonstrated adequate psychometric properties, with respects to validity (Gosling et al., 2003). Some of the subscales indicated low reliability in the present sample (alpha coefficients of .81, .37, .48, .75, .35 for *extraversion, agreeableness, conscientiousness, emotional stability*, and *openness to experience*, respectively).

Memory Experiences Questionnaire

The Memory Experiences Questionnaire (MEQ; Sutin & Robins, 2007) is a self-report measure that assesses various phenomenological characteristics associated with the recall of autobiographical memories. The MEQ consists of 10 scales (*vividness, coherence, accessibility, time perspective, sensory detail, emotional intensity, visual perspective, sharing, distancing*, and *valence)*, with 5 to 8 items per scale. Items were rated on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Sample items included: "My memory for this event is very detailed," "As I remember the event, I can feel now the emotions that I felt then," and "The order

of events in the memory is clear". The MEQ has demonstrated acceptable psychometric properties (Sutin & Robins, 2007). All scales were used in the present study, except for *sharing*, *time perspective*, and *distancing*, as these scales were not appropriate for an event/memory that recently occurred. In the present sample, the scales were generally reliability (alpha coefficients of .91, .82, .49, .80, .89, .77, and .94 for *vividness, coherence, accessibility, sensory detail, emotional intensity, visual perspective*, and *valence*, respectively).

The Stroop Color and Word Test

The Stroop Color and Word Test (Golden, 1978) was used to measure verbal inhibitory control. Executive functioning deficits are often found in depression (even in the euthymic phase, Paelecke-Habermann, Pohl, & Leplow, 2005), and research indicates that impaired executive functioning—particularly working memory—negatively impacts autobiographical memory recall (Dalgleish et al., 2007). As such, the Stroop Color and Word Test was included in the present study as a potential variable to control for in the main analyses if preliminary results indicated group differences in verbal inhibitory capacity.

The Stroop Color and Word Test, which was framed as a "thinking task," consisted of three pages, with five columns of 20 items per a page. Items on the first page (*Word* condition, "W") consisted of color words (blue, red, and green) printed in black ink; items on the second page (*Color* condition, "C") consisted of several Xs printed in blue, red, or green ink; and items on the third page (*Color-Word* condition, "CW") consisted of color words printed in incongruent ink (e.g., the word "red" printed in blue ink). Participants were given 45 seconds to read aloud items (page 1) or identify the ink color of items (page 2 and 3). The test produced three scores (*Word* score, *Color* score, and *Color-Word* score), which reflected the number of items completed on each page. An interference score was obtained by subtracting participants' raw

CW scores from their predicted CW scores; the predicted CW score was derived using the following formula: (C x W) / (C + W). The inference score has a mean value of zero, with a standard deviation of 10. Scores greater than zero reflect "high resistance" to interference, whereas scores less than zero reflect "low resistance" to interference **(**Golden, 1978).

FAS Test

The FAS Test is a subtest of the Neurosensory Center Comprehensive Examination for Aphasia (NCCEA; Spreen & Benton, 1969, 1977) that is used to measure verbal fluency. Like the Stroop Color and Word Test, the FAS Test was included in the present study as a potential variable to control for in the main analyses if preliminary results indicated group differences in verbal fluency.

The FAS Test was framed as a "memory task". Participants were instructed to generate words that began with the letters F, A, and S over a 3 minute period (1 minute per letter). All words were permitted except for proper nouns and variations of a word (i.e., apple, apples). A total score was obtained by summing the number of acceptable words produced across the three trials.

Encoding Style Manipulation Check Questionnaire

The questionnaire was created for the present study, and consisted of six items used to assess the degree to which participants employed a concrete encoding style during the staged positive event. The items were modeled after the Mindful Attention and Awareness Scale (MAAS; Brown & Ryan, 2003) and processing mode instructions used by Watkins (2004). Items were self-rated on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). Total scores range from 6 to 42, with higher scores indicating greater use of the concrete encoding style. Sample items included: "While completing the Fishing Game, I found it difficult to stay

focused on what was happening in the present moment," and "While completing the Fishing Game, I criticized the thoughts and feelings I had. The questionnaire had low reliability ($\alpha = .37$) in the present sample.

Memory Accuracy Test

Similar to previous studies (e.g., Richards & Gross, 2000), a 35-item, multiple-choice test was developed for the purpose of this study to test the accuracy of participants' memories. Thirteen of the items pertained to the staged positive event, and the remaining items pertained to other tasks completed during the study and non-study relevant details (e.g., objects in the room). A correct response to an item was given a score of 1, and an incorrect response was given a score of 0. The Memory Accuracy Test produced two separate scores: *positive material* score and *neutral material* score. The *positive material* score was derived by summing the number of correct responses across the subset of items pertaining to the staged positive event and dividing by 13. Similarly, the *neutral material* score was derived by summing the number of correct responses across the subset of items pertaining to other study events/details and dividing by 22. Scores ranged from 0 to 1; a score of 0 indicated zero correct responses and 1 indicated all correct responses.

Room Happiness

To check whether non-study relevant details in the experimental room were perceived as neutral, participants were asked to rate the happiness/cheerfulness of the room on a scale from 1 (not at all happy/cheerful) to 10 (extremely cheerful).

Filler Tasks and Questionnaires

Creative Writing Task

The task was framed as an "imagination task", and consisted of writing a creative story in

response to two neutral pictures selected from the International Affective Picture System (IAPS; Lang, Bradley & Cuthbert, 2005). Participants were instructed to imagine themselves in the place or scenario depicted in the picture, and write a story about that happened. Participants were given 10 minutes to complete the task (5 minutes per picture).

Card Task

The card task used in the current study was based on a similar task created by Morris (2014). Participants were first instructed to select a poster board and deck of cards (there were three different color/design options for each). Participants were then instructed to pull cards out of a particular suit one at a time in numerical order and place them in designated rows on the poster board. Participants were further told that the objective of the task was to correctly complete the pattern on the board as fast as possible. Participants completed four trials of the task (one for each suit), and the deck of cards was shuffled after each trial.

Tile Design Task

The task was framed as a "creativity task". Participants were instructed to use colored tile-like pieces to correctly recreate 14 different designs. Participants were given up to 60 seconds to complete the design.

Magazine Task

Participants were instructed to select one of four decorating/organizing do-it-yourself magazines. Participants were given 5-20 minutes[2] to read their selected magazine.

Creativity Scale for Different Domains

The Creativity Scale for Different Domains (CSDD; Kaufman & Baer, 2004) is a 10-item self-report measure of creativity in nine different domains (e.g., science, art, communication).

[2] The amount of time given to participants to read the magazine was based on how much time was left in the "30-minute delay period" after completing questionnaires and the Tile Design Task.

Sample items included: “How creative are you in the area of science?” and “How creative are you in the area of managing interpersonal relationships?” Items were rated on a 5-point scale ranging from 1 (not at all) to 5 (extremely).

Cognitive-Style Inventory

The Cognitive-Style Inventory (CSI; Martin, 1998) is a 40-item measure that assesses two types of cognitive styles: systematic or intuitive. Sample items included: “I attack a problem in a step-by-step, sequential, and orderly fashion” and “I get a ‘feel’ for a problem or try to ‘see’ it before I attempt a solution.” Items were rated on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Participants were administered an abridged version of the CSI, which consisted of 10 items (5 items for each cognitive style).

Magazine Questionnaire

The questionnaire was created for the present study, and consisted of six items that examined attitudes towards the magazine and completing the task. Sample items included: “I found the magazine interesting,” “I paid attention to the advertisements in the magazine,” and “I would have liked more time to look through the magazine”. Items were rated on a 9-point scale ranging from 0 (strongly disagree) to 8 (strongly agree).

Movie Questionnaire

The questionnaire was created for the present study, and consisted of eight items that examined participants’ ability to understand and immerse themselves in the Lion King movie. Sample items included: “I was able to take the characters’ perspective” and “While watching the movie clip, I imagined how I would feel if the events in the movie were happening to me”. Items were rated on a 9-point scale ranging from 0 (strongly disagree) to 8 (strongly agree).

Experimental Procedure

Encoding Style Manipulation

The majority of participants (91%) were randomly allocated to either the concrete or natural encoding style condition. In order to achieve a sample size of at least 25 in each of the four groups (i.e., formerly depressed/concrete, formerly depressed/natural, never-depressed/concrete, never-depressed/natural), it was necessary to assign the last 12 participants (most of whom were formerly depressed) to the natural encoding style condition.[3]

Instructions for the concrete encoding style were modeled after the concrete processing mode inductions used by Werner-Seidler and Moulds (2012) and a mindfulness intervention used by Erisman and Roemer (2010). Participants in the concrete encoding style condition were told that they would be taught a new thinking style called "concrete." Participants were given background information on the concrete thinking style, which emphasized attention to and nonjudgment of moment-to-moment experiences. The experimenter informed the participants that they would be asked to adopt the concrete thinking style during a creativity task (Tile Design Task) later in the session to examine how concrete thinking influences creativity, but that they would first practice during two "practice trials". These two practice trials consisted of the Card Task and the Fishing Game (i.e., staged positive event; see below for details). After providing participants with background information on concrete thinking, the experimenter gauged participants' understanding by having them summarize the main points of concrete thinking. The experimenter also placed a photo reflecting mindfulness on the desk to prompt participants to engage in concrete thinking during the practice trials and the Tile Design Task. Participants were reminded to think concretely before each task as well. In the natural encoding style condition,

[3] Results indicated no differences in demographic or sample characteristics between participants who were randomly allocated to a condition or non-randomly assigned. Furthermore, results of the primary analyses did not differ when condition assignment type (i.e., random versus non-random) was included in the model.

participants did not receive any instructions.

Staged Positive Event (Fishing Game)

Participants played a fishing game that involved using a small fishing pole with a magnetic end to catch fish. The fishing game was battery-powered, and contained four pods where the fish rotated and whose mouths (which contained a magnet inside) opened automatically. Participants were told that they would be asked to catch fish from four play sets arranged side-by-side. Participants were further told that among the 96 fish, 10 fish had a silver dot on the bottom of their tail and three fish had a gold dot (the tails of the fish are not visible until they were caught and lifted out of the pod). The objective of the game was to guess which of the fish had a marking, and successfully catch the fish with the fishing pole and drop it in a bucket. The experimenter informed participants that if they caught a fish with a silver dot, they would win a bag of candy; if they caught a fish with a gold dot, they would be entered into a raffle to win one of two grand prizes (e.g., a gift bag containing USF merchandise or a Busch Gardens Annual Pass), in addition to winning a bag of candy.

After receiving instructions, participants first completed a practice trial. For the practice trial, participants were presented with one play set and were instructed to successfully catch four fish within two minutes. The practice trail was arranged to make the game moderately difficult (but not impossible) by giving participants a fishing pole with a weak magnet. The manipulation of the practice trial was successful[4]. For the official trial, all four fishing play sets were used. Participants were instructed to successfully catch one fish from each of the four play sets, one at a time. Participants were given a 1-minute time limit for each play set. The four play sets used in the official trial were arranged so that all the fish in one of the play sets were marked with a gold

[4] This was determined based on participants' comments during the game, PAM recall, and/or debriefing. Participants caught an average of 1.21 fish (*SD* = 1.22).

dot. Furthermore, unbeknownst to the participants, the rigged fishing pole was secretly switched with a regular fishing pole prior to the start of the official trial, and thus it was easier to catch fish. Upon completing the fishing game, the participants were given a small bag of candy for catching a gold fish and were asked to write their contact information on a raffle stub. The experimenter emphasized that the participant had a very good chance of winning one of the grand prizes, given that not a lot of participants had caught a fish with a gold dot. This story was reinforced by having the participants place their stub in a jar already containing five stubs. In actuality, all participants were entered into a real raffle, and the drawing took place once the entire study was completed. Research indicates that similar gift and success paradigms are very effective in inducing positive affect (Gerrards-Hesse, Spies, & Hesse, 1994; Nummenmaa & Niemi, 2004; Westermann, Spies, Stahl, & Hesse, 1996).

Negative Mood Induction

Negative affect was induced using a 131-second clip from *The Lion King* (Hahn, Allers, & Minkoff, 1994), which depicts Simba's reaction to the death of this father. The mood induction was framed as an "imagination task." Prior to watching the film clip, participants were instructed to "try to imagine the events [in the film] as vividly as possible by imagining how [you] would feel in this situation," and to "try to get into the feeling of the movie" and "take the [characters'] perspective" (Joormann & Siemer, 2004, pp. 181).

PAM Recall Task

A 4-minute[5] semi-structured interview was used to elicit participants' memory of the staged positive event. The task was framed as a "memory task," and participants were told that

[5] Studies examining PAM recall have allotted participants various lengths of time to recall their memories. Recall times have ranged from 30 seconds (van Vreeswijk & de Wilde, 2004) to 15 minutes (Rottenberg et al., 2006) to unlimited (Lemogne et al., 2006). A 4-minute recall time was chosen for the present study to allow participants enough time to elaborate on what they remembered from the staged positive event, but short enough so that the entire length of the study was not unnecessary extended (and hence not too burdensome on the participant).

they would be asked to recall details of one of the many tasks they completed in the laboratory session. Participants were further told that it had been randomly decided that they would recall details from the Fishing Game (i.e., staged positive event). Participants were instructed to think back to the staged positive event that they participated in and to recall as many details as they could regarding what they did and how they felt. They were also asked to describe the event in enough detail so a stranger would be able to understand what happened. Experimenters used standardized prompts to obtain further information, and the task was audio-recorded.

Procedure Overview

Similar to previous studies of PAM and mood repair (e.g., Joormann & Siemer, 2004; Joormann et al., 2007; Werner-Seidler & Moulds, 2012), participants were told that they would be participating in a study that examined individual differences in thinking styles, creativity, and memory, and how these processes are impacted by mood and personality. Filler tasks and questionnaires were included throughout the study to support this cover story. Based on participants' comments during debriefing, the cover story was successful.

A schematic diagram of study protocol is presented in Appendix A. After providing informed consent, participants completed a series of questionnaires, one of which included the IDD. Participants' answers on the IDD were immediately scored. If participants met criteria for current depression, the study participants were awarded SONA credit for completing the questionnaire packet and received a handout with mental health resources prior to being dismissed. The remaining participants next completed the rest of protocol, with included a 30-minute delay[6] between the staged positive event and PAM recall. Prior to the PAM recall task, participants were relocated to another room. Upon study completion, the experimenter probed for

[6] Previous studies examining memory of staged events have used different delay periods, including 24-48 hours (Suengas & Johnson, 1988; Willoughby, McAndrews, & Rovet, 2014) to two weeks (Van Bergen & Salmon, 2010) to 10 minutes (Richards & Gross, 2000, 2005). Thirty minutes were chosen for the current study to ensure that sufficient time had passed to allow for the possibility of differential recall ability, as well as to make the study more feasible and less burdensome for the participants.

suspicions[7] about the study, and the participants were thoroughly debriefed and provided with a handout with mental health resources. The entire protocol lasted approximately 2 to 2.5 hours.

Data Management

Four participants were excluded from the analyses because of discrepancies in the IDD-L completed online and during the laboratory session (i.e., all four participants met criteria for lifetime depression based on the IDD-L completed online, but failed to meet criteria when they completed the IDD-L in the laboratory). The final sample with usable data consisted of 68 never-depressed (42 in the natural encoding style condition and 26 in the concrete encoding style condition) and 55 formerly depressed (26 in the natural encoding style condition and 29 in the encoding style concrete condition) participants. Data were screened for outliers; outliers were removed if values exceeded ±1.5 times the interquartile range. Data for the FAS Test-Trial 2 and Stroop Color and Word Test-Trial 1 were missing for three participants due to stopwatch malfunction.

[7] Twelve participants (10%) expressed extreme suspicion about the Fishing Game (i.e., stating that the fishing poles were switched, magnets were weak, etc.); however, 9 of those 12 participants did not indicate suspicions about catching a gold fish. Suspicions about the Fishing Game were controlled for the relevant analyses.

RESULTS

Participant Characteristics

Demographic information and sample characteristics are presented in Table 1. A series of *t*-tests and χ^2 tests were conducted to test for group differences in demographic variables and sample characteristics. Formerly depressed and never-depressed participants did not differ in age (formerly depressed: $M = 19.52$, $SD = 1.47$; never-depressed: $M = 19.20$, $SD = 1.24$; $t\,[111] = -1.26$, $p = .21$) or race/ethnicity ($\chi^2\,[6, N = 123] = 4.88$, $p = .56$), but differences in year in college approached significance ($\chi^2\,[4, N = 123] = 9.11$, $p = .06$). The groups did not differ in verbal fluency, as indexed by the FAS Test (formerly depressed: $M = 36.83$, $SD = 7.92$; never-depressed: $M = 36.67$, $SD = 8.19$, $t\,(119) = -.11$, $p = .91$). However, there was a trend for formerly depressed participants to exhibit worse verbal inhibitory control than never-depressed participants, as indexed by the Stroop Color and Word Test (formerly depressed: $M = -8.47$, $SD = 7.20$; never-depressed: $M = -6.26$, $SD = 5.92$; $t\,[115] = 1.83$, $p = .07$).

In terms of clinical and affective characteristics, not unexpectedly, the groups differed in current depressive symptom severity, $t\,(100.66) = -3.07$, $p = .003$, with formerly depressed participants endorsing greater symptom severity ($M = 14.36$, $SD = 8.25$) than never-depressed participants ($M = 10.18$, $SD = 6.42$). Moreover, formerly depressed participants reported higher levels of negative affect than never-depressed persons at several points during the session, including after the staged positive event (Time 2; formerly depressed: $M = .45$, $SD = .52$; never-depressed: $M = .25$, $SD = .31$; $t\,[77.14] = 2.40$, $p = .02$); after the negative mood induction (Time 3; formerly depressed: $M = 1.82$, $SD = 1.15$; never-depressed: $M = 1.43$, $SD = .97$; $t\,[117] =$

-2.02, p = .045); and after PAM recall (Time 4; formerly depressed: M = .79, SD = .79; never-depressed: M = .33, SD = .42; t [79.59] = -3.81, p <.001). Formerly depressed and never-depressed participants did not differ in their report of positive affect at any time point (Time 1: t [121] = -.50, p = .62; Time 2: t (121) = .07, p = .95; Time 3: t (94.95) = -.62, p = .54: Time 4: t (121) = -.35, p = .73).

Manipulation Checks

Encoding Style

To examine whether the encoding style manipulation had the intended effect, a 2 (Depression Status: formerly depressed vs. never-depressed) x 2 (Encoding Style: natural vs. concrete) analysis of variance (ANOVA) was conducted, with scores on the encoding style manipulation check questionnaire entered as the dependent variable. As expected, there was a main effect of Encoding Style, F (1, 119) = 7.13, p = .009, such that participants in the concrete encoding style condition (M = 32.29, SE = .58) reported employing the concrete encoding style to a greater degree than participants in the natural encoding style condition (M = 30.19, SE = .53). By contrast, the main effect of Depression Status (F [1, 119] = .14, p = .71) and Depression Status*Encoding Style interaction (F [1, 119] = 1.34, p = .25) were both non-significant.

Staged Positive Event

To examine whether the staged positive event successfully induced positive affect, a 2 (Depression Status: formerly depressed vs. never-depressed) x 2 (Time: baseline positive affect [Time1] vs. positive affect after staged positive event [Time 2]) mixed-model ANOVA was conducted, with Time entered as a repeated measure. As expected, the results of the ANOVA indicated a main effect of Time, F (1, 121) = 268. 39, p < .001, with participants reporting an increase in positive affect from Time 1 (M = 4.17, SE = .12) to Time 2 (M = 5.70, SE = .13).

There was no Depression Status* Time interaction, F (1, 121) = .54, p = .47.[8]

A similar ANOVA was conducted to examine change in negative affect. In this analysis, there was a main effect of time, F (1, 109) = 104.68, p = .001, with participants reporting a decrease in negative affect from Time 1 (M = .82, SE= .06) to Time 2 (M = .31, SE = .04). The Depression Status*Time interaction was non-significant, F (1, 109) = .53, p = .47.[9]

Negative Mood Induction

To examine whether the Lion King movie successfully induced negative affect, a 2 (Depression Status: formerly depressed vs. never-depressed) x 2 (Time: baseline negative affect [Time1] vs. negative affect after negative mood induction [Time 3]) mixed-model ANOVA was conducted, with Time entered as a repeated measure. As expected, there was a main effect of Time, F (1, 107) = 54.68, p < .001, with participants reporting an increase in negative affect from Time 1 (M =. 82, SE = .06) to Time 3 (M = 1.51, SE = .10). Importantly, there was a non-significant Depression Status*Time interaction, F (1, 107), = .24, p = .63.

A similar ANOVA was conducted to examine positive affect. Again there was a main effect of time, F (1, 117) = 81.80, p < .001, with participants reporting a decrease in positive affect from Time 1 (M = 4.11, SE = .12) to Time 3 (M = 3.03, SE = .12). The Depression Status*Time interaction was non-significant, F (1, 117) = .12, p = .73.

Primary Analyses

Aim 1: To Examine the Effect of Encoding Style on Mood Repair Efficacy of PAM Recall

Hypothesis 1. *There will be greater mood improvement (i.e., reduction in negative affect) among formerly depressed participants in the concrete encoding style condition compared to the*

[8] Results of the analyses remained the same even after controlling for suspicions regarding the fishing game.
[9] Results of the analyses remained the same even after controlling for suspicions regarding the fishing game.

natural encoding style condition. The magnitude of mood improvement of formerly depressed participants in the concrete encoding style condition will be comparable to that of the never-depressed participants, but their magnitude of mood improvement will be lower in natural encoding style condition relative to the never-depressed group.

A 2 (Encoding Style: natural vs. concrete) x 2 (Depression Status: formerly depressed vs. never-depressed) x 2 (Time: after negative mood induction-negative affect [Time 3] vs. after PAM recall-negative affect [Time 4]) mixed-model analysis of covariance (ANCOVA) was conducted, with Time entered as a repeated measure. Because group differences in verbal inhibitory control (Stroop Color and Word Test), current depressive symptom severity, and baseline negative affect were marginally significant, these variables were included as covariates.

Results of the ANCOVA indicated a significant main effect of Time, F (1, 95) = 19.91, p < .001, such that participants reported a decrease in negative affect after the negative mood induction (M = 1.52, SE = .09) to after PAM recall (M = .48, SE = .05). Inconsistent with our hypothesis, all other main effects and interactions were non-significant (all Fs < 2.10, ps > .05). All participants, regardless of depression status or encoding condition, experienced an improvement in mood after recalling details of the staged positive event. Adjusted means and standard errors are present in Table 2.

Aim 2: To Examine the Effect of Encoding Style on Memory Characteristics

Hypothesis 2. *Formerly depressed participants will recall richer PAM characteristics (i.e., greater vividness, coherence, accessibility, etc.) in the concrete encoding style condition compared to the natural encoding style condition. The richness of PAM characteristics among formerly depressed participants in the concrete encoding style condition will be comparable to*

the characteristics recalled by never-depressed individuals, but their PAM characteristics will be less rich in the natural encoding style condition relative to those of never-depressed individuals.

A multivariate analysis of covariance (MANCOVA) was conducted, with encoding style and depression status entered as the independent variables, and the seven memory characteristics assessed by the MEQ (vividness, coherence, accessibility, sensory detail, emotional intensity, visual perspective, and valence) entered as the dependent variables. Verbal inhibitory control was included as a covariate.

Adjusted means and standard errors of the memory characteristics for each group are presented in Table 3. Inconsistent with our hypothesis, there were no significant effects of Encoding Style (F [7, 105] = .22, p = .98), Depression Status (F [7, 105] = 1.79, p = .10), or Encoding Style*Depression Status interaction (F [7, 105] = .73, p = .65). All participants, regardless of depression status or encoding condition, recalled rich (e.g., highly vivid, coherent, etc.) memory characteristics.

Aim 3: To Examine the Effect of Encoding Style on Recall Accuracy of Positive and Neutral Material

Hypothesis 3. *Formerly depressed participants will exhibit greater accuracy for neutral material than positive material in the natural encoding style condition, but comparable accuracy for positive and neutral material in the concrete encoding style condition. The degree of accuracy for positive and neutral material among formerly depressed individuals in the concrete encoding style condition will be comparable to that of the never-depressed individuals.*

A 2 (Encoding Style: natural vs. concrete) x 2 (Depression Status: formerly depressed vs. never-depressed) x 2 (Memory Valence: neutral vs. positive material) mixed-model ANCOVA was conducted, with Memory Valence entered as a repeated measure. Verbal inhibitory control

and ratings for room happiness were included as covariates in the model. Room happiness was included as a covariate because we unexpectedly found that participants rated the experimental room as being very happy/cheerful (M = 8.76, SD = 1.14). When decorating the experimental room, our goal was to create a realistic environment and provide adequate sensory material for potential encoding. Equally important, we wanted the experimental room to be perceived as neutral, since objects in the room were included as questions in the *neutral material* subscale of the Memory Accuracy Test. Since the experimental room was perceived as positive, the neutral objects in the room may have also been perceived as positive by extension, thus possibility impacting encoding/retrieval. For example, if depression-vulnerable participants do indeed exhibit a bias against encoding positive stimuli, they would be less likely to encode information pertaining to the staged positive event (e.g., color of raffle stub for grand prize drawing), as well as the positively perceived "neutral" objects in the room (e.g., pen holder).

Adjusted means and standard errors of memory accuracy for each group are presented in Table 4. There was a significant Memory Valence*Depression Status interaction (F [1, 106] = 7.01, p = .009, η^2=.06) in the expected direction. Namely, formerly depressed participants were more accurate in their recall of neutral material than never-depressed participants, while never-depressed participants were more accurate in their recall of positive material compared to formerly depressed participants (see Figure 1). Inconsistent with our hypothesis, we did not find a significant Encoding Style*Depression Status*Memory Valence interaction or other effects (all Fs < 1.87, ps > .05). While formerly depressed participants exhibited a bias against positive stimuli (versus neutral stimuli) compared to never-depressed participants, this bias did not disappear among formerly depressed participants in the concrete encoding condition, as hypothesized.

Post Hoc Analyses

Group Differences in the Experience of Pleasure, Affect Regulation, Fear of Positive/Negative Emotions, Self-Esteem, and Personality

Given that the data did not support any of the three hypotheses, nor replicate findings from previous studies that found deficits in mood repair and memory characteristics among formerly depressed persons (Begovic et al., 2016; Joormann et al., 2007; Kovacs et al., 2015; Werner-Seidler & Moulds, 2011), we conducted several post hoc analyses to better understand our data. First, we conducted analyses to examine whether the formerly depressed participants in our study matched the typical profile of persons with a history of depression across several variables, including the experience of pleasure, affect regulation, fear of positive/negative emotions, self-esteem, and personality. Specifically, a series of *t*-tests were conducted to examine differences between formerly depressed and never-depressed participants on the TEPS, RRS, RPA, SBI, ACS, RSES, and TIPI.

Results of the analyses are presented in Table 5. The groups significantly differed on measures assessing the regulation of negative affect. Formerly depressed participants were more likely to engage in maladaptive rumination (i.e., brooding) (M = 12.89, SD = 3.50) than never-depressed participants (M = 10.99, SD = 3.42), t (121) = -3.04, p = .003, and formerly depressed participant were also more likely to fear depressed mood (M = 3.30, SD = 1.25) than their never-depressed counterparts (M = 2.44, SD = .89), t (95.13) = -4.29, $p < .001$. Additionally, formerly depressed participants endorsed less emotional stability (M = 4.01, SD = 1.49) than never-depressed participants (M = 5.07, SD = 1.30), t (121) = 4.19, $p < .001$. Regarding the experience and regulation of positive affect, formerly depressed participants were largely similar to never-depressed participants; group differences only emerged for the subscales of the SBI (including

marginal significance for the *anticipating* subscale), with formerly depressed participants scoring lower on every index of savoring.

Group differences on the TEPS did not emerge, which was unexpected given that the *anticipatory* and *consummatory* subscales of the TEPS theoretically match the *anticipating* and *savoring the moment* subscales of the SBI, respectively. Also unexpectedly, both groups had relatively high levels of self-esteem and there were no group differences. The lack of group differences in self-esteem is surprising since research has often found low self-esteem among depressed and depression-vulnerable persons (Altman & Wittenborn, 1980; Cofer & Wittenborn, 1980; Orth & Robins, 2013). However, some evidence also suggests that self-esteem improves once depressed individuals enter remission (Hamilton & Abramson, 1983). High self-esteem in our sample of formerly depressed participants may partially explain the general lack of impairment in positive affect regulation, since previous work has linked low self-esteem to dampening of positive affect (Feldman et al., 2008; Wood, Heimpel, & Michela, 2003). In line with this pattern, we would also expect to find savoring processes in our sample of formerly depressed participants to be comparable to never-depressed participants, yet we did not. Like with the TEPS and SBI, there appears to be a discrepancy between our two measures of positive affect regulation (RPA and SBI). The *emotion-focus* and *self-focus* subscales of the RPA theoretically reflect savoring, while the *dampening* subscale reflects the inverse of savoring; curiously, while the groups did not differ on the subscales of the RPA, they did on the SBI.

Despite some anomalies, the results suggest that the characteristics exhibited by the sample of formerly depressed participants in present study are at least somewhat representative of what one might expect from this population. Furthermore, the results also suggest that remitted depression is best characterized by deficits related to negative affect, rather than

positive affect.

Depression Severity

Results from the first set of post hoc analyses indicated a general lack of impairments in the experience of pleasure, positive affect regulation, beliefs about positive emotions, and self-esteem among individuals with a history of depression (who are no longer experiencing clinically significant symptoms of depression). As a follow up, we next examined if deficits in those domains are a feature of state, rather than trait, depression.

A series of regression analyses were conducted to examine if current depressive symptom severity impacted experience of pleasure, affect regulation, fear of positive/negative emotions, and self-esteem. As presented in Table 6, depression severity significantly predicted scores on the TEPS, RRS, RPA, SBI, ACS, and RSES in the expected directions, and accounted for 6-31% of the variance in the criterion. The results suggest that increased depression severity is associated with deficits related to both positive and negative affect.

Predictors of Mood Repair

Since encoding style and depression status did not emerge as moderators of mood repair success (as hypothesized), a series of regression analyses were conducted to explore if other variables predicted mood repair. Specifically, given that formerly depressed participants exhibited intact experience of pleasure, adaptive regulation of positive affect, and absence of (or minimal) fear related to positive affect, and were able to improve their mood by recalling a PAM, we examined if these variables accounted for the observed mood repair success.

In the first group of regressions, the subscales of the TEPS, RRS, RPA, SBI, and ACS were entered as predictors; change in negative affect from Time 3 (after negative mood induction) to Time 4 (after PAM recall) was entered as the criterion. The second group of

regressions was identical, except change in positive affect from Time 3 (after negative mood induction) to Time 4 (after PAM recall) was entered as the criterion. As shown in Table 7, the model including the TEPS subscales significantly predicted change in both negative and positive affect. No subscale emerged as a significant predictor, however. The model including the two RRS subscales significantly predicted change negative affect. Additionally, *reflection* emerged as a significant independent predictor, with increasing scores on the *reflection* subscale predicting improvement in negative affect. The model containing the SBI subscales significantly predicted change in positive affect, and the *anticipating* and *savoring the moment* subscale emerged as significant, independent predictors.

Overall, the results suggest that the temporal experience/savoring of positive stimuli plays an important role in PAM-based mood repair, but in a complicated and contradictory pattern. For example, the direction of the beta weight for the *consummatory* subscale of TEPS indicates that an increase in consummatory pleasure is associated with a decrease in negative affect, yet the direction of the beta weight for the *savoring the moment* subscale of the SBI suggests that increased savoring in the moment is associated with an *increase* in negative affect. A similar contradictory pattern is observed for the two subscales when mood repair is indexed by change in positive affect.

Predictors of Memory Characteristics

Results of our primary analyses indicated that quality of memory characteristics did not differ as a function of encoding style or depression status. Given that formerly depressed participants, like never-depressed participants, recalled rich memory characteristics, we examined if the lack of deficits in experience of pleasure, affect regulation, and beliefs about emotions played a role in the retrieval of rich memory characteristics.

As shown in Tables 8 and 9, a consistent pattern emerged for *sensory detail*. More specifically, models containing subscales of the TEPS, RRS, RPA, ACS, and SBI all significantly predicted ratings of *sensory detail*. The *brooding* subscale of the RRS and the *depressed mood* subscale of the ACS both emerged as significant, independent predictors, with increasing scores on *brooding* and *depressed mood* predicting a decrease in *sensory detail.* Regression models containing subscales of the RPA, ACS, and SBI also significantly predicted ratings of autobiographical memory valence. The *emotion-focused* subscale of the RPA, the *positive affect* subscale of the ACS, and the *savoring the moment* subscale of the SBI all emerged as significant, independent predictors of valence.

Predictors of Memory Accuracy

Findings from our primary analyses indicated that accuracy for valenced material differed by depression status, with formerly depressed participants exhibiting a bias against positively valenced material (compared to neutral material) and never-depressed participants exhibiting the opposite pattern. Since the experience of pleasure and affect regulation appears to play a role in mood repair and recall of memory characteristics (see results of previous post hoc analyses), we examined if these variables and others also have an impact on memory accuracy.

In the first group of regressions, the subscales of the TEPS, RRS, RPA, SBI, and ACS were entered as predictors, and raw scores on the *neutral material* subscale of the Memory Accuracy Test were entered as the criterion. The second group of regressions was identical, except the *positive material* subscale of the Memory Accuracy Test was entered as the criterion. The results of the analyses indicated that the three subscales of the SBI significantly predicted accuracy scores on the positive material subscale, F (3, 108) = 3.85, p = .01, R^2 = .10. The anticipation subscale (B = .63; t = 2.00, p = .048) and reminiscing subscale (B = - .63; t = -2.19,

p = .03) both emerged as significant, independent predictors of accuracy of positive material. The three subscales of the RPA also significantly predicted accuracy scores on the positive material subscale, F (3, 118) = 3.83, p = .01, R^2 = .09. The emotion-focused subscale (B = .19; t = 3.29, p = .001) and self-focused subscale (B = -.15; t = -2.19, p = .03) both emerged as significant, independent predictors of accuracy of positive material. No other measures emerged as a significant predictor of accuracy scores for positive or neutral material.

DISUCSSION

The ability to repair one's negative affect via the recall of positive memories has been shown to be an important and effective affect regulation strategy (Josephson et al., 1996; Kovacs et al., 2009), yet individuals with a history of depression often fail to derive benefits from it (Joormann et al., 2007; Kovacs et al., 2015). Moreover, scholars have implicated maladaptive affect regulatory responses (e.g., rumination) during the retrieval stage of a PAM as a cause of PAM-based mood repair failure (e.g., Joormann & Siemer, 2004; Joormann et al., 2007). However, previous research has generally overlooked the role of memory encoding, including the nature of the memory encoded and affect regulatory responses employed during the encoding stage of a positive event. The present study addressed this limitation by manipulating formerly depressed and never-depressed participants' encoding style of a "standardized" positive event to examine how memory encoding impacted later mood repair efficacy, quality of memory characteristics, and memory accuracy. We chose a standardize positive event to circumvent the limitations of having participant recall memories that occurred outside the laboratory (i.e., lack of vivid or positive memories to draw upon, inability to determine how the initial positive event was processed/encoded, etc.)

Hypotheses for the study were guided by the premise (supported by research) that individuals with a history of depression naturally exhibit faulty processing of positive stimuli and engage in maladaptive regulation of positive affect (e.g., Carl et al., 2013), which would impair encoding of positive events and lead to impaired retrieval. By extension, if depression-vulnerable individuals engaged in unbiased information processing and adaptive regulation of positive

affect (i.e., mindfulness) during encoding of a positive event, it might be possible to counteract any deficits during retrieval (e.g., unsuccessful mood repair, impoverished memory characteristics, inaccurate retrieval of positive material). As such, we hypothesized that formerly depressed participants in the concrete encoding style condition would match never-depressed participants, with respects to mood improvement after PAM recall, recall of rich memory characteristics, and recall accuracy of positive and neutral material. Importantly, formerly depressed participants in the concrete encoding style condition would experience greater mood improvement, recall richer memory characteristics, and exhibit greater accuracy in their recall of positive and neutral material compared to formerly depressed participants in the natural encoding condition.

Our findings did not support these hypotheses. Specifically, both formerly depressed and never-depressed participants experienced a decrease in negative affect when given the opportunity to repair their negative moods by recalling details of an earlier staged positive event; encoding style did not moderate mood repair efficacy. Furthermore, formerly depressed and never-depressed participants did not differ in memory characteristics. Finally, the pattern of results of participants' memory accuracy reflected the typical pattern established in the literature (e.g., Carl et al., 2013); formerly depressed participants were less accurate in recalling positive material compared to never-depressed participants, and exhibited greater accuracy for neutral material.

There are several potential reasons why the results did not support the hypotheses. One possibility is that the manipulation of the concrete encoding style may not have succeeded in promoting mindful attention and nonjudgment of moment-to-moment experiences during the staged positive event. A mindfulness-based manipulation was selected based on research

suggesting that mindfulness improves cognitive processes, like attention and memory (e.g., Bonamo et al., 2015; Chiesa et al., 2011), and has a positive impact on self-reported affect (e.g, Erisman & Roemer, 2010) and affect regulation (Jain et al., 2007). Although the manipulation check indicated that participants in the concrete encoding style condition reported employing "concrete thinking" to a greater extent than participants in the natural encoding style condition, it is possible that the self-report questionnaire did not adequately measure concrete encoding. If the encoding manipulation had succeeded, it would be reasonable to expect a significant main effect of encoding style condition in the analyses (e.g., participants in the concrete encoding style condition being better able to improve their moods after PAM recall than participants in the natural encoding style condition). That such findings did not emerge raises questions about the encoding style manipulation.

We also did not observe other expected effects. Apart from the concrete encoding style manipulation, we would still expect that formerly depressed participants would be less successful at repairing their moods after PAM recall compared to never-depressed participants (e.g., Joormann et al., 2007; Kovacs et al., 2015), and exhibit deficits in memory characteristics (e.g., Begovic et al., 2016, Werner-Seidler & Moulds, 2011; Williams et al., 2007) Surprisingly, our results did not reflect this pattern. Formerly depressed participants experienced an improvement in mood after PAM recall that was comparable to the never-depressed participants, and both groups recalled rich memory characteristics.

Although null findings are subject to many competing interpretation, it may be that variation in the recall paradigm may explain differences between studies. Unlike previous PAM studies (Joormann & Siemer, 2004; Joormann et al., 2007, Kovacs et al., 2015), the present study elicited details of the positive memory using a highly structured interview that prompted

participants to focus on the concrete and sensory aspects of the staged positive event. Although the focus of the study was on the encoding stage of memory and how manipulation of encoding style in depression-vulnerable individuals impacts processes during retrieval, the use of a highly structured interview during the retrieval phase may have confounded the encoding style manipulation. For instance, the structured nature of the recall paradigm may have limited natural variation in retrieval style; therefore, any potential effect of encoding style may have been washed out.

While it is not possible to determine for certain if the observed mood repair success and recall of rich memory characteristics among formerly depressed individuals in the present study is attributable to processes at the encoding stage or processes at the retrieval stage, some evidence from previous studies point to the latter. For example, Werner-Seidler and Moulds (2012) found that depressed and depression-vulnerable individuals failed to experience mood improvement when they processed their PAMs in a ruminative style characteristic of depression. However, when these individuals processed their PAMs in a concrete processing style (which is antithetical to rumination), their moods improved. The memory recall paradigm used in the present study was similar to the concrete processing style used by Werner-Seidler and Moulds (2012), as both prompted participants to focused on the concrete and sensory aspects of a positive memory, and thus may explain the observed mood improvement in our sample of formerly depressed participants.

There are several possible explanations for the lack of group differences in PAM characteristics as well. For instance, the delay period between the staged positive event and PAM recall may have been too short. Consequently, details of the event may have been fresh in the participants' minds and limited the degree of variability in phenomenological characteristics.

Indeed, this explanation is supported by the fact that mean scores for PAM vividness, coherence, accessibility, sensory detail, visual perspective, and valence were very high in the samples, suggesting a ceiling effect. It is also possible that biases in participants' assessment of their own PAM characteristics may have contributed to the high scores (e.g., participants overestimated their recall ability). This explanation is less tenable given that other studies (e.g., Werner-Seidler & Moulds, 2011) using the same self-report measure of memory characteristics have found group differences. Nevertheless, future research should clarify the correspondence between self- and other-rated memory characteristics.

Implications of Results

The current study used a novel experimental approach to understand memory encoding as a potential underlying mechanism of mood repair efficacy, quality of PAM characteristics, and recall accuracy in individuals with a history of depression. However, because the core manipulation did not appear to work as intended, it is difficult to interpret subsequent findings of the study. Consequently, the study produced more questions than answers regarding autobiographical memory processes in depression and its relationship to affect regulation. In an effort to clarify this relationship and better understand the pattern of results in the current study, we conducted a series of post hoc analyses that examined the impact of the experience of pleasure, affect regulation, fear of positive/negative emotions, self-esteem, and personality.

The post hoc analyses revealed an interesting—but at times puzzling—pattern of results. With regards to mood repair, temporal experience and savoring of positive stimuli emerged as the sole predictors of change in both negative and positive affect (i.e., mood repair). However, temporal experience/savoring generally accounted for a small percentage of variance in mood change, except in the case of savoring and changes in positive affect. The results also indicated

some association between measures of experience of pleasure, affect regulation, fear of positive/negative emotions, and memory characteristics (primarily sensory detail and valence). Finally, indices of positive affect regulation emerged as the sole predictors of accurate recall of positive material. Overall, the results suggest that positive affect regulation and experience of pleasure are associated (albeit weakly) with mood repair outcomes, recall of memory characteristic, and memory accuracy.

Post hoc analyses also revealed that formerly depressed participants, like their never-depressed counterparts, were generally characterized by in tact experience of pleasure, adaptive regulation of positive affect, and absence of (or minimal) fear related to positive affect. Unlike never-depressed participants, however, formerly depressed participants did evidence maladaptive regulation and fear of negative affect. We also found that greater severity of current depressive symptoms reliably predicted maladaptive affect regulation and fear of both positive and negative affect. Put together, these results suggest—at least in this sample—that deficits related to positive affect may be a state-like feature of depression, rather than trait-like.

As a whole, the results of the post hoc analyses suggest that the general lack of deficits in the experience of pleasure and positive affect regulation in formerly depressed participants may have contributed to typical, unbiased encoding of a positive event, and subsequently resulted in mood repair success and recall of rich memory characteristics. Although we did not include a sample of currently depressed individuals in this study, we suspect that such individuals would have exhibited deficient encoding of the positive event (due to biased processing of positive stimuli and maladaptive regulation of positive affect), resulting in unsuccessful mood repair and impaired memory characteristics.

Limitations and Future Directions

The present study, to the best of our knowledge, represents the first attempt to examine the role of encoding of autobiographical memories within the context of depression and affect regulation. Additionally, we employed a novel experimental paradigm. Despite these strengths, however, the study had several limitations that bear mentioning. First, we assessed depression history using a self-report measure. While self-report measures are convenient, a semi-structured interview (the "gold standard") would have been more ideal for diagnosing depression history. Second, we did not include a sample of currently depressed participants; therefore, we were unable to examine the impact of current, clinically significant depressive symptoms on autobiographical memory processes and affect regulation. Third, the manipulation of encoding style was a key aspect of the study, yet assessment of manipulation success was based on self-report. Although studies have shown that mindfulness can be effectively taught in a brief session (e.g., Alberts & Thewissen, 2011; Mrazek, Smallwood, & Schooler, 2012), we cannot completely verify that participants in the study understood the mindfulness instructions and were able to successfully implement the skill during the staged positive event.

While our study was unable to provide definitive answers about the role of memory encoding in PAM recall and mood repair within the context of depression, it did provide clues and introduced questions that warrant further investigation in future research. One such question pertains to how affect regulatory processes during both memory encoding *and* retrieval impact mood repair efficacy, memory characteristics, and recall accuracy. Our study, like previous work, only manipulated one memory stage; thus, future studies should manipulate both encoding and retrieval style to assess the relative influence of these two important memory stages. Another area of future investigation relates to the influence of contextual factors. We found that formerly

depressed participants were able to improve their mood and recall rich characteristics when recalling a positive event that was staged in the laboratory, yet formerly depressed individuals do not experience similar benefits when recalling a positive event that had occurred in daily life (e.g., Begovic et al., 2016; Joormann et al., 2007). These contradictory findings suggest that context (i.e., laboratory versus daily life) may be important. Future studies employing multi-context designs have the potential to provide important insights in this regard. Finally, the role of depression status (i.e., currently depressed versus formerly depressed) on autobiographical memory processes (encoding and retrieval) and affect regulation in different contexts needs to be clarified.

TABLES

Table 1. Demographic Information and Sample Characteristics.

	Never Depressed	Formerly Depressed
Variable	*M* (*SD*)	*M* (*SD*)
Age	19.20 (1.24)	19.52 (1.47)
Race (n, %)		
White/Caucasian	33 (48.5%)	36 (65.5%)
Black/ African American	15 (22.1%)	8 (14.5%)
Hispanic/Latina	8 (11.8%)	5 (9.1%)
Asian/Pacific Islander	4 (5.9%)	1 (1.8%)
Middle Eastern	2 (2.9%)	1 (1.8%)
Bi/Multi Racial	5 (7.4%)	4(7.3%)
Other	1 (1.5%)	0 (0%)
Year in college (n, %)		
Freshman	34 (50%)	19 (34.5%)
Sophomore	19 (27.9%)	12 (21.8%)
Junior	5 (7.4%)	13 (23.6%)
Senior	10 (14.7%)	10 (18.2%)
Other	0 (0%)	1 (1.8%)
Stroop Color and Word Test (verbal inhibitory control)	-6.26 (5.92)	-8.47 (7.20)
FAS Test (verbal fluency)	36.67 (8.19)	36.83 (7.92)
Current Depressive Symptom Severity	10.18 (6.42)	14.36 (8.25)
Positive Affect		
Time1 (baseline)	4.11 (1.28)	4.23 (1.35)
Time 2 (after staged positive event)	5.71 (1.42)	5.69 (1.41)
Time 3 (after negative mood induction)	2.96 (1.07)	3.11 (1.52)
Time 4 (after PAM recall)	4.05 (1.35)	4.15 (1.64)
Negative Affect		
Time 1 (baseline)	.72 (.54)	.95 (.76)
Time 2 (after staged positive event)	.25 (.31)	.45 (.52)
Time 3 (after negative mood induction)	1.43 (.97)	1.82 (1.15)
Time 4 (after PAM recall)	.33 (.42)	.79 (.79)

Table 2. Adjusted Means and Standard Errors of Negative Affect After Negative Mood Induction and After PAM Recall.

	Never Depressed		Formerly Depressed	
Time	Natural	Concrete	Natural	Concrete
After Negative Mood Induction	1.42 (.16)	1.48 (.20)	1.78 (.20)	1.39 (.19)
After PAM Recall	.42 (.08)	.36 (.10)	.57 (.10)	.57 (.09)

Table 3. Adjusted Means and Standard Errors of Memories Characteristics for Each Group.

	Never Depressed		Formerly Depressed	
Memory Characteristic	Natural	Concrete	Natural	Concrete
Vividness (range: 0-5)	3.99 (.12)	3.94 (.15)	4.08 (.14)	3.86 (.14)
Coherence (range: 0-5)	4.19 (.09)	4.04 (.11)	4.22 (.11)	4.16 (.11)
Accessibility (range: 0-5)	3.97 (.09)	3.90 (.11)	3.89 (.11)	3.78 (.10)
Sensory Detail (range: 0-5)	3.61 (.11)	3.58 (.14)	3.68 (.13)	3.50 (.13)
Emotional Intensity (range: 0-5)	2.56 (.15)	2.83 (.18)	2.69 (.18)	2.35 (.17)
Visual Perspective (range: 0-5)	4.13 (.09)	4.20 (.12)	4.10 (.11)	4.04 (.11)
Valence (range: 0-5)	4.46 (.08)	4.47 (.11)	4.71 (.10)	4.59 (.10)

Table 4. Adjusted Means and Standard Errors of Memory Accuracy for Each Group.

	Never Depressed		Formerly Depressed	
Memory Accuracy Type	Natural	Concrete	Natural	Concrete
Neutral Material	.59 (.02)	.56 (.02)	.60 (.02)	.59 (.02)
Positive Material	.72 (.02)	.74 (.03)	.67 (.03)	.66 (.03)

Table 5. Group Differences in the Experience of Pleasure, Affect Regulation, Fear of Positive/Negative Emotions, Self-Esteem, and Personality.

	Never-Depressed	Formerly Depressed		
	M (*SD*)	*M* (*SD*)	df	*t*
TEPS				
Total (range: 1-6)	4.84 (.53)	4.74 (.56)	119	.98
Anticipatory (range: 1-6)	4.89 (.55)	4.79 (.70)	120	.89
Consummatory (range: 1-6)	4.82 (.68)	4.70 (.71)	118	.92
RRS				
Brooding (range: 5-20)	10.99 (3.42)	12.89 (3.50)	121	-3.04**
Reflection (range: 5-20)	10.59 (3.74)	11.58 (3.22)	121	-1.56
RPA				
Emotion-Focus (range: 5-20)	14.68 (3.32)	14.00 (3.24)	121	1.14
Dampening (range: 8-32)	14.06 (4.18)	14.43 (4.29)	119	-.48
Self-Focus (range: 4-16)	10.19 (2.91)	10.13 (3.13)	121	.12
SBI				
Total (range: 1-7)	6.01 (.56)	5.47 (1.19)	72.06	3.01**
Anticipating (range: 1-7)	5.82 (.71)	5.44 (1.33)	78.43	1.93§
Savoring the Moment (range: 1-7)	5.82 (.78)	5.07 (1.43)	81.31	3.47**
Reminiscing (range: 1-7)	6.20 (.82)	5.83 (1.03)	112	2.09*
ACS				
Depressed Mood (range: 1-7)	2.44 (.89)	3.30 (1.25)	95.13	-4.29***
Positive Affect (range: 1-7)	2.61 (.73)	2.78 (.84)	121	-1.25
RSES (range: 10-40)	33.93 (4.66)	32.44 (5.45)	121	1.63
TIPI				
Extraversion (range: 1-7)	4.51 (1.61)	4.46 (1.75)	121	.14
Agreeableness (range: 1-7)	5.32 (.98)	5.02 (1.23)	121	1.50
Conscientiousness (range: 1-7)	5.68 (1.05)	5.57 (1.20)	121	.51
Emotional Stability (range: 1-7)	5.07 (1.30)	4.01 (1.49)	121	4.19***
Openness to Experience (range: 1-7)	5.38 (1.05)	5.50 (1.14)	121	-.59

Note: *$p < .05$; **$p < .01$; *** $p < .001$; §= marginally significant ($.05 < p < .10$). TEPS = Temporal Experience of Pleasure Scale; RRS = Ruminative Response Scale-Short Version; RPA = Responses to Positive Affect; SBI = Savoring Beliefs Inventory; ACS = Affective Control Scale; RSES = Rosenberg Self Esteem Scale; TIPI = Ten Item Personality Inventory.

Table 6. Depression Severity as a Predictor of Experience of Pleasure, Affect Regulation, Fear of Positive/Negative Emotions, and Self-Esteem.

	Depression Severity (predictor)		
Criterion	*F*	R^2	*B*
TEPS-Total (n = 119)	7.42**	.06	- .02 **
TEPS-Anticipatory (n = 120)	11.42**	.09	- .03**
TEPS- Consummatory (n = 118)	6.78 *	.06	- .02*
RRS-Brooding (n = 121)	36.52***	.23	.23***
RRS-Reflection (n = 121)	8.94**	.07	.12**
RPA-Emotion-Focus (n = 121)	9.13**	.07	- .12**
RPA-Dampening (n =119)	43.97***	.27	.29***
RPA-Self-Focus (n = 121)	10.40**	.08	- .11**
ACS-Depressed Mood (n = 120)	53.82***	.31	.09***
ACS-Positive Affect (n = 121)	16.96***	.12	.04***
SBI-Total (n = 111)	43.75***	.29	- .07***
SBI-Anticipating (n = 114)	18.85***	.14	- .05***
SBI-Savoring the Moment (n = 116)	22.57***	.16	-. 06***
SBI-Reminiscing (n = 112)	24.74***	.18	-.05***
RSES (n = 121)	54.44***	.31	- .37***

Note: *$p < .05$; **$p < .01$; *** $p < .001$; §= marginally significant ($.05 < p < .10$). TEPS = Temporal Experience of Pleasure Scale; RRS = Ruminative Response Scale-Short Version; RPA = Responses to Positive Affect; SBI = Savoring Beliefs Inventory; ACS = Affective Control Scale; RSES = Rosenberg Self Esteem Scale.

Table 7. Predictors of Mood Repair (Changes in Negative and Positive Affect).

	Mood Repair-Negative Affect				Mood Repair- Positive Affect			
Predictors	*N*	*F*	R^2	*B*	*N*	*F*	R^2	*B*
Set 1	111	3.26*	.06		155	3.67*	.06	
TEPS-Anticipatory				-.18				.33
TEPS- Consummatory				-.20§				.28
Set 2	113	3.25*	.06		118	.26	.00	
RRS-Brooding				.00				.01
RRS-Reflection				-.06*				-.03
Set 3	111	1.21	.03		116	1.88	.05	
RPA- Emotion-Focus				-.02				.06
RPA- Dampening				-.04				-.01
RPA- Self-Focus				-.02				.03
Set 4	105	2.35§	.07		110	10.23***	.22	
SBI-Anticipating				-.42*				1.04***
SBI-Savoring the Moment				.28*				-.73***
SBI-Reminiscing				.14				-.02
Set 5	113	.97	.02		117	2.27	.04	
ACS-Depressed Mood				-.04				-.21
ACS-Positive Affect				-.11				-.03

Note: *$p < .05$; **$p < .01$; *** $p < .001$; §= marginally significant ($.05 < p < .10$). TEPS = Temporal Experience of Pleasure Scale; RRS = Ruminative Response Scale-Short Version; RPA = Responses to Positive Affect; SBI = Savoring Beliefs Inventory; ACS = Affective Control Scale.

Table 8. Predictors of Memory Characteristics.

	Vividness				Coherence				Accessibility				Sensory Detail			
Predictors	*N*	*F*	R^2	*B*	*N*	*F*	R^2	*B*	*N*	*F*	R^2	*B*	*N*	*F*	R^2	*B*
Set 1	118	.87	.02		118	1.82	.03		118	1.26	.02		118	3.61*	.06	
TEPS-Anticipatory				.03				.05				.07				.17
TEPS- Consummatory				.12				.12				.08				.14
Set 2	122	.58	.01		122	1.16	.02		122	.30	.01		122	5.94**	.09	
RRS-Brooding				-.01				-.02				-.01				-.06**
RRS-Reflection				.02				.02				.00				.03§
Set 3	120	.19	.01		120	.28	.01		120	.46	.01		120	5.48**	.12	
RPA- Emotion-Focus				.01				.01				.01				.03
RPA- Dampening				.00				.00				.01				-.02
RPA- Self-Focus				.01				.01				.01				.04
Set 4	112	.85	.03		112	1.88	.05		112	.75	.02		112	2.80*	.07	
SBI-Anticipating				.18				.10				.09				.09
SBI-Savoring the Moment				-.01				.01				.00				.02
SBI-Reminiscing				-.13				.01				-.03				.07
Set 5	121	.20	.00		121	3.08*	.05		121	1.33	.02		121	5.48**	.08	
ACS-Depressed Mood				.01				-.06				-.03				-.13*
ACS-Positive Affect				-.07				-.09				-.07				-.10

Note: *$p < .05$; **$p < .01$; *** $p < .001$; §= marginally significant ($.05 < p < .10$). TEPS = Temporal Experience of Pleasure Scale; RRS = Ruminative Response Scale-Short Version; RPA = Responses to Positive Affect; SBI = Savoring Beliefs Inventory; ACS = Affective Control Scale.

Table 9. Predictors of Memory Characteristics (continued).

	Emotional Intensity				Visual Perspective				Valence			
Predictors	*N*	*F*	R^2	*B*	*N*	*F*	R^2	*B*	*N*	*F*	R^2	*B*
Set 1	118	.64	.01		117	2.44§	.04		118	1.87	.03	
TEPS-Anticipatory				.13				-.04				.12
TEPS- Consummatory				.05				.18*				.05
Set 2	122	1.55	.03	-.04	120	1.10	.02		122	.22	.00	
RRS-Brooding				-.01				-.02				.01
RRS-Reflection								.00				-.01
Set 3	120	1.44	.04		118	1.78	.04		120	4.35**	.10	
RPA- Emotion-Focus				-.02				.04				.05*
RPA- Dampening				-.02				-.02				.00
RPA- Self-Focus				.04				-.03				.00
Set 4	112	2.05	.05		111	1.29	.04		112	3.86*	.10	
SBI-Anticipating				.15				-.13				.18§
SBI-Savoring the Moment				.15				.10				-.16*
SBI-Reminiscing				-.20				.11				.11
Set 5	121	1.50	.03		119	6.02**	.09		121	4.35*	.07	
ACS-Depressed Mood				-.13				-.06				-.01
ACS-Positive Affect				.10				-.18*				-.17*

Note: *$p < .05$; **$p < .01$; *** $p < .001$; §= marginally significant ($.05 < p < .10$). TEPS = Temporal Experience of Pleasure Scale; RRS = Ruminative Response Scale-Short Version; RPA = Responses to Positive Affect; SBI = Savoring Beliefs Inventory; ACS = Affective Control Scale.

FIGURES

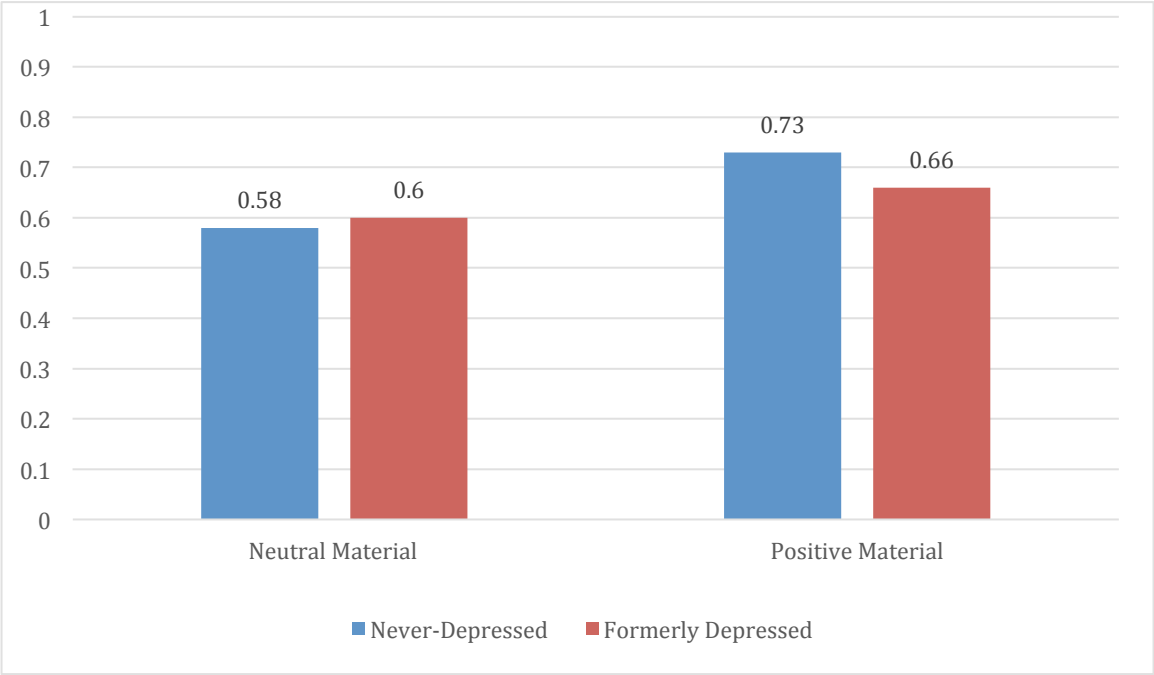

Figure 1. Memory accuracy as a function of memory valence and depression status.

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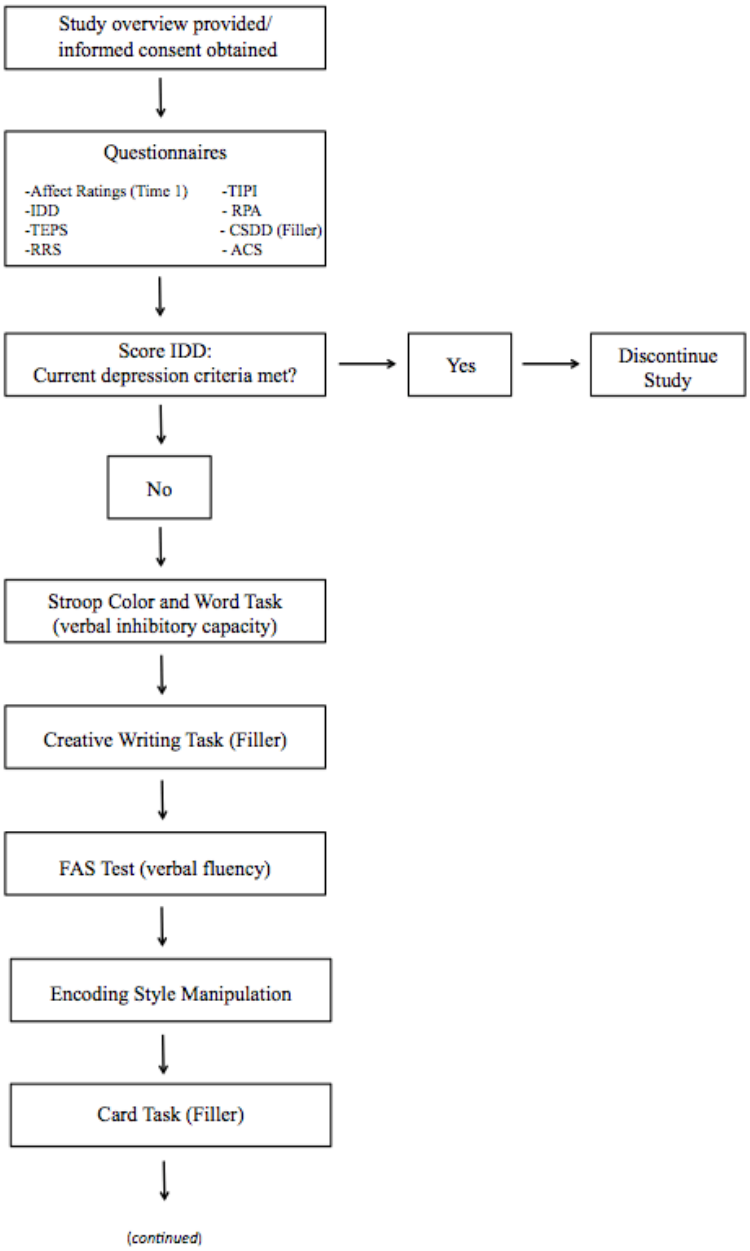
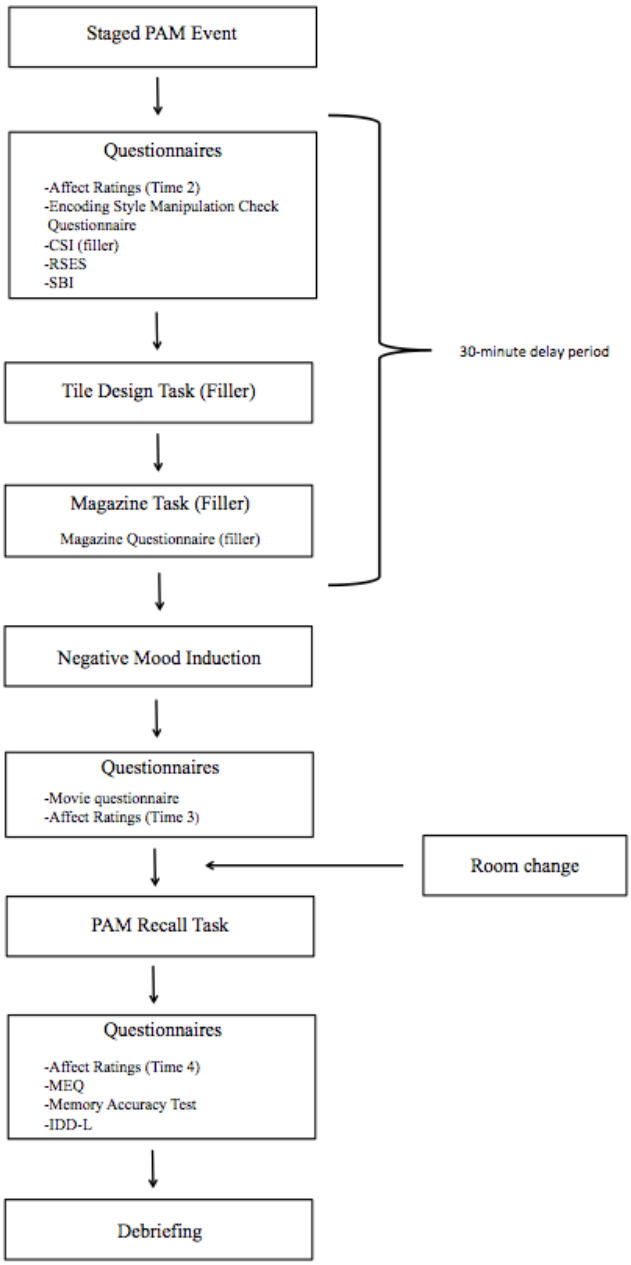
APPENDICES

APPENDIX A: Schematic Diagram of Study Protocol




Staged PAM Event
Questionnaires
-Affect Ratings (Time 2)
-Encoding Style Manipulation Check Questionnaire
-CSI (filler)
-RSES
-SBI
Tile Design Task (Filler)
Magazine Task (Filler)
Magazine Questionnaire (filler)
30-minute delay period
Negative Mood Induction
Questionnaires
-Movie questionnaire
-Affect Ratings (Time 3)
Room change
PAM Recall Task
Questionnaires
-Affect Ratings (Time 4)
-MEQ
-Memory Accuracy Test
-IDD-L
Debriefing

APPENDIX B: IRB Initial Review Approval

USF
UNIVERSITY OF
SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX(813)974-7091

1/27/2015

Ena Begovic, B.S.
Psychology
4202 East Fowler Ave
Tampa, FL 33620

RE: **Full Board Approval for Initial Review**
IRB#: Pro00020116
Title: Encoding Style of Positive Autobiographical Memories: Relationship to Mood Repair, Memory Recall Characteristics, and Depression

Study Approval Period: 1/16/2015 to 1/16/2016

Dear Ms. Begovic:

On 1/16/2015, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents outlined below.

Approved Item(s):
Protocol Document(s):
Begovic_Thesis_Encoding_of_PAMs_USF_IRB_PROTOCOLGUIDELINES_Final-updated with IDD.docx

Consent/Assent Document(s)*:
Begovic_Encoding of PAMs-CONSENT FORM-updated.docx.pdf

Consent Script(s):
Begovic_Thesis_Encoding of PAMs_ONLINE_study Consent form_UPDATED 1.25.15.docx

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent document(s) are only valid during the approval period indicated at the top of the form(s).

Your study qualifies for a waiver of the requirements for the documentation of informed consent as outlined in the federal regulations at 45CFR46.117(c) which states that an IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it

finds either: (1) That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern; or (2) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval by an amendment.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

John A Schinka, Ph.D.

John Schinka, Ph.D., Chairperson
USF Institutional Review Board

APPENDIX C: IRB Continuing Review Approval

USF
UNIVERSITY OF
SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-7091

1/15/2016

Ena Begovic, B.S.
Psychology
4202 East Fowler Ave
Tampa, FL 33620

RE: **Full Board Approval for Continuing Review**
IRB#: CR1_Pro00020116
Title: Encoding Style of Positive Autobiographical Memories: Relationship to Mood Repair, Memory Recall Characteristics, and Depression

Study Approval Period: 1/16/2016 to 1/16/2017

Dear Dr. Begovic:

On 1/15/2016, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Begovic_Thesis_Encoding_of_PAMs_USF_IRB_PROTOCOLGUIDELINES_Final_March2015_Clean_version.02 copy.docx

Consent/Assent Document(s)*:
Begovic_Thesis_Encoding_of_PAMs_ConsentForm_FINAL_March2015_Clean_version.03.docx.pdf

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab on the main study's workspace. Please note, the consent/assent document(s) are only valid during the approval period indicated at the top of the form(s).

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with USF HRPP policies and procedures and as approved by the USF IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) calendar days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

John A Schinka, Ph.D.

John Schinka, Ph.D., Chairperson
USF Institutional Review Board