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Mood Repair and Processing Mode in Depression

Aliza Werner-Seidler and Michelle L. Moulds
The University of New South Wales, Sydney, Australia

Recalling positive autobiographical memories is a powerful emotion regulation strategy that can be used to repair low mood and alleviate negative affect. Unlike healthy individuals, those with current or past depression do not experience an improvement in mood as a consequence of recalling positive memories. We tested whether differences in processing mode might account for this impairment. Following mood induction procedures designed to ensure equivalence of mood state, depressed ($n = 35$) and recovered depressed ($n = 33$) participants were instructed to recall a positive memory and focus on it while adopting either an abstract or a concrete mode of processing. Participants in the abstract processing condition experienced no change in mood, while those in the concrete processing condition showed improved mood after memory recall. This research illustrates that the process by which positive autobiographical memories are recalled is important in determining their emotional impact and suggests that psychological interventions for depression may be improved by explicitly targeting processing mode.

Keywords: depression, rumination, memory, processing mode

Depression and its recurrence are associated with impairment in the regulation of low mood and negative affect. The idea that depression is linked to the use of maladaptive emotion regulation strategies has recently received increased theoretical attention and garnered empirical support (e.g., Campbell-Sills, Barlow, Brown, & Hofmann, 2006). For example, there is evidence that depressive symptoms are associated with the frequent use of dysfunctional regulation strategies such as suppression and rumination (Campbell-Sills et al., 2006; Garnefski & Kraaij, 2006). Interestingly, a recent study found that deficits in emotion regulation are not restricted to current depression but can persist beyond the resolution of a depressive episode (Ehring, Fischer, Schnülle, Bösterling, & Tuschen-Caffier, 2008). Specifically, formerly depressed individuals used less functional emotion regulation strategies such as catastrophizing and rumination than never-depressed individuals, suggesting that poor emotion regulation could represent a residual vulnerability factor that heightens the likelihood of recurrence. These findings illustrate that emotion regulation difficulties play a role in depression and its recurrence.

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Aliza Werner-Seidler and Michelle L. Moulds, School of Psychology, University of New South Wales, Sydney, Australia.

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Correspondence concerning this article should be addressed to Aliza Werner-Seidler, School of Psychology, The University of New South Wales , NSW 2052 Australia. E-mail: awerner-seidler@psy.unsw.edu.au

Positive Memory Recall as a Mood Regulation Strategy

Accordingly, a closer evaluation of specific mood regulation strategies intended to reduce or alleviate low mood, and the degree to which these strategies are impaired in depression, is warranted. The recall of positive memories is one such strategy. Studies from the memory field have shown that individuals frequently retrieve positive autobiographical memories as a way to repair negative mood (Parrott & Sabini, 1990; Rusting & DeHart, 2000). In an examination of factors that may influence this process, Joormann and Siemer (2004) induced sad mood and found that while healthy individuals habitually use positive memories to improve mood, dysphoric individuals do not. To test whether this could be attributable to motivational differences, the authors explicitly instructed participants to recall happy memories and examined the emotional consequence. Results showed that unlike healthy individuals, dysphoric participants did not derive any emotional benefit from positive memory recall. This finding has since been replicated in clinically depressed individuals. Joormann and colleagues examined the effectiveness of positive memory recall as a mood repair strategy in a sample of depressed, formerly depressed and healthy individuals. Not only did depressed and previously depressed individuals not benefit emotionally (i.e., report improved mood) after recalling happy memories, participants who were currently depressed actually reported worse mood after recalling positive memories (Joormann, Siemer, & Gotlib, 2007). This suggests that the benefit associated with the recall of positive memories to improve mood depends on depressive status because for currently depressed individuals, the recall of happy memories is to the detriment of their mood; for recovered depressed individuals, positive memory recall does not change mood.

Rumination as a Possible Mechanism

These findings raise an important question about the mechanism/s responsible for this effect. Although speculative, one sug-

gestion that has been raised in the literature is that positive memory recall may induce processes associated with depression such as rumination (Joormann et al., 2007). From a theoretical perspective, seminal models of ruminative thought propose that focusing on discrepancies between actual and ideal states underlie rumination (Martin & Tesser, 1989, 1996). Martin and Tesser (1996) assert that ruminative processing is commonly prompted by problems with goal achievement—a claim that has been substantiated experimentally in work that has illustrated elevated rumination levels when an individual experiences difficulty in attaining their goals (Moberly & Watkins, 2010). From this perspective then, happy memory recall would likely draw attention to the discrepancy between an individual's current circumstances (i.e., low mood) to past, happier times. If we assume that, in general, individuals aim to avoid depressed mood and experience positive mood, the recall of a positive memory would emphasize the failure in achieving this goal and in turn prompt a ruminative response. We expect that this explanation may account for the mood repair deficit observed by Joormann and colleagues, although they did not directly manipulate rumination to evaluate its effect on mood.

Studies that have examined cognitive processes in depression have established a core role for rumination. Considerable evidence has shown that thinking about the causes, meanings, and consequences of depressive symptoms (i.e., depressive rumination) maintains and exacerbates low mood. However, not all rumination results in unfavorable outcomes. Watkins and colleagues have suggested that the mode of processing that is adopted while an individual focuses on their mood determines whether this process is helpful or not (Watkins, 2004; Watkins & Moulds, 2005; Watkins & Teasdale, 2004). That is, rumination is problematic to the extent that self-focused material is processed at an abstract, general level, as opposed to a more specific, concrete level. Specifically, an abstract mode of processing lends itself to the tendency to focus on "why" questions, while concrete processing is oriented toward moment-to-moment experience. There is accruing evidence that in the context of depression, an abstract processing mode is associated with poor outcomes while a concrete processing mode has adaptive functional consequences (see Watkins, 2008 for review). Applying this mode of processing distinction to the mood repair deficit observed among depressed and remitted individuals, it could be the case that these groups have a natural tendency to adopt an abstract mode of processing during low mood, which could mitigate the potential emotional benefit of positive memory recall. In contrast, a concrete processing mode may heighten the memory's affective impact via prompting vivid, specific, and detailed sensory memory features.

Theoretical Underpinnings

Relevant research from the social cognition literature has identified a useful framework to account for differential emotional consequences that follow from making mental simulation-based comparisons. In their Reflection and Evaluation Model, Markman and McMullen (2003) propose that the operation of two distinct psychological modes of thinking (evaluation and reflection) determine whether the emotional consequence of making a mental comparison will be that of assimilation (i.e., toward the target) or affective contrast (i.e., away from the target). The "evaluation" mode is characterized by using the focus of the comparison as a reference point from which to evaluate one's present standing. Conversely, the "reflection" mode is experiential in nature and involves vividly imagining information about the target being compared to and incorporating this information into their view of themselves. Importantly, the evaluation mode leads to an affective contrast effect while the reflection mode results in affective assimilation. We propose that these "evaluation" and "reflection" modes are conceptually similar to "abstract" and "concrete" processing modes (respectively) and suggest this parallel provides a basis for explaining why each mode produces distinct emotional consequences following positive memory recall. That is, the evaluative or abstract mode involves focusing on the happy memory as a reference point from which to compare the individual's actual low mood state. It is in this way that thinking in an evaluative, abstract, and ruminative way could reduce the direct, sensory, and concrete details of the memory being processed. Instead, focusing on the discrepancy between the actual low mood and past happy times (as outlined by the model) would maintain or intensify low mood. On the other hand, the reflection or concrete mode involves generating vivid mental details and experiencing the phenomenology of the memory more directly, thereby improving mood.

The Contribution of Imagery

Findings from the imagery literature provide indirect support for this idea that distinct affective consequences follow according to the way in which emotional material is processed. For example, in a study examining the effects of visual imagery on mood, healthy volunteers who imagined positive events experienced improved mood, while those who processed these same positive events verbally did not (Holmes, Lang, & Shah, 2009). That is, imagining positive events had greater emotional benefits than thinking about the meanings of those same events (Holmes et al., 2009). Similarly, a study with depressed individuals designed to train a positive interpretation bias found that those who engaged with the training material in an image-based way were successful in deriving emotional benefit from the training, while those who processed the material verbally were not (Blackwell & Holmes, 2010). One possible account of these findings is to consider the overlap between generating imagery and the induction of a concrete processing mode. Imagery has perceptual correspondence to direct sensory experience (Kosslyn, Ganis, & Thompson, 2001) which is not dissimilar to a moment-by-moment, concrete method of information processing (e.g., Watkins, 2004). In contrast, thinking about something verbally and focusing on its meaning could be akin to an abstract processing mode (Holmes et al., 2009). While these imagery studies did not address memory directly, they nonetheless illustrate that the way that positive cognitive material is processed has important implications for the affective consequence that follows.

Aims and Hypotheses

The aim of the current study was to investigate the possibility that processing mode could be involved in the difficulty that depressed and recovered depressed individuals have in using positive memories to improve their mood. We focused explicitly on depressed and formerly depressed individuals because the mood repair deficits evident in previous studies are specific to these two

groups (Joormann et al., 2007). Guided by findings from both the rumination and imagery literatures, we hypothesized that inducing an abstract, ruminative mode of processing would prevent successful mood repair. Conversely, we predicted that participants who engaged in a concrete mode of processing would report improved mood after recalling a positive memory. Given the paucity of research examining mood repair among clinical groups, we did not have a clear hypothesis about whether the depressed group would differ from the recovered depressed group in their emotional response to positive memory recall.

We expected that following the recall of happy memories, (i) a concrete processing mode would lead to an improvement in low mood and (ii) an abstract processing mode would lead to the maintenance or exacerbation of low mood.

Method

Design

We used a 2 (Group: currently depressed, recovered depressed) × 2 (Condition: abstract, concrete) design.

Participants

Participants ($N = 68$) were recruited from the community through advertisements in newspapers and online in the careers section of these newspapers. Potential participants were contacted via phone to be screened for suitability. They were required to be over the age of 18, fluent in English, and needed to report experiencing at least a two-week period of low mood or anhedonia at some stage in their lives to be invited into the lab for a more comprehensive interview.

To determine depression status and history, participants were administered the Mood Module of the Structured Clinical Interview for the *Diagnostic and Statistical Manual of Mental Disorders IV* (*DSM–IV*) Axis I Disorders (SCID-IV; First, Spitzer, Gibbons, & Williams, 1996). The final sample consisted of 68 individuals, and all participants were reimbursed $20 for taking part.

Materials and Measures

SCID-IV–Mood Module (First et al., 1996). The SCID-IV is a semistructured interview used to diagnose Axis I disorders. The mood module was administered by an Intern Clinical Psychologist (AW-S) with extensive experience with this instrument.[1] Of the 68 individuals interviewed using the SCID-IV, 35 met criteria for current MDE, while 33 met criteria for a past MDE. Participants were included in the current MDE group if they met *DSM–IV* criteria for a current depressive episode. For inclusion in the recovered MDE group, participants needed to have met *DSM–IV* criteria for a past major depressive episode with their most recent MDE ending at least four consecutive weeks before the assessment.

Beck Depression Inventory–Second Edition (BDI-II). The BDI-II (Beck, Steer, & Brown, 1996) is a 21-item self-report measure of depression severity over the last two weeks. The BDI-II possesses strong psychometric properties, including internal consistency of .92.

Leiden Index of Depression Sensitivity-Revised (LEIDS-R). The LEIDS-R (Van der Does, 2002) is a 34-item self-report measure that indexes cognitive reactivity in response to low mood. Participants are instructed to think about the last time they felt somewhat sad and to indicate the degree to which a list of statements describe their typical cognitions and behaviors. The LEIDS-R has good psychometric qualities (Van der Does, 2002).

Ruminative Response Scale (RRS) of the Response Styles Questionnaire. The RRS (Nolen-Hoeksema & Morrow, 1991) is a 22-item self-report measure which indexes the tendency to ruminate in response to sad mood. It includes items that are self-focused, symptom-focused, and focused on the mood's possible causes and consequences. The RRS has strong psychometric properties.

Mood induction. Mood was induced in recovered depressed participants using a 10-min video clip. Replicating Joormann et al. (2007), a clip from *Dead Poets Society* showing a suicide scene was used and participants were instructed to imagine how they might feel if they were in the situation shown in the film. Again following Joormann et al. (2007), depressed individuals were not administered the sad mood induction for ethical reasons and also because they were already (by definition) in a state of low mood. Therefore, a neutral clip that depicted a nature scene that has been used previously was selected (Joormann et al., 2007). As discussed below, these inductions produced comparable mood ratings for the recovered and currently depressed groups.

Mood rating scale. Participants completed a mood rating scale on three occasions during the study: prior to (Time 1) and after (Time 2) the mood induction, and after the memory processing induction (Time 3). Participants were instructed to rate on a 9-point Likert scale how they were feeling right now, where 1 = *not at all* and 9 = *very* on dimensions of 'sad,' 'bad,' and 'happy,' with extra items such as "distracted" and "excited" interspersed throughout in order to mask the study's focus on mood. We were interested in sad mood ratings alone, as well as an aggregate mood score that combined sad, bad, and reverse-scored happiness items. The internal consistency of the aggregated scale was very good for each of the three time points ($\alpha = .89$, .81, and .80, for Times 1, 2, 3, respectively).

To meet our goal of examining the use of positive memories to repair mood, we needed to ensure that participants' mood was successfully manipulated by the sad film-clip. Accordingly, we stipulated a priori that following the mood induction, participants

[1] To obtain an estimate of interrater reliability, the mood module was readministered to 15% of participants in a separate interview that was conducted within two weeks of the initial interview by a fully qualified Clinical Psychologist from our lab. The estimate of interrater reliability was .76. The two assessors recorded a discrepant diagnosis for one of the participants who received a diagnosis of recovered MDD on initial interview and current MDD on second interview. Notably, these diagnoses were consistent with the participants' self-reported increase in depressive symptoms on the BDI-II. It appears that this individual had relapsed into an MDE within the two weeks of delay between the two interviews. After removing this participant from the interrater reliability analysis, there was complete agreement between the two interviewers in diagnostic assessments.

needed to have sad mood ratings of at least three of nine, where 1 = *not at all* and 9 = *very*.[2] Accordingly, eight depressed participants were excluded from the analysis and the final sample consisted of 60 participants (31 recovered and 29 currently depressed).

Autobiographical memory recall task. Participants were instructed to think back to their high school years and recall a single specific positive memory that had occurred during that time. Once they had retrieved a memory of an event that made them feel happy at the time that it occurred, they were instructed to provide a written description of the memory in a few sentences. Participants then rated on a nine-point scale the valence and vividness of their memory.

Processing induction. The memory processing induction was adapted for the current study from the procedure used by Watkins, Moberly, and Moulds (2008) to train concrete and abstract processing modes. In both conditions, participants were instructed to read through a list of 10 items at their own pace for five minutes. In the abstract condition, participants were prompted to think about their memory and consider the "causes, meanings and consequences of what happened," while in the concrete condition they were asked to "play the scene over in your head like you are replaying a movie of how the event unfolded." A manipulation check item was included after the completion of the task (for details see Appendix A).

Procedure

We informed participants that this was a study examining the relationship between imagination, mood, and memory and how they relate to individual thinking styles. We framed our study in a similar way to Joormann et al. (2007), taking care to disguise the focus of our study on mood. After providing informed consent, participants were administered the SCID-IV (mood module). They then completed the questionnaire package that included demographic information, baseline mood rating scale, LEIDS-R, RRS, and BDI-II. Next, participants were told they would be doing an imagination exercise, which involved watching the relevant film-clip and imagining how they might feel if they were in that situation. They then completed the second mood rating scale with items interspersed with questions about the film content. Participants were then told they would be doing the memory task, which required them to recall and describe one positive autobiographical memory from their high school years and make ratings of memory valence and vividness. They were then randomly allocated to either the abstract or concrete condition and instructed to complete the "thinking styles" component of the study, which required them to work through the relevant memory processing induction. The importance of remaining focused on their memory and following the prompts was emphasized. Participants then completed the final mood rating scale and manipulation checks and were than thanked for their time and fully debriefed.

Results

Participant Characteristics

Demographic information and sample characteristics are presented in Table 1. The recovered and currently depressed participants did not differ in terms of age, gender, marital status, education, employment status, ethnicity, depression treatment, depression chronicity, cognitive reactivity, or trait rumination. However, as expected, the currently depressed group reported more depressive symptoms than the remitted group, $t(58) = 6.79$, $p < .05$.

Table 1
Sample Characteristics

	Currently depressed $n = 29$	Recovered depressed $n = 31$
Gender (% female)	52.0	67.0
Age	32.78 (2.48)	34.59 (2.86)
Marital status (% single)	76.0	75.0
Educational history (% completed school)	86.0	97.0
Employment status (% unemployed)	48.0	52.0
Ethnicity (% of sample)		
Caucasian	62.0	65.0
Asian	21.0	16.0
Other	17.0	19.0
LEIDS-R	97.38 (2.90)	90.29 (2.49)
RRS	59.80 (2.18)	54.53 (2.11)
BDI-II	29.90 (1.86)	14.06 (1.43)
Number of previous episodes	5.62 (1.28)	3.94 (0.56)
Current antidepressant treatment (%)	35.0	19.0
Current psychological treatment (%)	28.0	29.0

Note. LEIDS-R = Leiden Index of Depression Sensitivity–Revised; BDI-II = Beck Depression Inventory-II; RRS = Ruminative Response Scale.

Means and standard deviation for sad and happy mood ratings are presented in Table 2. There were no between-condition differences at baseline, such that those assigned to the concrete and abstract processing mode conditions reported comparable levels of sadness, $t(58) = .58$, $p > .05$ and happiness, $t(58) = .00$, $p > .05$. However, there was a between-group difference in mood ratings at baseline such that depressed participants reported more sadness, $t(58) = 5.23$, $p < .05$ and less happiness, $t(58) = 5.77$, $p < .05$ than recovered depressed participants. Importantly, the groups did not differ after the mood induction in sadness, $t(58) = -1.87$, $p > .05$ or happiness, $t(58) = -.41$, $p > .05$.

Mood Induction

To determine whether the mood induction had the intended effect, a 2 (Group: currently depressed, formerly depressed) × 2 (Condition: abstract, concrete) × 2 (Time: baseline, postinduction) mixed-model ANOVA with repeated measures on the third factor

[2] This was decided for a number of reasons. First, our question of interest was to examine the utility of positive autobiographical memory as a strategy to improve sad mood. Therefore, it was necessary that participants actually be in a sad mood state, and a rating of 1 or 2 suggested otherwise. Second, anecdotal evidence from currently depressed individuals suggested that many of them actually enjoyed the film-clip that depicted nature scenes and reported that it had a calming effect on their mood. Notably, only participants from the currently depressed group reported sad mood scores of 1 or 2 on the sad mood rating scale, and for each individual who did so this reflected an improvement in mood as a result of the mood induction.

Table 2
Means (and SD*) for Mood Ratings and Memory Characteristics*

	Depressed (n = 29)		Recovered (n = 31)	
	Abstract (15)	Concrete (n = 14)	Abstract (n = 15)	Concrete (n = 16)
Sad mood Ratings				
Time 1	5.86 (1.7)	6.00 (1.4)	3.68 (1.9)	3.31 (1.8)
Time 2	5.06 (1.9)	4.93 (1.1)	4.93 (1.1)	5.38 (1.3)
Time 3	5.66 (2.1)	3.42 (1.6)	4.26 (1.9)	2.43 (1.0)
Happy mood Ratings				
Time 1	2.66 (1.3)	2.14 (0.8)	5.13 (1.5)	5.29 (1.8)
Time 2	3.33 (2.1)	3.64 (1.9)	3.33 (1.6)	4.00 (1.5)
Time 3	3.00 (1.6)	4.57 (1.9)	5.13 (1.7)	6.00 (1.6)
Memory Quality				
Valence	7.86 (1.4)	8.35 (1.1)	8.40 (0.7)	8.37 (0.6)
Vividness	7.20 (1.7)	7.71 (1.5)	7.53 (1.1)	7.00 (1.7)

Note. Time 1 (baseline) = Mood at baseline; Time 2 (post-induction) = Mood after the mood induction film clip; Time 3 = Mood after the memory processing task.

was conducted with sad mood ratings as the dependent variable. There was no main effect of condition, $F(1, 56) = 1.06$, $p > .05$, no time × condition interaction, $F(1, 56) = .18$, $p > .05$, and no time × group × task interaction, $F(1, 56) = .00$, $p > .05$. However, there was a main effect of time, $F(1, 56) = 4.70$, $p < .05$, a main effect of group, $F(1, 56) = 6.15$, $p < .05$, and a time × group interaction, $F(1, 56) = 29.93$, $p < .05$. To deconstruct the time × group interaction, follow-up paired samples t-tests were conducted and showed that participants who had recovered from depression reported increased sad mood in response to the sad mood induction, $t(30) = -5.38$, $p < .05$, while those who were currently depressed exhibited a minor improvement in mood in response to the neutral mood induction, $t(28) = 3.42$, $p < .05$. This indicates that after the mood induction, the sad mood group reported elevated ratings of sad mood as intended, while for depressed participants, mood improved (See Figure 1). As this improvement in mood was not expected, we conducted an independent samples t-test between the two groups following the induction procedure to check whether the mood ratings differed; importantly, they did not, $t(58) = -1.86$, $p > .05$. Therefore, despite the mood improvement reported by currently depressed individuals in response to the neutral mood induction, this group remained sufficiently sad so as to be comparable in mood to recovered depressed individuals following the sad mood induction.

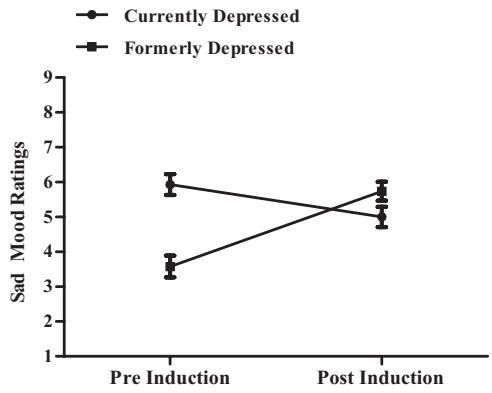

Figure 1. Mean (and *SE*) for sad mood ratings before and after the mood induction.

Memory Characteristics

To ensure that the groups and conditions were matched in terms of the positive memories they recalled, we compared self-reported ratings of positivity and vividness (see Table 2 for means and standard deviations). The average rated positivity of the autobiographical memories was high, and there were no differences in positive ratings between groups, $F(1, 56) = 1.06$, $p > .05$, or conditions, $F(1, 56) = .75$, $p > .05$, and no group × condition interaction, $F(1, 56) = .92$, $p > .05$. Memories that were recalled were also highly vivid, and there were no differences in vividness ratings between diagnostic groups, $F(1, 56) = .22$, $p > .05$, conditions, $F(1, 56) = .00$, $p > .05$, and no interaction, $F(1, 56) = 1.66$, $p > .05$. To evaluate memory specificity, memories were defined as specific if they occurred at a particular place and time and lasted for less than one day (Williams & Broadbent, 1986). All memories were rated by one rater (AW-S).[3] The proportion of specific memories reported by the sample was high (87%), and there were no differences in specificity between depressed and recovered depressed groups, $F(1, 56) = .01$, $p > .05$, nor between abstract or concrete conditions, $F(1, 56) = .00$, $p > .05$, and there was no interaction, $F(1, 56) = 2.57$, $p > .05$. Together, these analyses show that the memories recalled by remitted and depressed participants did not differ in valence, vividness, or specificity.

Mode of Processing

To ensure that the processing mode manipulation had the intended effect, we conducted a 2 (Group: currently depressed, recovered depressed) × 2 (Condition: abstract, concrete) ANOVA

[3] To obtain an estimate of interrater reliability, an additional independent rater with extensive experience with memory specificity guidelines re-rated 50% of the memories. There was perfect agreement between the two assessors.

with ratings of abstract/concrete thinking as the dependent variable. There was no main effect of group, $F(1, 56) = 0.39$, $p > .05$, and no group × condition interaction, $F(1, 56) = 1.37$, $p > .05$, but importantly, there was a main effect of condition, $F(1, 56) = 14.18$, $p < .05$. As intended, and regardless of depressive status, participants who were allocated to the abstract processing task reported thinking in a more abstract and less concrete way ($M = 6.73$, $SE = 0.34$) than those allocated to the concrete processing condition ($M = 4.92$, $SE = 0.34$).

To examine the effect of processing mode on mood we conducted a 2 (Group: currently depressed, recovered depressed) × 2 (Condition: abstract, concrete) × 2 (Time: after mood induction, after processing task) mixed-model ANOVA with repeated measures on the third factor and sad mood ratings as the dependent variable. There was a main effect of time, $F(1, 56) = 31.31$, $p < .05$, and condition, $F(1, 56) = 13.16$, $p < .05$, but no main effect of group, $F(1, 56) = .41$, $p > .05$. The analysis also yielded a time × group interaction, $F(1, 56) = 14.66$, $p < .05$ and a time × condition interaction, $F(1, 56) = 9.68$, $p < .05$, but no group × condition interaction, $F(1, 56) = .02$, $p > .05$, nor a time × group × condition interaction, $F(1, 56) = 1.02$, $p > .05$. To deconstruct the time × group interaction, follow-up paired samples *t*-tests were conducted. Results indicated that when mode of processing was collapsed across groups, currently depressed individuals did not show a change in sad mood ratings following the processing induction, $t(28) = .97$, $p > .05$, while for formerly depressed individuals, mood improved, $t(30) = 6.99$, $p < .05$. To deconstruct the time × condition interaction, we conducted follow-up paired samples *t*-tests and found that, as predicted, individuals instructed to focus on the concrete, sensory aspects of their positive memories showed an improvement in mood as a result of the task, $t(29) = 7.39$, $p < .05$, while for those instructed to process their positive memories abstractly, mood did not change, $t(29) = 1.33$, $p > .05$ (See Figure 2).[4] In summary, individuals instructed to focus on the concrete, sensory aspects of their positive autobiographical memories benefitted emotionally irrespective of depressive status, while the abstract processing of positive memories did not improve mood.

Discussion

We predicted that (i) a concrete processing mode would result in an improvement in mood following positive memory recall and (ii) an abstract processing mode would maintain or exacerbate induced low mood. Our results supported both hypotheses. Abstract processing of positive memories was shown to be maladaptive in that it did not facilitate recovery from low mood. Conversely, concrete processing enabled depressed and recovered depressed individuals to derive emotional benefit from the recall of happy memories—an effect observed among healthy volunteers in previous work (e.g., Joormann et al., 2007). Further, we found that the processing mode inductions which either improved (concrete) or maintained (abstract) low mood appeared to operate in comparable ways independently of whether the individual was depressed or had recovered from depression. As each processing mode was associated with a distinct set of functional outcomes, they will be discussed individually.

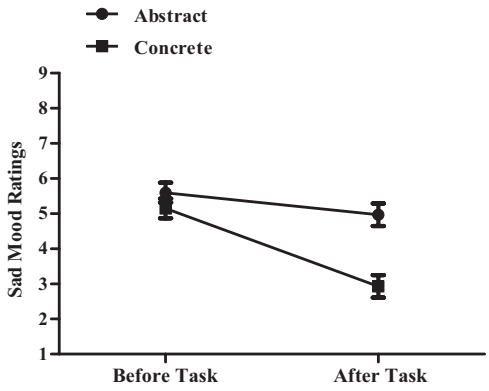

Figure 2. Mean (and *SE*) for sad mood ratings before and after the memory processing task.

Abstract Processing

Our finding that an abstract processing mode may hinder mood improvement fits with the considerable literature highlighting the adverse consequences of analytical/abstract rumination (e.g., Watkins & Moulds, 2005). Our study represents a unique extension of knowledge in this area by identifying that abstract processing may be involved in the ability of depressed and formerly depressed individuals to effectively use positive memory recall to improve mood. Evidence suggesting that an abstract processing mode exacerbates (or at the very least maintains) low mood supports the notion that a ruminative cycle of thought is a likely candidate for preventing mood repair—an effect that has been shown to be characteristic of healthy populations (e.g., Joormann & Siemer, 2004; Joormann et al., 2007).

While our study was the first (to our knowledge) to explicitly examine the impact of processing mode on mood repair, parallels between our results and those of Joormann et al. (2007) warrant discussion. Consistent with Joormann et al., we found that depressed and recovered depressed individuals do not report improved mood after they had recalled a positive memory. The key difference between these studies is that we showed this to be the case only when participants recalled happy memories in a ruminative, abstract way. Although Joormann et al. did not include a processing mode manipulation, the consistency between our pattern of findings for depressed and recovered depressed participants in the abstract condition, and Joormann et al.'s results for clinical groups might reflect a the natural propensity for depressed and recovered individuals to adopt a ruminative processing mode while in a low mood. Alternatively, the inverse could be true in that adopting a concrete processing mode may be necessary to enable positive memories to improve mood—something that depressed and formerly depressed individuals may not do spontaneously.

[4] In keeping with the analytic approach taken by Joormann et al. (2007) we also conducted an analysis using an aggregate of sad, bad, and reverse-scored happy items. We obtained the same pattern of results, including the critical time by condition interaction, $F(1, 56) = 9.55$, $p < .05$. Follow-up *t*-tests supported the same interpretation as that made for sad mood ratings alone—that individuals who processed their positive memories in a concrete way experienced improved mood, $t(29) = 3.03$, $p < .05$, while for those in the abstract processing condition mood did not change, $t(29) = .27$, $p > .05$.

One important difference in the findings of the two studies was Joormann et al.'s demonstration that formerly depressed individuals reported no change in mood following the memory task, but currently depressed individuals showed a worsening of mood. In contrast, we did not detect a difference in mood following memory recall as a function of depressive status. Instead, our statistical results indicated that depressed and recovered depressed individuals showed comparable affective responses following positive memory recall (within each of the processing mode conditions). There are a number of likely reasons for this difference. First, we used a smaller sample than did Joormann et al. Decreased power may have reduced our ability to detect a difference between these groups, a difference that we may have expected in the abstract processing mode group. Although not statistically significant, an examination of means for our recovered and depressed groups within the abstract processing condition suggests that our depressed participants reported worse mood following the abstract processing induction than formerly depressed individuals (see Table 2). Second, our recovered depressed group were more chronic than the recovered sample used in Joormann et al.'s study in that they (i) had experienced a greater number of depressive episodes and (ii) were more symptomatic. Unlike Joormann et al., we did not exclude participants based on the presence of subthreshold residual symptoms because these symptoms are common in recovered groups and, furthermore, have been found to predict recurrence (Judd et al., 2000).

Concrete Processing

Our results indicated that a concrete processing mode enabled positive memory recall to have a reparative effect on mood for depressed and recovered participants. Previous findings have shown that distraction is effective in alleviating the deficit in mood repair experienced by this sample (Joormann et al., 2007). It is conceivable that a concrete processing mode could (to a degree) function in a similar way to distraction in the sense that in both inductions the individual is instructed to focus *away from* the discrepancy between their current state and themselves at a previous, happier time. Processing memory in a concrete way may serve the same function as distraction insomuch as participants are doing something that prevents them from making comparisons between their previous and current selves—the ruminative process that we propose contributes to difficulty with mood repair. Alternatively, concrete processing could be emotionally beneficial because of the aforementioned features that it shares with imagery. We expect that pairing highly sensory imagery with an emotionally laden, personally relevant memory may have given participants the greatest chance possible of being able to capitalize on the mood reparative effects associated with positive memory recall among healthy individuals. Whether concrete processing is helpful because of features shared with imagery or because it induces a processing mode antithetical to rumination, or indeed whether it is a combination of the two will need to be clarified and empirically addressed in future research.

The Involvement of Imagery

Our results are also consistent with evidence from the imagery literature which suggests that focusing on the sensory aspects of positive material is more emotionally powerful than verbal representations of the same events (Holmes et al., 2009). Interestingly, the potency of mental imagery for eliciting emotion has been well-documented and applies to both positive and negative material such that imagery elicits a stronger affective response than the verbal processing of the same material irrespective of valence (for review see Holmes & Mathews, 2010). If, as proposed previously, concrete processing is akin to mental imagery, and abstract to verbal processing, our findings have important consequences for the processing of material according to valence. In terms of positive memory, as our data suggests, it would be clinically advantageous for depressed and formerly depressed individuals to adopt a concrete processing mode during positive memory recall as a way to derive emotional benefits. However, in the case of negative memory, we would expect a concrete processing mode to produce stronger emotional effects, which would result in an amplification of negative emotion in the short term but more successful emotional processing in the long term. In any case, we suspect that flexibility in the application of processing mode as determined by contextual factors and the valence of material being processed will be important variables to consider to produce clinically beneficial outcomes (see Watkins, 2008).

Clinical Implications

Our findings suggest some important ways that existing therapeutic techniques used to treat depression could be improved. First, capitalizing on treatments that promote concrete processing could be particularly advantageous. One study recently found that training individuals to think more concretely about emotional events resulted in a reduction in depressive symptoms and rumination (Watkins & Moberly, 2009). Second, the utility of reducing rumination and increasing concreteness could be relevant not only for the treatment of in-episode depression but also prophylactically as a way to reduce relapse. For example, a case series targeting residual depression symptoms by explicitly addressing ruminative processes was found to be very effective with high response and remission rates (Watkins et al., 2007). Also in the context of relapse prevention are mindfulness-based cognitive–behavioral therapy treatments which essentially encourage individuals to switch from ruminative, abstract ways of thinking and take a more concrete approach by attending to the present moment and experiencing the world in a moment-by-moment manner (Segal, Williams, & Teasdale, 2002; Teasdale, 1999). The promising outcomes from interventions that seek to reduce rumination and/or train concreteness underscores the involvement of processing mode in depressive disorders as well the importance of ongoing research in this area.

Limitations

Our study is not without a number of limitations that deserve mention. First, we did not include a healthy comparison group. We made this decision because our research focus was to investigate the mechanism underlying the mood repair deficit experienced by depressed and depression vulnerable individuals. The inclusion of a control group would clarify the degree to which the effects of the processing mode manipulation generalize to healthy individuals. Second, previous work has suggested that a field vantage perspec-

tive contributes to the positive emotional impact of positive material (Holmes, Coughtrey & Connor, 2008). While care was taken in our study to ensure that groups were matched on important memory characteristics, in order to replicate the methodology of Joormann et al. (2007) we did not provide any instruction as to the vantage perspective from which to recall the memory. Future work will therefore need to examine the role of vantage perspective in this context. Finally, while our mood induction procedures followed those of Joormann et al. (2007), the use of nonequivalent mood inductions represents a key limitation in mood induction research with clinical groups. From a scientific perspective, this is not ideal. Of note is that our depressed sample actually reported a slightly improved mood as a result of the neutral mood induction. We expect that the clip was sufficiently distracting from participants' depressed state that it improved mood. Future studies would benefit from using a variety of mood elicitation procedures that examine naturally occurring low mood and induced low mood in a more systematic way.

Conclusions

The present study represents the first experimental investigation of possible mechanisms underlying the mood repair deficit evident among depressed and formerly depressed individuals. We found that an abstract processing mode prevented mood repair, while a concrete mode of processing enabled positive memory recall to improve mood. These results suggest that our treatments for depressive disorders might be improved by explicitly targeting processing mode.

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Appendix A

Processing Mode Induction Details

Ten prompts were designed to induce an abstract mode of processing and encourage ruminative comparisons between the participant's current life and circumstances and the content of their happy memory. Items such as "How did you think your life would turn out when this event took place?" and "How is your life different now to how it was then?" were included. The ten prompts for this condition were designed to orient the participants to the sensory, concrete aspects of the experience and included items such as "Imagine what your surroundings looked like" and "What were the sensations going through your body during the event."

To ensure that the induction was effective in inducing the mode of processing intended, participants were instructed to indicate how much they were thinking in an abstract or concrete way during the task, where 1 = *not at all abstract, completely concrete* and 9 = *extremely abstract, not at all concrete*. This item was taken from Watkins & Teasdale (2001), and following their procedure participants were provided with information and examples of each processing mode to assist them in making ratings.

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