Running Head: CONCRETENESS OF DEPRESSIVE RUMINATION AND TRAUMA
RECALL

Concreteness of Depressive Rumination and Trauma Recall in Individuals with
Elevated Trait Rumination and/or Posttraumatic Stress Symptoms

Abstract

The present study sought to compare the cognitive characteristics of depressive rumination and trauma recall in participants with high trait rumination and/or high levels of posttraumatic stress symptoms (PTSS), as well as in participants with normative levels of these variables.

Specifically, we sought to compare the degree to which periods of depressive rumination and trauma recall were characterized by verbal-linguistic versus imagery-based activity and abstract versus concrete thought. We also explored whether these characteristics differed between participants with high trait rumination and/or high levels of PTSS, as well as participants with normative levels of trait rumination and PTSS. We found that for all participants, depressive rumination was characterized by increased verbal-linguistic activity, whereas trauma recall was characterized by increased imagery-based activity. We also found that individuals with both high trait rumination and high levels of PTSS evidenced lower levels of imagery-based activity during all repetitive thinking periods, as well as lower levels of concreteness during depressive rumination. Theoretical and clinical implications of these findings are discussed.

Keywords: repetitive thinking, depressive rumination, trauma recall, concreteness

Concreteness of Depressive Rumination and Trauma Recall in Individuals with Elevated Trait Rumination and/or Posttraumatic Stress Symptoms

Depressive rumination and trauma recall are types of repetitive, negative thinking (RNT) that are elevated in psychiatric populations and are associated with unconstructive consequences (Behar, Zullig, & Borkovec, 2005; Watkins, 2008). The cognitive characteristics of RNT may help explain negative outcomes such as increased depression or anxiety. To gain a better understanding of the role RNT may play in the onset and maintenance of different psychological conditions, experimental studies have investigated two key cognitive characteristics of RNT – verbal-linguistic versus imagery-based thinking and abstractness versus concreteness of thinking (e.g., Behar et al, 2005; Goldwin & Behar, 2012; McLaughlin, Borkovec, & Sibrava, 2007).

Previous evidence suggests that RNT characterized by a predominance of verbal-linguistic mental activity may contribute to the suppression of somatic reactivity (Vrana, Cuthbert, & Lang, 1986) that could, in turn, interfere with successful emotional processing (Foa & Kozak, 1986) and therefore maintain symptoms of anxiety and depression. Whereas imagery-based mental activity is theoretically associated with more complete accessing of the fear structure in memory and the facilitation of emotional processing, verbal-linguistic mental activity is theoretically associated with incomplete accessing of the fear structure and thus with incomplete emotional processing (Borkovec, Alcaine, & Behar, 2004). Both worry and depressive rumination are characterized by a predominance of verbal-linguistic activity as opposed to imagery-based activity, with worry being particularly evocative of verbal-linguistic activity. This pattern of results appears both in an unselected sample of undergraduates and in a sample selected for high levels of worry and/or rumination (McLaughlin et al., 2007). When comparing worry and trauma recall, worry is characterized by a predominance of verbal-

linguistic activity, whereas trauma recall is characterized by a predominance of imagery-based activity; this pattern of results is found both in an unselected sample and in a sample of individuals selected on the basis of generalized anxiety disorder symptoms and past trauma status (Behar et al., 2005). Together, these findings provide evidence for the verbal-linguistic nature of worry and depressive rumination and the imagery-based nature of trauma recall in individuals with elevated psychiatric symptoms and in individuals with a greater tendency to engage in RNT. However, no published studies to date have directly compared the characteristics of depressive rumination and trauma recall in a selected population.

In addition to increased verbal-linguistic activity, reduced concreteness of thought may help to explain the negative consequences of RNT. Abstract thought is defined as “indistinct, cross-situational, equivocal, unclear, aggregated,” whereas concrete thought is defined as “distinct, situationally specific, unequivocal, clear, singular” (Stöber & Borkovec, 2002, p. 92). Abstractness and concreteness of thought are considered to lie on opposite ends of a continuum; that is, the more abstract one’s thinking is, the less concrete it is. When focused on negative content, abstract thinking is more likely to be associated with maladaptive consequences relative to concrete thinking (Watkins, 2008). Furthermore, current research posits that an individual’s concreteness of thought is state-dependent and related to the topic about which one is thinking; for example, whereas the “why” details of an action tend to be more abstract, the “how” aspects tend to be more concrete (Trope & Liberman, 2003).

One mechanism by which concreteness of thought might influence the effects of RNT is via the degree of generalization employed in response to an emotional event (Watkins, 2008). Because abstract thoughts are decontextualized and do not contain situation-specific details (Trope & Liberman, 2003), individuals may interpret a single negative event as stable or global.

Accordingly, abstract thinking about a negative, emotional event could lead to negative overgeneralizations. For example, an individual who thinks abstractly about a single failure might believe that she will never succeed in the future. Similarly, an individual who thinks abstractly about a single traumatic experience might believe that he is in constant danger. On the other hand, an individual who actively and concretely thinks about a past trauma may be less likely to generalize the trauma experience. This person would, in turn, be less likely to view the world as a dangerous place in which he is vulnerable, and would therefore be less likely to suffer from symptoms of anxiety.

Finally, reduced concreteness of thought may be related to increased verbal-linguistic activity, and these two characteristics may jointly interfere with successful emotional processing and contribute to the maintenance of negative emotional states. For example, Stöber and colleagues' reduced concreteness theory of worry (Stöber, 1998; Stöber, Tepperwien, & Staak, 2000) posits that reduced concreteness contributes to the reduction of images and, accordingly, to the maintenance of anxiety. By avoiding more concrete, catastrophic images, individuals reduce the activation of the response element of the fear structure (physiological activation), thereby precluding emotional processing of fear cues (Foa & Kozak, 1986). Thus, the less one processes information at a concrete level, the less emotional processing one is likely to achieve.

Previous studies have examined the influence of level of concreteness of thought on both depressive rumination and trauma-related rumination. For example, Goldwin and Behar (2012) found that a period of depressive rumination about a personally relevant past negative event was significantly less concrete compared to a period of uninstructed mentation. Furthermore, studies have compared the effects of abstract versus concrete depressive rumination on cognitive processes associated with increased vulnerability to depression. Among depressed individuals,

abstract or overgeneral thinking is associated with reduced specificity of autobiographical memory recall (Watkins & Teasdale, 2001, 2004), impaired social problem solving (Watkins & Moulds, 2005), and increased global negative self-judgments (Rimes & Watkins, 2005). Also, individuals with higher levels of trait repetitive thinking who engage in abstract thinking about previous failures demonstrate poorer emotional processing as indicated by slower emotional recovery to previous failures (Watkins, 2004) and greater emotional reactivity to subsequent failures (Moberly & Watkins, 2006) relative to those who engage in concrete thinking. Together, these studies provide preliminary evidence for the reduced concreteness of depressive rumination and poorer emotional processing subsequent to depressive rumination.

Studies have also examined the effects of abstract versus concrete thinking about traumatic events. In one study, motor vehicle accident survivors' level of concreteness during an iterative rumination task about the accident predicted subsequent PTSS better than did rumination frequency alone (Ehring, Frank, & Ehlers, 2008). In an experimental study of the effects of trauma-related rumination on PTSS, participants were shown a film of real-life footage of the aftermath of a road traffic accident (Ehring, Szeimies, & Schaffrick, 2009). Compared to concrete thinking, abstract thinking about the traumatic film led to longer persistence of some PTSS, including negative mood and arousal, and may have interfered with the beneficial effects of concrete trauma-related thinking (including elaboration of trauma memories and modification of excessive negative appraisals). Together, these studies provide preliminary evidence of increased PTSS following abstract trauma-related rumination.

Rumination plays an important role in the maintenance of PTSS (Ehlers & Clark, 2000) and predicts persistent PTSS and posttraumatic stress disorder (PTSD; Clohessy & Ehlers, 1999; Ehlers, Mayou, & Bryant, 1998; Murray, Ehlers, & Mayou, 2002; Steil & Ehlers, 2000). In

addition to engaging in rumination while recalling traumatic events, individuals with elevated PTSS experience imagery-based memories as well (Michael, Halligan, Clark, & Ehlers, 2007; Zetsche, Ehring, & Ehlers, 2009). Although evidence suggests that individuals attempt to use rumination as a strategic form of cognitive avoidance to cope with intrusive memories (Michael et al., 2007), trauma-related rumination paradoxically triggers such memories (Birrer, Michael, & Munsch, 2007). If rumination is a cognitive attempt to avoid intrusive imagery, rumination could interfere with successful emotional processing and could therefore maintain PTSS (Ehring et al., 2008). Many studies have separately examined trauma-related rumination and intrusive memories to elucidate the characteristics associated with these two types of thinking (e.g., Ehlers & Clark, 2000; Joseph, Williams, & Yule, 1997); however, this approach separates cognitive processes that, although phenomenologically distinct, typically interact. Accordingly, these investigations preclude conclusions about the nature of naturally occurring repetitive thinking about traumatic events. Specifically, the characteristics of trauma-related rumination or intrusive memories in isolation may not generalize to those of trauma recall, which includes both trauma-related rumination and intrusive memories.

There is also evidence suggesting that key trait variables predict the development of maladaptive emotional states. For example, trait rumination predicts the onset and severity of PTSS following traumatic events (Nolen-Hoeksema & Morrow, 1991). Also, repetitive thinking about a traumatic event predicts persistence of PTSD following road accidents (Ehlers et al., 1998; Mayou, Bryant, & Ehlers, 2001; Mayou, Ehlers, & Bryant, 2002; Murray et al., 2002) and assaults (Halligan, Michael, Clark, & Ehlers, 2003; Michael, Ehlers, Halligan, & Clark, 2005). It may be that individuals with both elevated PTSS and the trait tendency to engage in rumination are more likely to engage in RNT characterized by indices of incomplete emotional processing

(e.g., decreased imagery-based activity, decreased concreteness of thought). By gaining a better understanding of the combined effects of elevated trait rumination and PTSS on the quality of RNT, the mechanism by which rumination maintains PTSS may be elucidated. No study to date has compared the cognitive characteristics of depressive rumination and trauma recall among individuals with normative and elevated levels of PTSS and trait rumination, elevated PTSS only, elevated trait rumination only, and individuals who experience normative levels of each variable. Such an investigation could contribute to the field's understanding of how different types of RNT play a role in the maintenance of psychological conditions.

The current study aimed to compare the characteristics of depressive rumination (defined as “repetitive mental activity about a past event that was distressing but not associated with a traumatic event”) and trauma recall (defined as “repetitive mental activity about some past traumatic event”). Participants with high trait rumination and/or high levels of PTSS, as well as participants with normative levels of these variables, were selected to test whether levels of imagery-based activity and concreteness of thought of individuals with greater tendencies to engage in RNT differed from the cognitive characteristics of individuals with normative levels of RNT. By selecting participants who scored highly on one, both, or neither of these variables, we were able to identify the effects of trait rumination and PTSS, both separately and in concert, on the cognitive characteristics of RNT.

We posed two primary hypotheses based on previous findings. First, consistent with evidence regarding the nature of depressive rumination (Goldwin and Behar, 2012; McLaughlin et al., 2007) and trauma recall (Behar et al., 2005), we expected that a state of depressive rumination would be characterized by lower levels of imagery-based activity and lower concreteness relative to a baseline mentation period and a state of trauma recall. Second,

consistent with previous research indicating that rumination may interfere with successful emotional processing and contribute to the maintenance of PTSS (Ehring et al., 2008), we expected that individuals reporting high trait rumination and elevated PTSS would be most likely to demonstrate correlates of poor emotional processing during negative thinking – namely, reduced concreteness and reduced imagery-based activity.

Methods

Participants

Over the course of two semesters, 1003 introductory psychology students were administered a measure of trait rumination (Ruminations Inventory [RI]) and a measure of PTSS (Posttraumatic Stress Disorder Checklist [PCL]). Of this initial sample, 416 individuals met inclusion criteria for the study. Inclusion criteria consisted of participants being 18-64 years old, having experienced at least one traumatic event at any time in their lives, and meeting criteria for one of four trait groups (detailed below). The final sample consisted of 111 participants (76.4% female) with a mean age of 19.4 years ($SD = 1.7$). The sample was 32.1% Caucasian, 23.9% Hispanic, 18.3% Asian, 15.5%, and African-American, with 10.2% identifying as “Other.” Participants were selected based on their responses to the RI and the PCL and were identified as comprising four groups created by crossing high and normative levels of trait rumination and PTSS: (1) high trait rumination/high PTSS (HR/HP; $n = 23$); (2) high trait rumination only (HR-only; $n = 13$); (3) high PTSS only (HP-only; $n = 25$); (4) and control participants (C; $n = 50$). The HR/HP group was identified as having a score of more than 1 SD above the sample mean¹ on both the RI (scores of 57 and above) and the PCL (scores of 52 and above). The HR-only group had a score of more than 1 SD above the mean on the RI and a score on the PCL within 0.5 SD of the mean (scores between 30 and 44). The HP-only group had a score on the PCL of more

than 1 SD above the mean and a score on the RI within 0.5 SD of the mean (scores between 43 and 52). The C group fell within 0.5 SD of the means of the RI and the PCL. Table I presents the means and standard deviations of the screening measures for each symptom group. All participants received research credit as compensation for their participation.

Screening Measures

Ruminations Inventory (RI; Martin, Tesser, & McIntosh, 1993; McIntosh & Martin, 1992). The RI is a 10-item measure designed to assess ruminative thought that is repetitive and aversive. Participants respond on a 1 (*does not describe me well*) to 7 (*describes me well*) scale. The RI assesses rumination in a global manner which is more consistent with the type of rumination used in our induction procedures than measures focusing on responses to depressed mood (as does the Response Style Questionnaire; Nolen-Hoeksema, 1991). This measure has demonstrated favorable construct validity (McIntosh & Martin, 1992) and has been used in previous studies of repetitive thought and rumination (McLaughlin et al., 2007; Segerstrom, Stanton, Alden, & Shortridge, 2003). Scores on the RI are positively and significantly correlated with depressive symptoms (Harrington & Blakenship, 2002; McIntosh & Martin, 1992). The RI demonstrated acceptable internal consistency in this sample ($\alpha = 0.55$). To our knowledge, there is no published clinical cutoff available for the RI.

Posttraumatic Stress Disorder Checklist (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993). The PCL is a 17-item self-report measure of the symptoms associated with a diagnosis of PTSD. Participants respond on a 1 (*not at all*) to 5 (*extremely*) Likert Scale to indicate how much they have been bothered by a problem in the last month. To assess intensity of PTSS, a total symptom severity score (range = 17-85) can be obtained by summing the scores from each of the 17 items. The PCL has good internal consistency and convergent validity

(Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Ruggiero, del Ben, Scotti, & Rabalais, 2003) and is efficient in detecting cases of PTSD in a sample of college students with a clinical cutoff of 44 and above (Ruggiero et al., 2003). The PCL demonstrated good internal consistency in this sample ($\alpha = 0.88$). To index exposure to a traumatic event, we asked participants to complete the following statement prior to completing the PCL, “The event you experienced was _____ (event) on _____ (date).” All participants who completed this statement were considered to have experienced a prior traumatic event regardless of whether the event listed was consistent with Criterion A (APA, 2000) standards.

Procedure

Experimental sessions were run in groups of 8 to 12 participants in a group testing room. Each individual signed an informed consent form and then received an experimentation packet that included all instructions and materials for the study. Depressive rumination was defined as “repetitive mental activity about a past event that was distressing but not associated with a traumatic event.” Trauma recall was defined as “repetitive mental activity about some past traumatic event.” This definition was intentionally broad in an attempt to induce a period of naturally occurring repetitive thinking about traumatic events that could theoretically involve both trauma-related rumination and trauma-related imagery.

All participants were asked to identify at least one and up to three past negative events and at least one and up to three past traumatic events about which they currently think with at least some frequency. Participants reported an average of 2.37 ($SD = 0.72$) depressive rumination topics and 2.24 ($SD = 0.81$) traumatic events. All participants reported at least one depressive rumination topic and one traumatic event (see Table II for categories of topics/events). Once these events had been recorded, participants engaged in three 4-minute-

long induction periods. All participants were first asked to undergo a baseline mentation period (“Close your eyes and think about anything you would like”). Next, participants engaged in counterbalanced periods of depressive rumination and trauma recall. Prior to engaging in each repetitive negative thinking period, participants were asked to refer to their list of identified events. For the depressive rumination period, they were instructed to “Close your eyes and ruminate about a past negative event in your usual fashion and as intensely as you can.” For the trauma recall period, they were instructed to “Close your eyes and recall a traumatic experience in your usual fashion and as intensely as you can.” Participants were asked to focus their attention on the task as much as possible, and that if they noticed their minds wandering, they should gently redirect their attention to the selected topic. After completing all three inductions and the corresponding ratings, participants engaged in a period of relaxation and deep breathing in order to reduce any negative effects of having engaged in the two negative thinking inductions. Participants were informed that they would be interrupted four times (once every minute) over the course of each induction period and asked to indicate the degree (0-100%) to which their mental content over the preceding period involved thoughts, images, or “other” (neither thoughts nor images)², as well as to record the contents of their thoughts at the moment of interruption (hereafter referred to as “thought samples”).

Dependent Measures

Mental content ratings. Participants were asked to report the percentage of thoughts and percentage of images they experienced during a given period, using a 0-100% scale. Thoughts were defined as “words you are saying to yourself,” and images were defined as “pictures in your mind.”

Concreteness ratings. All thought samples ($N = 1332$) were rated for degree of concreteness by three independent raters who had been trained in Stöber's (1998) coding system. Stöber's system defines abstract thought as "indistinct, cross-sectional, equivocal, unclear, aggregated" and concrete thought as "distinct, situationally specific, unequivocal, clear, singular." The rating scale includes five categories with higher values indicating greater concreteness ($1 = abstract$, $3 = neither abstract nor concrete$, $5 = concrete$). Previous studies using this measure report excellent reliability (e.g., intraclass coefficient [ICC] = 0.97; Stöber, et al., 2000). All three raters were blind to condition and to the purpose and hypotheses of the study. Raters were trained by the first author using a collection of thought samples unrelated to the current study. Coding meetings entailed discussing individual coders' independent ratings in order to arrive at a single consensus rating for each thought sample. This consensus rating was utilized for all data analyses. To calculate the interrater reliability of the coders' original ratings, we followed McGraw and Wong's (1996) guidelines for selecting the appropriate intraclass coefficient (ICC). We utilized a two-way mixed model with measures of absolute agreement with coders treated as a fixed factor and the ratings treated as a random factor. The reliability of coders' original ratings was good (ICC = 0.75).

Results

Statistical Analyses

A 4 (Group: HR/HP, HR-only, HP-only, C) X 3 (Induction: baseline, depressive rumination, trauma recall) mixed model analysis of variance (ANOVA), with Group as a between-subjects variable and Induction as a within-subjects variable, was conducted on each dependent variable. Induction order (Rumination first, Trauma Recall first) was entered as a

covariate for all analyses. All significant effects were followed up with Holm-Bonferroni-corrected *post-hoc* analyses.

Preliminary Analyses

Equivalence at baseline. To test for baseline differences prior to inductions, a one-way multivariate ANOVA (Group) was performed on age, percentage of thoughts, and percentage of images during the baseline mentation period. Chi-square analyses were conducted to assess equivalence among groups on sex ($\chi^2 = 5.19, p = .16$) and ethnicity ($\chi^2 = 6.30, p = .90$). No significant between-groups effects emerged, indicating that the four symptom groups did not systematically differ on demographic characteristics or the content of mental activity during the baseline mentation period.

Manipulation check. At the conclusion of the depressive rumination and trauma recall periods, participants were asked to report the percentage of time they had spent actually engaging in the task. Participants reported actively ruminating during 68.61% ($SD = 24.90$) of the depressive rumination induction and recalling a traumatic event during 71.93% ($SD = 20.95$) of the trauma recall induction. These values were not significantly different, $t(83) = 1.08, p = .28$.

Verbal-linguistic and Imaginal Activity During Negative Repetitive Thinking

We ran two separate 4 (Group) X 3 (Induction) mixed model ANOVAs on the percentage of thoughts and images reported. For the percentage of thoughts analysis, results indicated a main effect of Induction, ($F[2,210] = 7.29, p = .001, \eta^2 = .07$). Depressive rumination ($M = 64.62, SD = 22.18$) was characterized by significantly higher levels of verbal-linguistic activity than either trauma recall ($M = 48.56, SD = 22.99; p < .001; d = 0.72$) or baseline mentation ($M = 58.36, SD = 22.58; p = .02, d = 0.28$). Also, baseline mentation was characterized by

significantly higher levels of verbal-linguistic activity than was trauma recall ($p = .01$, $d = 0.43$). No results involving Group emerged, ($F[3,105] = 2.30$, $p = .08$, $\eta^2 = .06$).

For the percentage of images analysis, results indicated a main effect of Induction, ($F[2,210] = 10.95$, $p < .001$, $\eta^2 = .09$). Trauma recall ($M = 48.11$, $SD = 22.32$) was characterized by significantly higher levels of imagery-based activity than was either depressive rumination ($M = 31.11$, $SD = 21.28$; $p < .001$, $d = 0.78$) or baseline mentation ($M = 36.60$, $SD = 20.79$; $p < .001$, $d = 0.53$). Depressive rumination and baseline were not characterized by significantly different levels of imagery-based activity ($p = .09$; $d = 0.26$). Results also indicated a main effect of Group, ($F[3,105] = 3.17$, $p = .03$, $\eta^2 = .08$). The HR/HP group ($M = 34.37$, $SD = 17.62$) reported significantly lower levels of imagery than did the HR-only group ($M = 48.77$, $SD = 16.84$; $p = .01$, $d = 0.83$).

Concreteness of Negative Repetitive Thinking

We ran a 4 (Group) X 3 (Induction) mixed model ANOVA on concreteness ratings. Results indicated a marginally significant main effect for Group ($F[3,105] = 2.68$, $p = .05$, $\eta^2 = .07$) and a significant main effect of Induction ($F[2,210] = 4.53$, $p = .01$, $\eta^2 = .04$), both of which were qualified by a significant Group X Induction interaction ($F[6,210] = 2.49$, $p = .03$, $\eta^2 = .07$). Simple effects analyses indicated that levels of concreteness did not differ across the four groups during the baseline period ($F[3,105] < 1$, $\eta^2 = .01$) or during trauma recall ($F[3,105] < 1$, $\eta^2 = .01$). However, levels of concreteness during depressive rumination did differ across groups ($F[3,105] = 6.10$, $p = .001$, $\eta^2 = .15$), with participants in the HR/HP group ($M = 3.12$, $SD = 0.89$) evidencing lower concreteness relative to participants in the HR-only ($M = 4.02$, $SD = 0.77$; $p < .01$, $d = 1.08$) and C ($M = 3.77$, $SD = 0.72$; $p < .05$, $d = 0.80$) groups (see Figure I).

Discussion

Our results provide important information about the basic nature of both depressive rumination and trauma recall. Depressive rumination was characterized by greater verbal-linguistic activity than was either trauma recall or a baseline mention period (as consistent with Goldwin & Behar, 2012; McLaughlin et al., 2007). Conversely, trauma recall was characterized by greater imagery-based activity relative to depressive rumination and a baseline mention period (as consistent with Behar et al., 2005). Thus, our results support Ehrling and Watkins' (2008) view that trauma recall has unique characteristics that distinguish it from other forms of RNT such as worry and depressive rumination. These other forms of RNT are typically associated with a predominance of verbal-linguistic activity as well as reduced concreteness, reduced imagery-based activity, and reduced physiological reactivity to threat stimuli (Behar et al., 2005; Ehrling et al., 2008; Glynn, Christenfeld, & Gerin, 2002; Goldwin & Behar, 2012; McLaughlin et al., 2007). These characteristics have been theorized to lead to compromised emotional processing (Borkovec & Hu, 1990; Foa & Kozak, 1986; Vrana, Cuthbert, & Lang, 1986). In contrast, trauma recall seems to be uniquely associated with greater levels of imagery-based activity (the current study; Behar et al., 2005) and greater physiological reactivity (Pennebaker et al., 1987), both of which are theoretically associated with enhanced emotional processing (e.g., Foa & Kozak, 1986).

Analyses comparing the four groups provided additional information regarding the concreteness of negative thinking periods. Baseline and trauma recall periods were characterized by equivalent levels of concreteness across the four trait groups. In contrast, depressive rumination was associated with lower levels of concreteness for individuals with high levels of both trait rumination and PTSS symptoms relative to control participants and individuals with

high trait rumination only. Thus, the co-occurrence of high trait rumination and high levels of PTSS is associated with reduced concreteness during a period of depressive rumination. Also, the presence of PTSS above and beyond the presence of high trait rumination was associated with an inhibition of imaginal activity. The emerging picture, then, is one in which individuals with high trait rumination *and* high levels of PTSS evidence lower levels of imaginal activity and lower levels of concreteness during depressive rumination.

Multiple cognitive models of PTSD posit that as intrusions increase, individuals engage in protective or avoidant mechanisms (Brewin, Dalgleish, & Joseph, 1996; Ehlers & Clark, 2000; Foa & Rothbaum, 1998; see Dalgleish, 2004 for a more detailed discussion). Ehlers and Clark's cognitive model of the maintenance of PTSD posits that individuals with PTSD negatively appraise intrusive images or memories as indicators of current threat that must be avoided; they consequently engage in maladaptive behavioral and cognitive coping strategies, including rumination, to avoid or control this threat (Ehlers & Clark, 2000). For example, individuals may attempt to cognitively avoid trauma-related images via rumination, which paradoxically could trigger more traumatic images (Birrer & Michael, 2011; Michael et al., 2005). Indeed, extant research shows that individuals with elevated PTSS are hypervigilant to threatening information (Kimble, Fleming, Bandy, Kim, & Zambetti, 2010) and that intrusive images may trigger rumination as an attempt to control the threat and to avoid the negative affect that accompanies the aversive images (Ehlers & Clark, 2000; Ehlers & Steil, 1995). Our results further indicate that one possible avoidance strategy, particularly among individuals with elevated PTSS and the trait tendency to engage in rumination, might be the use of verbalization and abstraction. Individuals may be motivated to use verbalization to disengage from or inhibit emotional arousal to aversive material (Tucker & Newman, 1981). This increased verbalization and related

abstraction likely have operant functions. Specifically, individuals with PTSS experience concrete, intrusive memories, which likely lead to increased arousal and negative emotional responses. They might then engage in abstract, verbal-linguistic rumination which serves to decrease the distress associated with traumatic memories. Thus, the use of verbalization and abstraction is reinforced, fear and negative appraisals of the trauma are maintained and strengthened, and habituation is precluded (Foa & Kozak, 1986).

Because the verbal-linguistic, abstract nature of rumination may play a role in the maintenance of and increased distress associated with persistent PTSS (Steil & Ehlers, 2000), rumination may be an important target of intervention for individuals with elevated PTSS or PTSD. If future studies in clinical samples confirm our findings regarding the nature of rumination, there are several possible important implications for treatment. Specifically, reducing the amount of rumination in which these individuals engage could lead to less cognitive avoidance and, accordingly, more complete emotional processing. In a study of survivors of genocide, a brief rumination-focused intervention that incorporated components of cognitive-behavioral treatments for PTSD (Ehlers & Clark, 2000) and rumination-focused treatment for depression (Watkins & Baracaia, 2002) was successful in reducing PTSS (Sezibera, Van Broeck, & Philippot, 2009). Also, concreteness training paradigms that focus on increasing concreteness of thought during rumination have proven to be effective in reducing the maladaptive consequences of abstract rumination in individuals with high levels of PTSS (Vrielynck, Philippot, & Rimé, 2010).

A number of limitations of this study are noteworthy. First, because our manipulation check was exclusively based on self-report, we cannot verify that participants were actually engaged in the types of thinking in which they were instructed to engage. For example, it is

possible that after selecting depressive rumination and trauma recall topics, participants engaged in thinking about these negative events during the baseline period. Thus, the characteristics of our baseline period may not be representative of a neutral period of repetitive thinking. Second, because we were interested in examining the characteristics of two cognitive processes, we recruited individuals with the tendency to engage in these types of thinking as opposed to recruiting individuals who met diagnostic criteria for specific psychological disorders. Given our sample characteristics, we cannot make any claims regarding the characteristics of RNT among individuals with major depression, PTSD, or both. Future investigators should examine the characteristics of depressive rumination and trauma recall among individuals who meet criteria for these psychological disorders. Third, because experimental sessions were run in groups, we were unable to ensure that individual participants appropriately distinguished between an upsetting event and a traumatic event or selected a trauma recall topic consistent with Criterion A (APA, 2000) standards. Inspection of Table II reveals that across all four groups of participants, many of the selected traumatic events were indeed consistent with typical Criterion A events; however, we did not ensure *a priori* that participants selected traumatic events were Criterion A traumatic events. Furthermore, we cannot rule out the alternative explanation that the differences observed between depressive rumination and trauma recall may have been driven by different interpretations of upsetting and traumatic events across the four groups. Future studies employing a clinical interview rather than self-report measures could ensure that participants select traumatic events that meet Criterion A definitions and could elect to select participants who meet formal diagnostic criteria for PTSD.

Finally, because we wanted the trauma recall period to reflect traumatic thinking as it naturally occurs, we did not specify whether participants should engage in trauma-related

rumination or trauma-related imagery. This could limit the applicability of our findings to future research due to the likelihood that the *DSM-5* will include an explicit distinction between intrusive re-experiencing and trauma-related rumination in PTSD (Friedman, Resick, Bryant, & Brewin, 2011). Although we recognize that trauma-related rumination and intrusive memories are considered phenomenologically and functionally distinct phenomena (e.g., Ehlers & Clark, 2000) and that our use of trauma recall limits our ability to draw conclusions about these separate cognitive processes, we believe that our results reflect the nature of naturally occurring repetitive negative thinking, particularly in the context of findings that trauma-related rumination triggers intrusive memories (Birrer et al., 2007). To gain a better understanding of the distinct phenomena and to reflect the probable changes to the definition of PTSD in *DSM-5*, future studies should investigate the cognitive characteristics of trauma-related rumination and intrusive memories in individuals with elevated PTSS and/or individuals who meet criteria for PTSD.

In conclusion, whereas trauma recall is associated with characteristics theorized to enhance emotional processing (i.e., a predominance of imagery-based activity), depressive rumination is associated with characteristics associated with compromised emotional processing (i.e., increased verbal-linguistic activity and reduced concreteness). Furthermore, individuals high in trait rumination who also experience high levels of PTSS evidenced lower levels of imaginal activity and concreteness of thought during depressive rumination. These reductions during rumination may serve an operant function by promoting avoidance of the distress associated with imagery-based traumatic memories, ultimately leading to a maintenance and exacerbation of traumatic memories and their meaning.

Table I

Scores on Screening Measures for Each Group.

	HR/HP (<i>n</i> = 23)	HR-only (<i>n</i> = 13)	HP-only (<i>n</i> = 25)	Control (<i>n</i> = 50)	ANOVA
RI	60.70 (4.48) ^a	58.54 (2.15) ^a	48.04 (3.10) ^b	46.88 (2.91) ^b	$F(3,104) = 120.18, p < .001$
PCL	62.74 (7.34) ^a	36.62 (3.50) ^a	60.67 (6.32) ^b	36.94 (4.00) ^b	$F(3,104) = 190.10, p < .001$

Note. RI = Ruminations Inventory; PCL = Posttraumatic Stress Disorder Checklist. HR/HP = high trait rumination/high posttraumatic stress symptoms; HR-only = high trait rumination only; HP-only = high posttraumatic stress symptoms only. Means with different superscripts are significantly different with Holm-Bonferroni-corrected *post-hoc* analyses.

Table II

Depressive Rumination and Trauma Recall Topics listed by Groups

	HR/HP	HR-only	HP-only	Control	Total
Depressive Rumination Topics					
Relationships	40 (70.18%)	26 (83.87%)	38 (66.67%)	74 (66.67%)	178 (69.53%)
Academic performance	5 (8.77%)	2 (6.45%)	5 (8.77%)	13 (11.71%)	25 (9.77%)
Health/survival	5 (8.77%)	2 (6.45%)	6 (10.53%)	7 (6.31%)	20 (7.81%)
Unspecified/vague depressive rumination topic	2 (3.51%)	1 (3.23%)	5 (8.77%)	12 (10.81%)	20 (7.81%)
Appearance	2 (3.51%)	0 (0%)	1 (1.75%)	2 (1.80%)	5 (1.95%)
Illegal activity	0 (0%)	0 (0%)	1 (1.75%)	3 (2.70%)	4 (1.56%)
Sexual harassment or assault	3 (5.26%)	0 (0%)	1 (1.75%)	0 (0%)	4 (1.56%)

Trauma Recall Topics

Injury/Accident	12 (22.64%)	8 (27.59%)	16 (30.19%)	32 (30.48%)	68 (28.22%)
Death	9 (16.98%)	6 (20.69%)	13 (24.53%)	21 (20.00%)	49 (20.33%)
Victimization	10 (18.87%)	3 (10.34%)	5 (9.43%)	18 (17.14%)	36 (14.94%)
Unspecified/vague trauma-related topic	7 (13.21%)	5 (17.24%)	7 (13.21%)	14 (13.33%)	33 (13.69%)
Negative interpersonal relationships	9 (16.98%)	5 (17.24%)	5 (9.43%)	8 (7.62%)	28 (11.62%)
Illness	5 (9.43%)	1 (3.45%)	7 (13.21%)	11 (10.48%)	24 (9.96%)
Suicide	1 (1.89%)	1 (3.45%)	0 (0%)	1 (0.95%)	3 (1.24%)

Note. HR/HP = high trait rumination/high posttraumatic stress symptoms; HR-only = high trait rumination only; HP-only = high posttraumatic stress symptoms only. Values represent the number of participants indicating each depressive rumination and trauma recall topic. Multiple responses by participants were coded individually, accounting for greater number of total responses than the number of participants in the study.

Figure Caption

Figure 1. Mean concreteness of thought for each induction and group.

Figure I.

Note. PTSS = posttraumatic stress symptoms.

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Footnotes

¹ Cutoff means and standard deviations were based on the scores from all of the participants who completed the screening measures during the first semester of data collection ($n = 600$; RI: $M = 47.98$, $SD = 8.39$; PCL: $M = 37.64$, $SD = 13.92$). The means for all of the participants who completed the screening measures the second semester of data collection ($n = 403$; RI: $M = 48.66$, $SD = 8.17$; PCL: $M = 36.73$, $SD = 14.20$) were not significantly different from the first semester means (RI: $t[1001] = 1.27$, $p = .20$; PCL: $t[1001] = 1.01$, $p = .31$).

² We initially ran a 4 (Group) x 3 (Induction) repeated measures ANOVA on “other” ratings to determine whether participants reported this type of mentation differentially across conditions. No significant main effects or interactions emerged. Due to the relatively low frequency of “other” ratings (ranging from 3.50% to 4.26%) and our inability to speculate regarding the type of cognitive activity participants were experiencing, we have omitted the “other” mentation ratings from subsequent analyses. These analyses are available from the first author upon request.