Emotion
2008, Vol. 8, No. 3, 364–378

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1528-3542/08/$12.00 DOI: 10.1037/1528-3542.8.3.364

Processing Mode Causally Influences Emotional Reactivity: Distinct Effects of Abstract Versus Concrete Construal on Emotional Response

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Three studies are reported showing that emotional responses to stress can be modified by systematic prior practice in adopting particular processing modes. Participants were induced to think about positive and negative scenarios in a mode either characteristic of or inconsistent with the abstract-evaluative mind-set observed in depressive rumination, via explicit instructions (Experiments 1 and 2) and via implicit induction of interpretative biases (Experiment 3), before being exposed to a failure experience. In all three studies, participants trained into the mode antithetical to depressive rumination demonstrated less emotional reactivity following failure than participants trained into the mode consistent with depressive rumination. These findings provide evidence consistent with the hypothesis that processing mode modifies emotional reactivity and support the processing-mode theory of rumination.

Keywords: processing mode, emotional reactivity, rumination, training, overgeneralization

Depressive rumination, defined as "behavior and thoughts that focus one's attention on one's depressive symptoms and on the implications of these symptoms" (Nolen-Hoeksema, 1991, p. 569) has been identified as a core process in the onset and maintenance of depression. Prospective longitudinal studies have found that self-reported depressive rumination predicts the likelihood, severity, and duration of syndromal depression (Nolen-Hoeksema, 2000; Spasojević & Alloy, 2001).

One potential mechanism by which depressive rumination may contribute to the onset and maintenance of depression is via influencing emotional reactivity. Emotional reactivity is conceptualized as the change in the quality and intensity of affect in response to an emotionally evocative event, such as change in despondency following a failure (e.g., Rottenberg, Gross, Wilhelm, & Gotlib, 2001; Wilson, MacLeod, Mathews, & Rutherford, 2006). Experimental studies have found that induction of depressive rumination intensifies dysphoric mood, increases negative thinking, and impairs problem solving relative to distraction in individuals already in a dysphoric mood, but has no differential effect in individuals who are not already dysphoric (e.g., Lyubomirsky & Nolen-Hoeksema, 1995; Nolen-Hoeksema & Morrow, 1993). These findings suggest that, when there is a negative emotional response to a stressful event, depressive rumination will further exacerbate negative affect and negative thinking, whereas when there is little or no negative emotional response, rumination will have no further impact. Thus, it is hypothesized that when confronted with a stressful event, depressive rumination will further exacerbate any negative emotional response produced by the stressor. Consistent with this, increased trait rumination is associated with increased emotional reactivity (Thomsen, Jørgensen, Mehlsen, & Zachariae, 2004).

Recent evidence has suggested that there are a number of distinct modes of rumination, each of which has distinct functional properties, some adaptive and others maladaptive, such that the consequences of rumination may, in part, be determined by the processing mode that is active during rumination (Watkins, 2008). Phenomenologically, depressive rumination is characterized by a multidimensional configuration of focus on self and symptoms, self-evaluation, repeated analysis of the causes, meanings, consequences, and implications of symptoms of depression, negative social comparisons, and "Why?" type questions (Roberts, Gilboa, & Gotlib, 1998; Treynor, Gonzalez, & Nolen-Hoeksema, 2003).

Moreover, this processing configuration is implicated in the detrimental effects of rumination. In studies of patients with major depression, Watkins and colleagues have compared two variants of the standard rumination manipulation. These constitute (a) an abstract, verbal–analytical, evaluative variant, consistent with the phenomenology of depressive rumination, in which participants are instructed to "think about the causes, meanings, and consequences" of their symptoms and feelings, and (b) a concrete, experiential variant, inconsistent with the phenomenology of depressive rumination, in which participants are instructed to "focus attention on the experience of" their symptoms and feelings. Compared to the abstract, evaluative variant, the concrete, experiential variant reduced overgeneral autobiographical memory recall (E. Watkins & Teasdale, 2001, 2004), reduced negative global self-evaluations (Rimes & Watkins, 2005), and improved social problem solving (Watkins & Moulds, 2005), indicating that processing mode influences the consequences of rumination.

These results prompted the development of the processing-mode theory of rumination, which proposes that the negative *cognitive*

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This research was supported by a project grant to Dr. Ed Watkins from the Wellcome Trust, United Kingdom.

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and *emotional* consequences of rumination, including emotional reactivity, are, in part, determined by the processing configuration adopted during focus on self, feelings, and problems, with the mode consistent with depressive rumination having maladaptive consequences, and modes antithetical to this configuration having adaptive consequences (Moberly & Watkins, 2006; Watkins, 2004; Watkins & Moulds, 2005). Thus, the processing-mode theory hypothesizes that processing mode will influence variation in emotional reactivity. To test this prediction directly, it is necessary to manipulate the processing mode active during the stressful event experimentally, in order to assess consequent changes in emotional response. Inducing a processing mode consistent with the processing configuration found in depressive rumination (henceforth "depressive rumination mode" or "DR mode") is relatively straightforward: There is general consensus that this mode is characterized by abstract, evaluative, and analytical processing. In order to induce a processing mode inconsistent with the processing configuration found in depressive rumination (henceforth "mode antithetical to depressive rumination" or "A-DR mode"), the manipulation needs to produce a mode of processing that is phenomenologically different from the processing configuration found in depressive rumination, and, in particular, differs on those dimensions that are the active elements influencing the consequences of ruminative self-focus.

One relevant dimension within the processing-mode theory is the relative degree of abstract construal versus low-level, concrete construal (Watkins, in press). Research on mental representation in the cognitive and social–cognitive literatures makes a distinction between higher- and lower-level construals (Trope, 1989; Trope & Liberman, 2003; Vallacher & Wegner, 1987). High-level construals are abstract, general, superordinate, and decontextualized mental representations that convey the essential gist and meaning of events and actions (e.g., inferences of global traits that are invariant across different situations, such as "laziness," or representations of "why" an action is performed and of its ends and consequences). In contrast, low-level construals are more concrete mental representations that include subordinate, contextual, and incidental details of events and actions (e.g., inferences of situation-specific states, such as "tiredness," or representations of the specific "how" details of an action and of the means to an end). Within this construal-level analysis, the processing configuration or "mind-set" characteristic of depressive rumination involves predominantly high-level construals about self and mood: Ruminative thinking is focused on meanings, consequences, implications, and "why" questions, and is characterized by reduced concreteness of thinking (Stöber & Borkovec, 2002; Watkins & Moulds, 2005, 2007). Furthermore, those experimental manipulations that demonstrate antithetical effects to depressive rumination, such as reducing overgeneral memory and improving problem solving, despite involving equivalent focus on self and feelings, are characterized by low-level construals, such as focus on direct, concrete experience and more specific, detailed representations of the self and of problems (Rimes & Watkins, 2005; Watkins & Molds, 2005; Watkins & Teasdale, 2001).

Moreover, there are reasons to suppose that level of construal could directly account for variations in emotional reactivity. Whereas low-level construals involve contextualized representations, high-level construals engender generalizations. Thus, in the context of a negative event, relative to low-level construals, high-level construals are likely to produce negative overgeneralizations (e.g., "I am always making mistakes"), such that a single failure is generalized to a global sense of personal inadequacy (Carver & Ganellen, 1983; Rimes & Watkins, 2005). Such generalization is known to increase risk for depression (Carver, 1998) and exacerbate emotional reactivity (Wenzlaff & Grozier, 1988). Moreover, voluntarily recalling an emotional event in specific detail produces less emotional response than recalling it at a more general level (Philippot, Baeyens, & Douilliez, 2006; Philippot, Schaefer, & Herbette, 2003), and practicing recalling specific autobiographical memories reduces the negative experience to a subsequent stressful task relative to prior practice at recalling general autobiographical memories (Raes, Hermans, Williams, & Eelen, 2006). Thus, by influencing the extent of generalization, processing characterized by high-level construals is hypothesized to exacerbate emotional reactivity relative to processing characterized by low-level construals.

The processing-mode theory therefore predicts that adopting a processing mode characterized by high-level construals, consistent with depressive rumination (DR mode), will increase subsequent emotional reactivity, compared to adopting a processing mode characterized by low-level construals, inconsistent with depressive rumination (A-DR mode). In order to test this prediction, the current studies were designed to induce a mind-set either consistent with or inconsistent with the processing configuration found in depressive rumination (i.e., abstract, evaluative, analytical), rather than to induce a state directly analogous to depressive rumination itself. In this way, the studies only tested the role of one particular element of rumination—*the processing mode adopted*—in influencing emotional reactivity.

In a preliminary study using this approach, participants repeatedly focused on both positive and negative scenarios in either a low-level, concrete construal mode ("imagine the details of what is happening in each scenario") or a high-level, abstract construal mode ("think about the causes, meanings, and implications of each situation"), before a failure experience (Moberly & Watkins, 2006). After the failure experience, higher levels of trait rumination were associated with lower levels of positive affect, but only for participants in the high-level, abstract construal condition and not for participants in the low-level, concrete construal condition. Thus, processing mode moderated the effect of trait rumination on emotional reactivity following a failure. However, this study was limited in only utilizing a student sample tested in a group practical class and in only using positive affect as the measure of mood. To confirm relevance to depression, replication of the finding is needed with a depression-related measure (e.g., despondency). Moreover, the processing-mode theory predicts that mode alone can causally influence emotional reactivity; therefore a direct demonstration of a main effect of processing mode on emotional reactivity, coupled with the findings of Moberly and Watkins (2006), would provide convergent evidence consistent with the processing-mode theory.

To that end, this article reports three experiments that investigate the hypothesis that processing mode can causally influence subsequent emotional reactivity. Experiment 1 examines whether an extensive training procedure delivered in an individual format produces a main effect of processing mode on subsequent emotional reactivity. Experiment 2 examines whether the effects of Experiment 1 can be replicated and adds a no-training control

condition in order to explore whether the effect of manipulating processing mode on emotional reactivity is due to a maladaptive effect of DR mode or due to a beneficial effect of A-DR mode. Experiment 3 further tests the hypothesis that level of construal is an active element within the different processing modes, by utilizing a different methodology (implicit training of interpretative bias) that is nevertheless conceptually consistent with the induction of high-level versus low-level construals. In each experiment, participants worked through a set of emotional scenarios in a manner designed to train them to adopt either DR mode or A-DR mode. Following these training protocols, participants were exposed to an anagram stress failure manipulation designed to induce negative mood. Variations in emotional reactivity were revealed by variations in the degree to which the stress task altered self-reported mood (Wilson et al., 2006).

In summary, the aim of these studies was to test whether processing mode plays a causal role in influencing emotional reactivity and, more specifically, whether shifting processing away from a mind-set characteristic of depressive rumination reduces emotional reactivity. Across all three experiments, we hypothesized that those participants trained into A-DR mode should show attenuated emotional reactivity, relative to those participants trained into DR mode. We expected that training itself would not directly affect mood because the processing-mode theory predicts that the different modes change the way information is processed rather than the content and valence of what is processed. Furthermore, the training conditions matched positive and negative scenarios, so there should be no overall mood-induction effect or valence effect across the different training conditions. Moreover, previous studies have failed to find any direct mood-induction effect of manipulating processing mode (Moberly & Watkins, 2006; Watkins & Teasdale, 2001, 2004). Likewise, we expected that there would be no difference in the magnitude of self-focus induced across the training conditions as the training conditions were balanced for extent of self-reference.

Experiment 1

Method

Overview

This experiment consisted of a processing-mode induction training phase, followed by a failure stress phase. During the training phase, all participants read through 30 short descriptions of positive and negative situations while imagining each event happening to them. Each participant was allocated at random to instructions designed to induce either high-level construals consistent with depressive rumination or low-level construals inconsistent with depressive rumination, when processing each situation. After this training phase, participants attempted one item from a social problem-solving task, which was then rated as a manipulation check of the induction of the intended mode. Following this training phase, all participants then completed an anagram stressor task designed to induce the experience of failure and despondent mood.

Participants

Forty participants were recruited from a panel of community and student volunteers (age, $M = 25.93$, $SD = 5.91$; 10 male, 30 female; 25% students, 75% community volunteers). All participants were paid £10 ($20) on completion of the experiment. No participants met diagnostic criteria for current or past major depression on the Structured Clinical Interview for *DSM–IV* (SCID; Spitzer, Williams, Gibbon, & First, 1996) and all scored less than 12 on the Beck Depression Inventory–II (BDI) ($M = 1.77$, $SD = 1.58$; Beck, Steer, & Brown, 1996). The participants were randomly allocated to one of two training conditions designed to induce DR mode and A-DR mode, respectively. There were no differences between participants in the two conditions on any of the baseline measures (age, BDI, initial despondency), all Fs < 1. A chi-squared analysis revealed that there was no difference in allocation of gender across the conditions, $p = .71$.

Materials

Level-of-construal training conditions. Fifteen positive and 15 negative written scenarios, each approximately three sentences in length, were used as the training material for all participants. For example, one negative scenario read as follows:

> You have an argument with your best friend. You have only had a few minor disagreements in the past, but this argument becomes heated and she tells you that she feels that she will never be able to trust you again. You are shocked and hurt.

For example, one positive scenario read as follows:

> You go for a job interview. You are well prepared and able to answer the questions competently. The interview panel is friendly and encouraging, and you leave feeling very confident that you had performed well enough to secure the position.

All participants read through all 30 scenarios, with instructions to spend a minute concentrating on each event. The order of the written scenarios was randomized with the constraint that there were no more than three scenarios of the same valence presented consecutively. Both positive and negative scenarios were used for the training conditions to ensure the training conditions were not direct mood inductions. Rather, the training conditions were designed to ensure that the intended processing configuration was trained to both positive and negative scenarios.

To prepare the training materials, we generated 34 scenarios that reflected positive and negative events across a range of settings (social, interpersonal, academic, employment) relevant to our participant sample. Ten independent judges rated each scenario on 1–7 Likert scales for valence from 1 (*extremely positive*) to 4 (*neutral*) to 7 (*extremely negative*) and vividness from 1 (*extremely vivid*) to 7 (*not at all vivid*). We selected 15 positive and 15 negative scenarios that were matched for intensity of valence and vividness, and significantly different in terms of positive versus negative valence; positive items, $M = 1.76$, $SD = 0.40$; negative items, $M = 6.03$, $SD = 0.49$; $t(9) = 22.00$, $p < .01$.

In the DR-mode condition, participants were instructed as follows for each scenario: "I would like you to think about why it happened, and to analyze the causes, meanings, and implications of this event." In the A-DR–mode condition, participants were instructed as follows for each scenario: "I would like you to focus on how it happened, and to imagine in your mind as vividly and concretely as possible a 'movie' of how this event unfolded." Thus, DR mode was characterized by high-level construals,

whereas A-DR mode was designed to be antithetical to the ruminative configuration by focusing on low-level construals. Given that the training conditions were matched for degree of self-reference, we did not expect any difference in the magnitude of self-focus induced by the different training conditions.

Prior to the main training phase, all of the participants practiced adopting the assigned mode on the same (negative) practice scenario and described what they were thinking during the practice. Where necessary, further feedback and practice were given to ensure that participants understood the instructions and were adopting the appropriate mode before training started.

Anagram stress task—failure feedback. The failure-feedback task consisted of an anagram solution task, consisting of 15 hard-to-solve anagrams and 15 insoluble anagrams, each five letters long. Participants were given 3 min to unscramble as many anagrams as possible into real words. Before starting the task, participants were told that on average five to six anagrams are correctly solved in 3 min and that performance on this task is a consistent and reliable indicator of future academic and career success. Versions of this task have reliably been found to induce negative mood in previous studies (MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002). All participants were told how many anagrams they had solved correctly (on average, 1 out of 30) and that they had scored well below average.

Mood measure. To measure negative mood, we used a visual analogue scale on which participants rated level of despondency from 0 (*not at all*) to 100 (*completely*). This measure has been previously found to be a reliable and sensitive self-report measure of negative mood (e.g., MacLeod et al., 2002; Watkins & Teasdale, 2001, 2004).

Self-focus measure. To assess self-focus, we used a visual analogue scale on which participants rated how much their thinking was focused on themselves on a 0–100 scale ranging from 0 (*not at all self-focused*) to 100 (*totally self-focused*).

BDI-II (Beck et al., 1996). The BDI-II is a 21-item self-report instrument developed to measure severity of depression in adults and adolescents (range = 0–63).

Manipulation check for level-of-construal processing configuration. To check whether training successfully induced the intended mode of processing, participants were given one interpersonal vignette ("A disagreement with your boss") from the Means Ends Problem Solving Task (MEPS; Platt & Spivack, 1972, 1975), and asked to generate the ideal strategy for overcoming the problem situation (Marx, Williams, & Claridge, 1992). A judge unaware of condition scored each participant's description of his or her problem solutions on the Stöber and Borkovec (2002) abstract–concrete scale. The descriptions are rated on a 1–5 Likert scale, on which 1 = *abstract*, 2 = *somewhat abstract*, 3 = *neither–nor*, 4 = *somewhat concrete*, 5 = *concrete.* Concrete thought is defined as "distinct, situationally specific, unequivocal, clear, singular" and abstract thought as "indistinct, cross-situational, equivocal, unclear, aggregated" (Stöber & Borkovec, 2002, p. 92). Thus, the abstract–concrete scale accurately captures the dimension of high-level versus low-level construals: More abstract ratings reflect general, superordinate, and decontextualized representations, which are more consistent with high-level construals than with low-level construals. There was good interrater reliability with an independent second judge who was also unaware of condition (agreement across all responses was $r = .95$, $\kappa = .91$).

Procedure

Each participant was seen individually. Participants were given the rationale that the researchers were examining the processes of imagination, visualization, and cognition. After giving written informed consent, participants completed the BDI and SCID, followed by the first self-report measures of despondency and self-focus (pretraining measures). Participants then worked through their assigned experimental training condition before repeating the self-report measures (posttraining measures). Participants then completed the MEPS problem vignette followed by further self-report measures (prestress measures). Participants then attempted the anagram stress task, before completing the self-report measures again (poststress measures). Finally, open-ended questions investigated what the participants thought the study was testing; no participants guessed that the training phase was designed to shift the response to the failure stress task.

Results

Following MacLeod et al. (2002) and Wilson, MacLeod, Mathews, and Rutherford (2006), the analysis of the data is organized sequentially to address whether the training procedures were effective at inducing the intended processing modes, before addressing whether the training conditions influenced emotional reactivity. We need first to determine that the training procedures were effective at differentially inducing DR mode versus A-DR mode, before we can analyze the despondency ratings prestress and poststress to examine whether the manipulation of processing mode influenced the emotional response to the stressor. For this and all later experiments, an alpha level of .05 was used for all statistical tests and all analyses were two-tailed.

Testing the Induction of Different Processing Configurations

We used ratings of abstractness–concreteness for the descriptions of problem solutions that were written immediately posttraining to index the level of construal. A univariate analysis of variance (ANOVA) with training condition (DR mode vs. A-DR mode) as the between-groups factor examined the independent ratings of the concreteness of the solution description to determine whether the training succeeded in differentially inducing processing modes that varied in level of construal. There was a significant main effect of condition on ratings of concreteness, $F(1, 38) = 10.13$, $p < .005$, reflecting that solution descriptions were rated as more abstract in the DR-mode condition ($M = 2.85$, $SD = 0.59$) than in the A-DR–mode condition ($M = 3.45$, $SD = 0.60$). This result suggests that DR-mode training induced a processing configuration characterized by higher-level construals than A-DR–mode training.

Self-focus. We examined the visual analogue ratings of self-focus to determine whether induction of self-focus varied between the training conditions using a mixed-design 2 × 2 ANOVA, with Training Condition (DR mode vs. A-DR mode) as the between-groups factor and Time (pretraining vs. posttraining) as the repeated-measures factor. Consistent with our prediction that the training conditions would not differ in the extent to which they

induced self-focus, no significant main effects or interactions were obtained (all Fs < 1.30).

Testing Emotional Responses

As noted by MacLeod et al. (2002), the training procedure itself could act as a direct mood induction. Therefore, we followed the two-step approach to analysis adopted by MacLeod et al. (2002) to assess the effects of training on emotional reactivity. First, we analyzed data from the despondency scales administered before and after the training task, to determine whether the training conditions induced differential levels of despondency. Then, we analyzed the data from the despondency ratings administered before and after the anagram stress task, to test the hypothesis that the training conditions would modify emotional reactivity. The despondency scores at each assessment point during the training phase and the stress phase are shown in Table 1.

Despondency during training phase. A mixed-design 2 × 2 ANOVA, with Training Condition (DR mode vs. A-DR mode) as the between-groups factor, Time (pretraining vs. posttraining) as the repeated-measures factor, and rating of despondency as the dependent variable, found a significant main effect of time, $F(1, 38) = 11.31$, $p < .005$, reflecting an increase in despondency across the training phase for both conditions (see Table 1). Of particular importance, there was no main effect of Training Condition, nor a significant interaction of Training Condition × Time ($F < 1$ in both cases). Thus, it appears that the training procedures had no significant differential influence on despondency, suggesting that the manipulation of processing mode did not have a direct mood-induction effect.

Emotional reactivity. A mixed-design 2 × 2 ANOVA, with Training Condition (DR mode vs. A-DR mode) as the between-groups factor, Time (prestress vs. poststress) as the repeated-measures factor, and rating of despondency as the dependent variable, revealed a significant main effect of time, $F(1, 38) = 14.86$, $p < .001$, qualified by a significant interaction of Condition × Time, $F(1, 38) = 4.72$, $p < .05$. This interaction reflected a significant increase in despondency from prestress to poststress in the DR-mode condition, $t(19) = 3.70$, $p < .002$ (95% CI, 9.33, 33.67), but a nonsignificant increase in despondency in the A-DR–mode condition, $t(19) = 1.45$, $p = .16$, (95% CI, −2.64, 14.64).

Table 1
Despondency Scores During Training Phase and Stress Phase in Experiment 1

	Training condition			
	DR mode[a]		A-DR mode[b]	
Variable	*M*	*SD*	*M*	*SD*
Pretraining despondency	9.50	16.05	9.00	12.52
Posttraining despondency	16.50	18.14	17.50	18.32
Prestress despondency	18.50	20.07	15.00	20.65
Poststress despondency	40.00	29.56	21.00	21.98

Note. DR = mode consistent with depressive rumination; A-DR = mode antithetical to depressive rumination.
[a]4 male, 16 female; [b]6 male, 14 female.

Discussion

These findings provide encouraging support for the hypothesis that processing mode may causally modify emotional reactivity: Inducing a processing mode involving high-level construals produced greater emotional response to a subsequent stressful event than inducing a processing configuration involving low-level construals. The training procedure appeared to be effective in manipulating processing configuration: Compared to the A-DR–mode condition, the DR-mode condition produced more abstract and general descriptions of problem solutions on the MEPS posttraining, consistent with inducing a mode characterized by high-level construals.

The results found for the despondency ratings across the training phase indicate that, as expected, the manipulation of processing mode did not influence mood: the two training conditions did not differ in their effects on despondency. Furthermore, the two training conditions did not differ in the extent to which they induced self-focus. These findings demonstrate that the manipulation of training condition had neither a direct mood-induction effect nor a direct effect on self-focus. Critically, the induction of the different processing configurations modified emotional reactivity: Inducing DR mode resulted in a greater increase in despondency in response to the subsequent anagram stress task than inducing A-DR mode. This finding extends the Moberly and Watkins (2006) results by demonstrating that more extensive training delivered in an individual format has a main effect on modifying emotional reactivity.

One issue unresolved in Experiment 1 is whether the differential effect observed between the two training conditions is due to the DR-mode condition actively increasing emotional reactivity, due to the A-DR–mode condition actively reducing emotional reactivity, or due to a combination of both these processes. In Experiment 1, there was no control condition where processing mode was not trained, which is necessary to distinguish between these possibilities. Therefore, to explore the active roles of the different modes, in Experiment 2, we introduced a no-training control condition. Failure and unexpected outcomes, such as those produced in the anagram stressor task, can temporarily increase the use of higher-level construals in the form of "why" questions that are concerned with attributing the cause of the outcome (Wicklund, 1986; Wong & Weiner, 1981). Therefore, we predicted that the anagram stressor test would spontaneously lead to higher-level construals for participants in the no-training control condition, and that the no-training control condition would increase emotional reactivity to a similar degree as the DR-mode condition and to a lesser degree than the A-DR–mode condition.

Experiment 2

The principal purpose of Experiment 2 was to replicate the central finding of Experiment 1. The same training procedure and anagram stress task were used in Experiment 2 as were used in Experiment 1, except that we added a no-training control condition.

Method

Overview

The same design and materials as for Experiment 1 were used, except that participants were randomly allocated to three condi-

tions: DR-mode training, A-DR–mode training, and a no-training control.

Participants

Sixty-three naïve participants were recruited, using the same selection criteria as Experiment 1, from community volunteers and undergraduates, and assigned randomly to the DR-mode ($n = 21$), the A-DR–mode ($n = 21$), or the control no-training condition ($n = 21$; age, $M = 23.21$, $SD = 9.14$; 13 male, 49 female; BDI, $M = 4.37$, $SD = 2.98$). Participants were rewarded for taking part with either £10 ($20) or course credits. There were no differences between the three conditions on any of the baseline measures, all Fs < 1.1, smallest $p = .34$. A chi-squared analysis revealed that there was no difference in the gender distribution across the conditions, $p = .51$.

Materials

Level-of-construal training conditions. Participants in the control nontraining condition worked through the same 30 scenarios as the other participants, and as in Experiment 1. They were instructed as follows: "I would now like you to spend a minute concentrating on this text. Specifically, I would like you to count the number of verbs that occur in the description of this event." These instructions were chosen to ensure that participants read the text, without inducing either DR mode or A-DR mode.

Manipulation check for processing configuration. We repeated the use of the MEPS scenario with the rating of concreteness of solution description as a manipulation check for the processing configuration adopted posttraining. There was good interrater reliability with an independent second judge who was unaware of condition (agreement across all responses was $r = .72$, $\kappa = .73$).

Procedure

The procedure was identical to Experiment 1. Open-ended questions investigated what the participants thought the study was testing; no participants guessed that the training phase was designed to shift the response to the failure task.

Results

The same sequence of analysis as used in Experiment 1 was repeated for Experiment 2.

Testing the Induction of Different Processing Configurations

Ratings of abstractness–concreteness. As predicted, an ANOVA with training condition (DR mode vs. A-DR mode vs. no-training control) as the between-groups factor revealed a significant main effect of training condition on the rating of concreteness of solution descriptions, $F(2, 60) = 4.64$, $p < .05$. Post hoc Tukey's tests revealed that this main effect reflected the solution descriptions being rated as more concrete in the A-DR–mode condition ($M = 3.43$, $SD = 0.81$) than in the DR-mode condition ($M = 2.90$, $SD = 0.44$), $p < .05$ (95% CI, 0.10, 0.95), replicating Experiment 1. The no-training control condition ($M = 3.05$, $SD = 0.38$) did not significantly differ from the DR-mode condition, $p = .70$ (95% CI, −0.28, 0.57), whereas there was a trend for the A-DR–mode condition to be more concrete than the no-training control, $p = .09$ (95% CI, −0.81, 0.05).

Self-focus. A mixed-design 3 × 2 ANOVA, with Training Condition (DR mode vs. A-DR mode vs. no-training control) as the between-groups factor, Time (pretraining vs. posttraining) as the repeated-measures factor, and self-focus ratings as the dependent variable, revealed no significant main effects or interactions; all Fs < 1. These findings suggest that there was no difference in self-focus between the training conditions.

Testing Emotional Responses

Despondency during training phase. The scores obtained on the despondency scales in each training condition before and after the training phase and before and after the anagram stress task are presented in Table 2. A mixed-design 3 × 2 ANOVA, with Training Condition (DR mode vs. A-DR mode vs. no-training control) as the between-groups factor, Time (pretraining vs. posttraining) as the repeated-measures factor, and with rating of despondency as the dependent variable, revealed a significant main effect of time, $F(1, 60) = 7.90$, $p < .01$, reflecting an increase in despondency across the training phase for all three conditions. Of particular importance, there was not a significant interaction of Condition × Time, $F(2, 60) = 0.19$, $p = .83$, suggesting that the manipulation of processing configuration did not have a direct mood-induction effect.

Emotional reactivity. A mixed-design 3 × 2 ANOVA, with Training Condition (DR mode vs. A-DR mode vs. no-training control) as the between-groups factor, Time (prestress vs. poststress) as the repeated-measures factor, and with rating of despondency as the dependent variable, revealed a significant main effect of time, $F(1, 60) = 59.31$, $p < .001$, qualified by a significant interaction of Condition × Time, $F(2, 60) = 3.82$, $p < .05$. This interaction reflected the absence of a significant main effect of Training Condition at the prestress assessment, $F(2, 60) = 1.28$, $p = .29$, but a significant main effect of Training Condition at the poststress assessment, $F(2, 60) = 3.44$, $p < .05$. The nature of the interaction is shown in Figure 1. As can be seen, although all three conditions displayed an increase in despondency in response to the stress task, relative to the DR-mode and no-training control conditions, the

Table 2
Despondency Scores During Training Phase and Stress Phase in Experiment 2

	Condition					
	DR mode[a]		A-DR mode[b]		No training[c]	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*
Pretraining despondency	21.19	17.17	18.09	18.54	13.24	16.80
Posttraining despondency	25.24	16.92	23.57	20.44	16.48	18.78
Prestress despondency	25.24	17.78	25.48	21.56	17.38	16.25
Poststress despondency	58.57	23.72	38.09	23.58	47.48	28.39

Note. DR = mode consistent with depressive rumination; A-DR = mode antithetical to depressive rumination.
[a]4 male, 17 female; [b]6 male, 15 female; [c]3 male, 18 female.

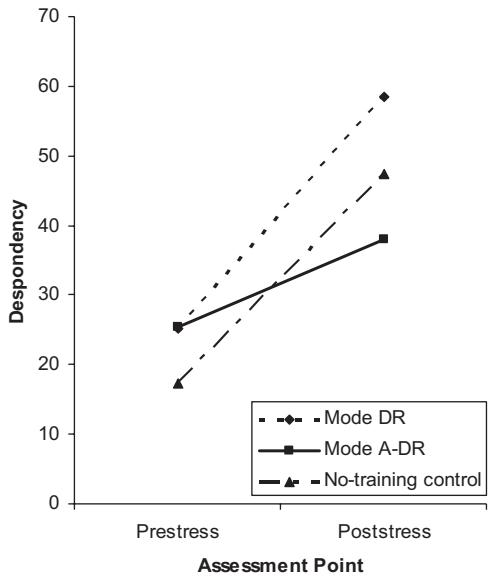

Figure 1. Effect of anagram stress task on despondency after processing-mode training in Experiment 2.

A-DR–mode condition attenuated the increase in despondency, extending the finding from Experiment 1. As predicted, the no-training control condition paralleled the effects of the DR-mode condition, with a very similar pattern of despondency change across the stress phase, albeit starting at a lower prestress level of despondency. Post hoc Tukey's tests showed that the increase in despondency from prestress to poststress was significantly greater in the DR-mode condition than in the A-DR–mode condition, $p < .05$ (95% CI, 1.34, 40.09), replicating Experiment 1. Moreover, as predicted, the increase in despondency from prestress to poststress did not differ between the DR-mode and no-training control conditions, $p = .91$ (95% CI, −16.14, 22.61). There was a trend for the increase in despondency from prestress to poststress to be greater in the no-training control condition than the A-DR–mode condition, $p = .08$ (95% CI, −1.90, 36.85).

Discussion

The principal aim of Experiment 2 was to replicate the main finding of Experiment 1. Experiment 2 was successful in this aim: The results of Experiment 2 confirm the ability of the training procedure to manipulate level of construal and modify emotional reactivity. Replicating Experiment 1, compared to the A-DR–mode condition, the DR-mode condition produced more abstract descriptions of problem solutions on the MEPS posttraining, indicating successful induction of the differential processing configurations. Furthermore, replicating Experiment 1, the manipulation of processing configuration had no direct mood-induction effect, with the three conditions not differing in their effects on despondency. Nonetheless, once again, inducing DR mode resulted in greater subsequent emotional reactivity than inducing A-DR mode.

The addition of the no-training control condition provided information about the default processing mode adopted by this sample of nonclinical participants, and about the relative contributions of the two training manipulations in modifying emotional reactivity. First, the no-training control condition did not significantly differ from the DR-mode condition on the posttraining rating of abstractness–concreteness of the problem description, and showed a trend to be more abstract than the A-DR–mode condition. This result suggests that the default response of the untrained participants prior to the anagram stressor is similar to that of participants in the DR-mode condition. This may be because nonclinical participants spontaneously adopt a higher-level construal style, consistent with extensive findings that individuals tend by default to use more abstract construals (Wegner & Vallacher, 1987; Wegner, Vallacher, Kiersted, & Dizadji, 1986) and use a more global, abstract processing style in neutral and happy moods (Beukeboom & Semin, 2005; Bless et al., 1996; Gasper & Clore, 2002; Storbeck & Clore, 2005). Alternatively, in this nonclinical sample, it may have been relatively easier to induce A-DR mode than to induce DR mode.

Second, the confidence intervals suggest that the effects of no-training control condition on emotional reactivity overlapped with the effects of the DR-mode condition but were distinct from the effects of the A-DR–mode condition, although there was not a significant ($p < .05$) difference between A-DR mode and no-training control. This pattern is broadly consistent with the prediction that participants in the no-training control condition would spontaneously adopt higher-level construals in response to the unexpected failure (Wong & Weiner, 1981), although this is a tentative interpretation that requires replication. Assuming that the response following the no-training control reflects the default response to failure, these results suggest that prior A-DR training reduces this default response to failure (i.e., abstract processing and elevated emotional reactivity), suggesting that training in A-DR mode has some active effect. Nonetheless, because the default mode adopted in the no-training control is similar to the DR mode, it is unclear whether the A-DR mode would have a beneficial effect when compared to a more neutral nonruminative control condition.

Experiments 1 and 2 both suggested that the manipulation of processing mode modifies emotional reactivity. Moreover, consistent with the hypothesis that level of construal is an important property discriminating between DR mode and A-DR mode, explicit instructions designed to produce low-level construals resulted in less emotional reactivity than explicit instructions designed to produce high-level construals. Experiment 3 further tested the level-of-construal hypothesis by manipulating processing mode via a different method that is nevertheless conceptually consistent with inducing high-level versus low-level construals. If a methodologically different training manipulation that is also conceptually consistent with shifting level of construal is able to replicate these effects on emotional reactivity, this provides further confirmation that level of construal may be a key active property within the different processing modes.

The manipulations in Experiments 1 and 2 involved explicit, voluntary, and transparent mental generation of the different processing configurations. Therefore, in Experiment 3 we adopted a more implicit training protocol in which participants were guided more covertly into the different modes to test whether we could conceptually replicate the finding that processing mode influences emotional reactivity. To do this, we adapted a computerized task used to induce interpretative bias (Mathews & Mackintosh, 2000): Whereas the original task forced participants to make either a

negative or a positive interpretation of otherwise ambiguous texts, our version forced participants to make interpretations of otherwise ambiguous texts that involved either high-level construals or low-level construals. In an unpublished pilot study using this paradigm with 40 participants, we found that the DR-mode and A-DR–mode conditions differentially influenced the ability to generate the reasons why a behavior was performed versus how it was performed (Vallacher & Wegner, 1989). Consistent with the intended processing configurations, the DR-mode condition significantly increased the number of "why's" generated but reduced the number of "how's" generated, relative to the A-DR–mode condition. Thus, these pilot data provide initial evidence that this interpretative-bias training paradigm can successfully induce high-level versus low-level construals.

A further aim of Experiment 3 was to examine whether our previous findings would generalize to a more inclusive sample and to a wider range of moods. To this end, we used a sample with relatively higher levels of depressive symptoms compared to the first two experiments. Moreover, instead of a single self-rating of despondency, we used the Positive and Negative Adjective Schedule (PANAS; Watson, Clark, & Tellegen, 1988) to assess mood. The inclusion of the PANAS allowed us to check that we could replicate our previous findings on a more elaborate and methodologically superior measure that encompassed more facets of positive and negative mood, including aspects of negative affect that are not necessarily related to depression (e.g., high arousal).

Experiment 3

Method

Overview

The training phase of this paradigm consisted of the following:

1. Participants read 64 computer-presented short descriptions of social situations that remain ambiguous in overall meaning, until the final word, presented as a fragment to be completed, which resolved the overall meaning for each scenario;

2. Across all the scenarios, each word fragment was chosen to lead the participant into making the required interpretation for the intended training condition;

3. Following each scenario, participants answered a subsequent comprehension question designed to further reinforce the required interpretation.

Whereas Mathews and Mackintosh (2000) induced positive versus negative interpretations, we induced interpretations consistent with high-level construals (DR mode) or with low-level construals (A-DR mode). In other respects, we followed the methodology described by Mathews and Mackintosh (2000; see Experiment 1 for full details).

Participants

Forty naïve participants were recruited from a panel of undergraduate volunteers (age, $M = 19.38$, $SD = 1.46$; 12 male, 28 female). Participants were rewarded for taking part with either £6 ($12) or course credits. We included participants with minimal to moderate levels of depression symptoms (BDI-II score < 25; mean BDI score $= 9.88$, $SD = 6.31$). The participants were randomly allocated to two training conditions designed, respectively, to induce DR mode and A-DR mode. There were no differences between the two conditions on any of the baseline measures (BDI, age, initial positive affect, initial negative affect), all Fs < 1.16, smallest $p = .28$. The two training conditions were matched for gender (14 females and 6 males in each condition).

Materials

Interpretative-bias training conditions. The 64 training descriptions consisted of two or three sentences and remained ambiguous in terms of whether they suggested an interpretation consistent with DR mode or with A-DR until the final word fragment, which alone determined the processing configuration. Each fragment only allowed one completion, which was congruent with the required processing configuration. Of the descriptions, 32 were positive in valence and 32 were negative in valence, to ensure that the training phase was not intrinsically mood inducing. Across the descriptions, the DR-mode completions disambiguated the sentences so as to generate meanings for each description that were abstract, general, evaluative, judgmental, and conceptual. In contrast, the A-DR–mode completions disambiguated the sentences so as to generate meanings for each description that were concrete, specific, experiential, and sensory focused. For example, one negative description read as follows (with final words and condition in parentheses):

> You are running a bath when you become distracted by a telephone call and forget to turn off the tap. The bath floods and the water begins to drip through the ceiling of the room below. Cleaning up the mess, you feel irritated because you are so w_t [wet, low-level construal, A-DR mode]/c_reless [careless, high-level construal, DR mode].

Another negative description read as follows:

> You have been seeing each other for three weeks, and it seems that you have found a true soul mate. After dinner one evening, your partner explains that you can't be together anymore. At that moment, you stare at the table and contemplate your empty gl_ss [glass, low-level construal, A-DR mode]/l-fe [life, high-level construal, DR mode].

A positive description read as follows:

> You are currently romantically unattached and are not expecting the Valentine's card that drops through the letterbox one morning. Your heart warms as it becomes clear that you have a secret admirer. Getting into the warm bath, you feel very re_axed [relaxed, low-level construal, A-DR mode]/desir_ble [desirable, high-level construal, DR mode].

Another positive description read as follows:

> Waiting at the railway station, you bump into an old friend of yours whom you haven't seen for years. You go for a drink, gossip about old times and it seems as though you have never been apart. As you shake hands you feel the strength of his gr_p [grip, low-level construal, A-DR mode]/lo_alty [loyalty, high-level construal, DR mode].

Thus, the A-DR–mode completions were more concrete, more experiential, and more sensory focused, describing physical sensations experienced ("wet," "relaxed," "grip") and physical objects observed ("glass"). In contrast, the DR-mode completions were more evaluative, abstract, and generalized, including judgments and global character attributions ("careless," "desirable," "competence") as well as abstract evaluations of meaning and implications of events ("life"). Importantly, an equivalent number of positive and negative completions were used for each training condition to minimize the likelihood that the training conditions differed on valence rather than on mode (high-level vs. low-level construals).

Ten independent judges each rated all of the scenarios (half the scenarios disambiguated with DR-mode completions and half disambiguated with A-DR–mode completions, disambiguation for each scenario counterbalanced across the judges) on a series of 1–9 Likert scales chosen to check that the disambiguated completions were consistent with the intended configuration. The scales assessed each completed scenario for (a) self-focus from 1 (*not at all self-focused*) to 9 (*very self-focused*); (b) focus on sensory details from 1 (*not at all sensory*) to 9 (*extremely sensory*); (c) evaluation of meanings and implications from 1 (*not at all*) to 9 (*extremely*); and (d) use of situation-specific, state-like to more global trait-like attributions from 1 (*extremely state-like*) to 9 (*extremely trait-like*). Consistent with the intended manipulations, on average, relative to the A-DR–mode completions, the DR-mode completions were rated as significantly less focused on sensory details, $t(9) = 4.24$, $p < .005$ (DR mode, $M = 4.12$, $SD = 0.97$; A-DR mode, $M = 5.55$, $SD = 0.90$), involving more evaluation of meanings and implications, $t(9) = 2.19$, $p = .06$ (DR mode, $M = 6.40$, $SD = 0.91$; A-DR mode, $M = 5.42$, $SD = 1.27$), and involving more trait-like, global attributions, $t(9) = 2.24$, $p = .05$ (DR mode, $M = 4.49$, $SD = 0.64$; A-DR mode, $M = 3.74$, $SD = 1.01$). That is, the DR-mode completions were more evaluative, abstract, and generalized, including judgments and character-level attributions consistent with higher-level construals, than the A-DR–mode completions. The DR-mode and A-DR–mode completions were matched for self-focus, $t(9) = 0.77$, $p = .46$ (DR mode, $M = 6.16$, $SD = 0.59$; A-DR mode, $M = 6.00$, $SD = 0.87$).

To progress to the next description, participants had to correctly type in the missing letter of the fragment and then respond to a comprehension question about the description. The comprehension questions were designed to induce the intended processing configuration further. For example, for the first negative passage shown above, the question in the A-DR–mode condition was "Do you manage to keep yourself dry?" which focused on concrete details of the experience. In contrast, in the DR-mode condition, the question was "Do you think that you are not to blame?" which focused on more abstract evaluations and judgments about what had happened. Participants had 10 s to respond either "Yes" or "No" following each question. Answers were followed by feedback (a "correct" or "wrong" message) consistent with the intended processing mode, both when generating a response to the word fragment and when answering the comprehension question.

Recognition test. The training descriptions were immediately followed by another set of 18 brief descriptions of social situations, each negative, different in context from the training situations, headed with a brief identifying title, and presented in random order. Unlike the training descriptions, which directed participants toward a particular mode of responding, the recognition descriptions, while superficially similar to the training descriptions, used word fragments whose completion allowed either a high-level construal, DR-mode interpretation, or a low-level construal, A-DR–mode interpretation, leaving participants free to generate their own response. A sample identifying title, test paragraph, and comprehension question is as follows:

> The Wedding Speech
>
> You have been asked to give a speech at your best friend's wedding reception. You are poorly prepared and make many hesitations and slips while speaking. Looking into the crowd of faces, you hear a distant murmur of voic_s [voices].
>
> Is your best friend getting married? (Yes/No)

After participants worked through a short filler task, a computer-based recognition test was used to assess the interpretations that were made of these paragraphs. In an individually randomized order, participants read the identifying title of each test paragraph, followed by four versions of the final sentence, also in random order. Two of these sentences reflected plausible interpretations of the paragraph ("target" interpretations), one consistent with high-level construals (DR mode) and the other consistent with low-level construals (A-DR mode). Two of these sentences reflected implausible interpretations of the paragraph ("foil" interpretations), one consistent with DR mode and the other consistent with A-DR mode. For example, for the title and test paragraph presented above, the recognition sentences were:

> (a) Looking into the crowd of faces, you hear a distant murmur of words (target, low-level construal, A-DR mode)
>
> (b) Looking into the crowd of faces, you hear a distant murmur of disapproval (target, high-level construal, DR mode)
>
> (c) Looking into the crowd of faces, you hear a distant murmur of aircraft (foil, low-level construal, A-DR mode)
>
> (d) Looking into the crowd of faces, you hear a distant murmur of resentment (foil, high-level construal, DR mode)

Participants were told that none of the sentences were identical to those in the original paragraph, but that any number of them could be similar in meaning to the original paragraph. Participants were instructed to rate each sentence, independently of all others, for its similarity in meaning to the original sentence using a 4-point scale, ranging from 1 (*very different in meaning*) to 4 (*very similar in meaning*).

Ten independent raters rated the plausible recognition targets (half of each mode, DR mode vs. A-DR mode, counterbalanced across raters) and 10 independent raters rated the implausible recognition foils (half of each mode, DR mode vs. A-DR mode, counterbalanced across raters), with the Likert scales used to rate the processing configuration of the training completions. We examined these ratings using a mixed-design 2×2 ANOVA, with Sentence Target (target interpretation vs. foil interpretation) as the between-subjects factor, and Sentence Meaning (DR mode vs. A-DR mode) as the within-subjects factor. As intended, there were

a number of significant main effects for Sentence Meaning.[1] Relative to the recognition sentences designed to be consistent with A-DR mode, the recognition sentences designed to be consistent with DR mode were rated as significantly less sensory focused, $F(1, 18) = 16.65$, $p < .001$ (DR mode, $M = 4.18$, $SD = 1.44$; A-DR mode, $M = 5.64$, $SD = 1.20$), involving significantly more evaluation of meanings and implications, $F(1, 18) = 15.43$, $p < .001$ (DR mode, $M = 6.34$, $SD = 0.98$; A-DR mode, $M = 5.02$, $SD = 1.23$) and involving significantly more global, trait-level attributions, $F(1, 18) = 5.93$, $p < .05$ (DR mode, $M = 4.49$, $SD = 1.23$; A-DR mode, $M = 3.68$, $SD = 1.59$). Thus, the different recognition sentences do seem to index the intended processing configurations, with the DR-mode recognition sentences reflecting higher-level construals than the A-DR–mode recognition sentences.

Mood measure—positive and negative affect schedule (PANAS; Watson et al., 1988). The PANAS consists of two 10-item scales measuring positive affect (e.g., "interested," "excited," "proud") and negative affect (e.g., "distressed," "upset," "scared"). In this experiment, each item is rated for the extent to which the participant feels that way right now on a 9-point scale from 1 (*very slightly/not at all*) to 9 (*extremely*). The PANAS has been found to be a reliable and valid measure of mood (Watson et al., 1988) and has been used extensively in experimental research.

Anagram stressor task—failure feedback. The failure-feedback task was a computerized version of the anagram-solution task used in Experiments 1 and 2 that included only the 15 solvable anagrams. The instructions informed participants that performance was related to intelligence and academic and career success and that they were expected to solve about 40–60% of the anagrams. During the task, each of the anagrams was presented for 20 s, after which participants were given 10 s to type in the solution. The computer then displayed "correct" or "incorrect" feedback, together with the correct solution and the proportion of anagrams solved so far. All participants solved fewer than 40% of the anagrams ($M = 15.5\%$, $SD = 11.1\%$, range = 0–33%).

Procedure

Each participant was seen individually. Participants were given the rationale that the researchers were examining the processes of imagination, visualization, and cognition. After giving written informed consent, participants completed the BDI, and then completed the first PANAS measure of mood, which was administered via computer (pretraining measure). Participants then worked through the training phase in their assigned experimental condition. After all the training descriptions had been completed, participants began the recognition descriptions. This was followed by a 2-min unrelated filler task, (a computerized version of the speed of comprehension test; Baddeley, Emslie, & Nimmo-Smith, 1992) in which participants made judgments as rapidly as possible as to whether sentences were true or false (e.g., "Admirals are people," "Beef steaks are footwear"). After this, participants completed the recognition ratings, with instructions emphasizing the need to rate each sentence independently of the others. A further computer-based PANAS measure of mood (posttraining/prestress measure) was then completed. Participants then attempted the anagram task designed to induce the experience of failure, before rating their mood again via the computerized PANAS (poststress measure). The computer software E-Prime was used to administer the study materials and to collect participants' responses.

Results

The same sequence of analysis used in Experiments 1 and 2 was repeated in Experiment 3.

Testing the Induction of Different Processing Configurations—Recognition Ratings

We calculated a level-of-construal index consisting of the ratings for the high-level construal (DR mode) recognition statements minus the ratings for the low-level construal (A-DR mode) recognition statements, such that higher scores on the index indicate a greater endorsement of higher-level construals consistent with DR mode. If the manipulation was successful, participants trained in the DR mode would have higher scores on this level-of-construal index than participants trained in the A-DR mode.

A mixed-design ANOVA with Training Condition as the between-subjects factor (DR mode vs. A-DR mode), sentence target (plausible target interpretation vs. implausible foil interpretation) as the within-subject factor, and the level-of-construal index as the dependent variable revealed a large main effect of target, $F(1, 38) = 31.78$, $p < .01$, indicating higher level-of-construal index for implausible rather than plausible interpretations. Critically, as predicted, there was a significant main effect of condition, $F(1, 38) = 8.11$, $p < .01$, reflecting more endorsement of high-level construals in DR mode ($M = 0.35$, $SD = 0.29$) than in A-DR mode ($M = 0.09$, $SD = 0.28$). The interaction between target and condition was not significant, $F(1, 38) = 1.63$, *ns*. These results provide confirmation that the DR-mode condition was successful in inducing a mind-set more characteristic of depressive rumination than the A-DR–mode condition.

Testing Emotional Responses

Mood state during training phase. The scores obtained on the positive and negative affect scales in each training condition before and after the training phase and before and after the stress phase are presented in Table 3. A mixed-design 2 × 2 × 2 ANOVA, with Training Condition (DR mode vs. A-DR mode) as the between-groups factor, Time (pretraining vs. posttraining) and Scale Type (positive affect vs. negative affect) as the repeated-measures factors, and score on each affect scale as the dependent variable, revealed a significant main effect of time, $F(1, 38) = 61.46$, $p < .001$, reflecting reductions in both positive and negative affect across the training phase in both conditions. There was also a significant main effect of scale type, $F(1, 38) = 90.17$, $p < .001$, reflecting lower scores on the negative-affect scale than on the positive-affect scale. Of particular importance, there was not a significant two-way interaction of Condition × Time, $F(1, 38) = 1.90$,

[1] There were few other significant main effects or interactions: There were no interactions of Sentence Target by Sentence Meaning, all Fs < 1, and only one significant main effect of Sentence Target, $F(1, 18) = 6.30$, $p < .05$, with the evaluation of meanings and implications as the dependent variable, reflecting foils being rated as less focused on meanings and implications than targets.

Table 3
Means and Standard Deviations for Affect Scores by Condition and Time in Experiment 3

	Condition			
	DR mode		A-DR mode	
Variable	*M*	*SD*	*M*	*SD*
Pretraining positive affect	51.70	9.94	53.05	13.41
Posttraining positive affect	46.30	14.33	45.00	16.29
Poststress positive affect	35.00	14.95	40.90	18.65
Pretraining negative affect	23.60	11.91	25.80	16.56
Posttraining negative affect	19.05	11.34	19.65	11.85
Poststress negative affect	30.65	17.11	23.20	13.13

Note. DR = mode consistent with depressive rumination; A-DR = mode antithetical to depressive rumination.

$p = .18$, nor a significant three-way interaction of Condition × Time × Scale Type, $F(1, 38) = 0.09$, $p = .77$. These results indicate that there was no direct mood-induction effect of manipulating processing configuration and that both training conditions had equivalent direct mood-induction effects on positive and negative affect. No other significant effects were obtained from the ANOVA (all Fs < 1).

Emotional reactivity. A mixed-design 2 × 2 × 2 ANOVA, with Training Condition (DR mode vs. A-DR mode) as the between-groups factor, Time (prestress vs. poststress) and Scale Type (positive affect vs. negative affect) as the repeated-measures factor, and scores on each affect scale as the dependent variable, revealed a significant main effect of scale type, $F(1, 38) = 33.54$, $p < .001$, qualified by a significant interaction of Scale Type × Time, $F(1, 38) = 41.43$, $p < .001$. The main effect reflected elevated scores on the positive-affect scale compared to the negative-affect scale, while the interaction reflected an increase in negative affect from prestress to poststress but a decrease in positive affect from prestress to poststress, confirming the effectiveness of the anagram stressor as a mood induction. Of greater relevance to the hypothesis under test, these effects were subsumed within a significant higher-order Training Condition × Scale Type × Time interaction, $F(1, 38) = 10.32$, $p < .005$. The significance of this interaction means that the degree to which the anagram stress task increased negative affect and reduced positive affect was modified in different ways for participants in each training condition. Calculation of component effects demonstrated that this higher-order interaction was due to significant interactions of Condition × Time for each Scale Type, but acting in opposite directions. Thus, for the positive-affect scale, there was a significant interaction of Condition × Time, $F(1, 38) = 8.34$, $p < .01$, which reflected a significantly greater decrease in positive affect from prestress to poststress in the DR-mode condition, $t(19) = 7.71$, $p < .001$ (95% CI for decrease in positive affect, 8.23, 14.37), than in the A-DR–mode condition, $t(19) = 2.03$, $p = .06$ (95% CI, - 0.12, 8.32). In contrast, for the negative-affect scale, there was a significant interaction of Condition × Time, $F(1, 38) = 5.91$, $p < .05$, which reflected a significantly greater increase in negative affect from prestress to poststress in the DR-mode condition, $t(19) = 3.89$, $p < .001$ (95% CI for increase in negative affect, 5.35, 17.85), than in the A-DR–mode condition, $t(19) = 2.48$, $p < .05$ (95% CI, 0.55, 6.55). Figure 2 illustrates the simple interaction for negative affect. These results confirm that the training conditions had a differential influence on emotional reactivity to the subsequent anagram stressor task.

Discussion

The results of Experiment 3 further support the processing-mode theory. They replicate our previous findings that inducing A-DR mode reduced subsequent emotional reactivity relative to inducing DR mode. Further, this replication strengthens the previous findings because Experiment 3: (a) used a means of training processing mode that, although conceptually consistent with the previous manipulations, was more implicit; and (b) replicated the findings on the PANAS, a more detailed and well-validated measure of positive and negative affect. Moreover, the recognition sentences measure confirmed that the DR-mode training condition produced greater endorsements of sentences consistent with high-level construals than the A-DR–mode training condition, indicating that the manipulation of processing mode was successful.

General Discussion

In a series of three experiments, we have shown that when one is focused on emotional scenarios, compared to inducing a mind-set characteristic of that observed in depressive rumination, inducing a mind-set antithetical to that observed in depressive rumination reduces subsequent emotional reactivity. These findings are consistent with our principal hypothesis that processing mode modifies emotional response to a stressful event.

Across all three experiments, the pattern of results indicates that the two distinct training procedures were effective in manipulating the level of construal adopted by participants in the intended direction. In Experiments 1 and 2, participants in the DR-mode condition produced more abstract and general solution descriptions, consistent with the processing configuration characteristic of

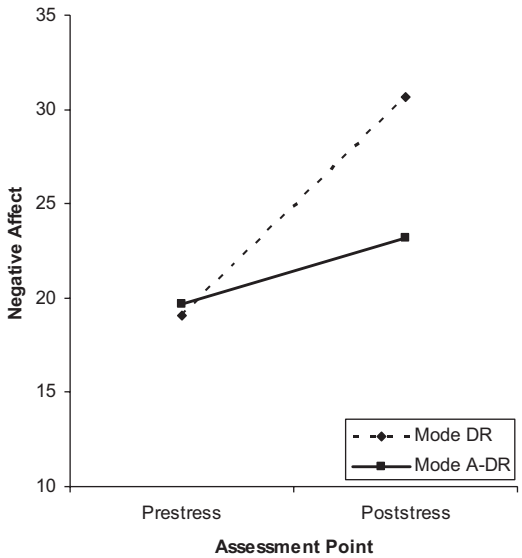

Figure 2. Effect of anagram stress task on negative affect after interpretative-bias training in Experiment 3.

depressive rumination, than participants in the A-DR–mode condition. Critically, this successful manipulation check was (a) on a non-self-report measure and (b) measured approximately 5 min after the end of the training phase, indicating that the training produced a shift in thinking that persisted for at least 5 min and was maintained despite the transfer of processing to a new task (problem solving). In Experiment 3, relative to the A-DR–mode condition, the DR-mode condition resulted in greater endorsement of recognition statements that disambiguated previously viewed negative scenarios in a way that was consistent with abstract, evaluative, and judgmental interpretations of the ambiguous scenarios. Again this effect was observed after a filler task, indicating that training produced a shift in processing that could persist for at least several minutes and transfer to another task.

Furthermore, these results clearly demonstrate that the different conditions had differential effects on emotional reactivity. In all three experiments, the manipulation of processing configuration had no direct mood-induction effect, with the training conditions not differing in their effects on mood ratings from pretraining to posttraining. Furthermore, immediately prior to the anagram stressor task, participants in the different training conditions reported equivalent levels of negative mood. Rather, the induction of the different processing configurations influenced emotional reactivity across the stress phase: Inducing higher-level construals resulted in a greater increase in negative mood (despondency in Experiments 1 and 2, increases in negative affect and reductions in positive affect in Experiment 3) in response to the subsequent anagram stress task than inducing lower-level construals.

We believe it unlikely that our findings could be the result of the DR-mode condition inducing participants to be more self-focused than the A-DR–mode condition, and thereby influencing emotional reactivity (Ingram, 1990). First, across all three studies, the emotional scenarios used were identical across the training conditions and each equally focused on self. Second, in both Experiments 1 and 2, we found that there was no difference between the training conditions in their effects on self-focus.

One might also argue that experimental demand may have contributed to the observed findings. Although some contribution of experimental demand can never be completely ruled out, we believe that it is unlikely that experimental demand was responsible for our results. First, none of our participants deduced that the training conditions were designed to influence their response to the anagram task, nor did they comment that the training scenarios were biased in any particular way. Second, as MacLeod et al. (2002) have argued, it seems implausible that experimental demand would lead to an effect of training only by influencing the emotional response to a subsequent stressor but not to a direct effect of training on mood. Third, whereas Experiments 1 and 2 had explicit training conditions, which potentially could have produced demand effects in participants, Experiment 3 had an implicit training procedure, with participants receiving no explicit instructions to alter their thinking about emotional events.

Importantly, the training procedure in Experiment 3 was designed to be methodologically different but conceptually equivalent in terms of inducing DR mode versus A-DR mode with respect to the training procedures in Experiments 1 and 2. Thus, the fact that all three experiments replicate the same main findings despite these methodological differences reduces the likelihood that the observed effects are due to idiosyncrasies of experimental method or artifacts of each training procedure, and strengthens the argument that the observed findings are consistent with the proposed hypothesis. In all three studies, the DR-mode training conditions focused on inducing high-level construals such as abstract and general implications and meanings of events, evaluations, and judgments, which are characteristic of the phenomenology of depressive rumination, whereas the A-DR–mode condition induced low-level construals with a focus on the concrete, specific, sensory–perceptual details of how events happen, inconsistent with depressive rumination. Together these findings are consistent with the hypothesis that level of construal may be an important dimension distinguishing between processing modes that result in unconstructive depressive rumination versus more constructive forms of self-focus.

An unexpected finding was the observation that in Experiments 1 and 2, despondency increased from pretraining to posttraining, suggesting that the training acted as a negative mood induction, despite having equivalent numbers of positive and negative emotional scenarios. This effect was probably not due to an imbalance of emotional intensity across the scenarios because the positive scenarios and negative scenarios were matched for intensity of valence and vividness. This effect may simply be a consequence of boredom and fatigue after 30 training presentations. Alternatively, the negative scenarios may be more salient than the positive scenarios, producing an overall negative mood induction, because negative information has greater salience and dominance for subsequent responses than positive information (Ito, Larsen, Smith, & Cacioppo, 1998; Rozin & Royzman, 2001). Methodological differences between the experiments can explain why the training phase had a negative mood induction effect in Experiments 1 and 2 but not in Experiment 3. In Experiment 3, the interpretative-bias training paradigm is more implicit and covert, and, therefore, much less likely to induce negative mood than the more effortful and overt training paradigm in Experiments 1 and 2.

The observation that the training phase acted as a negative mood induction in Experiments 1 and 2 raises the question of why we did not observe a differential effect on despondency of the two training conditions during the training phase. After all, we hypothesized that relative to training participants into DR mode, training participants into A-DR mode would reduce emotional reactivity. Thus, if the training itself acted as a mild stressor, one might expect to see the training conditions produce differential emotional responses during training itself. However, two potential accounts might explain why this effect was not observed. First, the training phase may not have been a powerful-enough negative mood induction to produce the variations in emotional response necessary to detect the effects of training condition on emotional reactivity, unlike the more intense anagram stressor task. The anagram stressor task involves an unexpected, involuntary, and real emotional experience, whereas the training involves voluntary, deliberate, and imaginary emotional experience. The anagram stressor task is thus likely to induce a more intense negative emotion than the training phase. Further, positive and negative scenarios were deliberately balanced in the training phase to minimize any overall mood-induction effect. Consistent with this account, across Experiments 1 and 2, the anagram stressor task resulted in a mean increase in despondency three times greater than the mean increase in despondency during the training phase (see Tables 1 and 2). Second, it may have taken repeated practice on the training items

to induce the desired processing mode. Thus, throughout much of the training phase, the intended processing mode may not have been fully developed and so could not operate effectively to influence emotional reactivity.

The current findings have a number of important theoretical implications. First, our findings provide strong support for the hypothesis that a mode of processing consistent with that observed in depressive rumination will result in greater emotional reactivity than a mode of processing inconsistent with that observed in depressive rumination. These findings indicate that differences in the adoption of these processing modes can causally influence emotional reactivity, at least within a nonclinical population. These findings are consistent with previous studies that found that a mode of processing characterized by a configuration of abstract, comparative, verbally based, evaluative, and "Why?"-type thinking produces detrimental consequences during focus on self, feelings, and problems, relative to a processing mode characterized by a configuration of concrete, process-focused, imagery-based, and experiential processing (Moberly & Watkins, 2006; Rimes & Watkins, 2005; Treynor et al., 2003; Watkins & Moulds, 2005; Watkins & Teasdale, 2001, 2004). Taken together, these findings are consistent with the processing-mode theory, which proposes that the consequences of depressive rumination, in part, depend on the particular processing mode adopted during focus on self, problems, and feelings.[2] Moreover, these findings suggest that processing mode may be an important element influencing the role of rumination in emotional reactivity.

Second, the absence of any differential mood-induction effect between the DR mode and A-DR mode *across the training phase* indicates that the abstract, evaluative processing mode consistent with the phenomenology of depressive rumination is not an inherently maladaptive form of thought. Previous studies have found that the maladaptive effects of depressive rumination only occur in dysphoric participants, such that it is the combination of ruminative processing with negative mood that seems to be maladaptive (e.g., Lyubomirsky & Nolen-Hoeksema, 1995; Nolen-Hoeksema & Morrow, 1993). In the current study we did not select dysphoric participants or induce negative mood prior to manipulating rumination, but rather exposed participants to a negative-mood-inducing event *after* inducing different processing configurations. Therefore, we examined the effect of a ruminative mind-set in the context of a negative mood *during the stress phase* of the study but *not during the training phase* of the study. Thus, our results are consistent with previous demonstrations that ruminative processing is only maladaptive in the context of dysphoric mood.

Third, Experiment 2 provided some tentative evidence that, relative to the no-training control condition, the A-DR mode has a protective effect against emotional reactivity, rather than that the DR mode exacerbates emotional reactivity. However, it is important to note that following failure, the default mode adopted in the no-training control seems to be similar to the DR mode. Thus, we do not know if the A-DR mode would have a beneficial effect when compared to a more neutral nonruminative control condition.

Fourth, the differential effects of the DR and A-DR modes on emotional reactivity are consistent with our level-of-construal hypothesis. As noted earlier, whereas low-level construals involve contextualized representations, high-level construals engender generalizations, such that it is hypothesized that in the context of a negative event, relative to low-level construals, higher-level construals are likely to produce negative overgeneralizations. Such overgeneralizations are implicated in the onset and maintenance of depression (Beck, 1976; Carver, 1998) and exacerbate emotional reactivity (Wenzlaff & Grozier, 1988). Within this account, the mechanism by which the A-DR mode would reduce emotional reactivity is by producing more concrete, specific mental representations that reduce negative overgeneralizations. Consistent with this hypothesis, inducing specific, concrete modes of thought results in less emotion to subsequent mood inductions, relative to inducing more general modes (Philippot et al., 2003, 2006; Raes et al., 2006). Similarly, these results have implications for cognitive models highlighting attributional style in vulnerability for depression, because higher-level construals are consistent with the global, stable attributions for negative events that are implicated in the onset of depression (Abramson, Seligman, & Teasdale, 1978; Alloy et al., 1999). Thus, level of construal during processing is a plausible candidate for a potential mediator of the differential effects of the DR mode versus other modes antithetical to depressive rumination. However, the current experiments were not designed to examine the role of this dimension (or any other dimension) as a mediator of the training effects. A design similar to that used by MacLeod et al. (2002, Study 2), in which the response to the stressor task is examined before and after the training phase is necessary in order to assess potential mediators of the effects of training on reactivity.

Finally, an unresolved question concerns whether there is a potential interaction between processing mode and the valence of the emotionally eliciting event, such that high-level construals exacerbate negative emotional responses to negative events but also exacerbate positive emotional responses to positive events (see Watkins, in press). Does DR-mode training specifically increase emotional reactivity to negative events, or does training into DR mode lead to people reading more general implications into any emotional event relative to A-DR–mode training, such that for a positive event, the DR-mode training condition would lead to a greater increase in positive mood? Currently, the evidence is mixed: Relative to inducing lower-level construals, inducing higher-level construals can increase the positive emotional response to positive events (e.g., compliments, Marigold, Holmes, & Ross, 2007) or positive mood inductions (Philippot et al., 2003, 2006), although thinking about positive events with lower-level construals has also been associated with increased positive affect compared to reappraisal (Lyubomirsky, Sousa, & Dickerhoof, 2006).

The current studies were designed as a preliminary test of whether processing mode influences emotional reactivity, using an analogue of a negative event in a nonclinical sample. Despite a number of strengths including a robust experimental methodology and replication across three studies, there are several limitations.

[2] We note that our conceptualization of high-level versus low-level construals does parallel the subtypes of rumination (brooding, reflective pondering) reported by Treynor et al. (2003). First, the distinction between levels of construal reflects a theoretical model, whereas the distinction between brooding and reflective pondering is atheoretical and derived from a factor analysis. Second, both brooding and reflective pondering factors are multidimensional involving focus on self, focus on feelings, and self-judgment as well as abstract construals. Third, both brooding and reflective pondering have been associated with depressive symptoms.

First, the failure induction was relatively mild. It is not known whether the present findings would generalize to more severe negative events. Second, our experimental sample was predominantly female, which may limit the extent to which we can generalize our findings to a male sample. Third, there is the question of whether the training conditions would have similar effects in clinical populations, such as people with major depression. All participants reported depressive symptoms well below clinical levels, limiting the extent we can generalize our findings to a more depressed sample. Because Moberly and Watkins (2006) found that similar training conditions influenced the relationship between trait rumination and emotional reactivity, and trait rumination is a known vulnerability factor for depression, we speculate that the effects of training observed here would extend to individuals with clinical depression such that training in A-DR mode would reduce emotional reactivity relative to training in DR mode. Nonetheless, as noted earlier, the A-DR–mode manipulation may be more potent for less-dysphoric populations, whereas the DR-mode manipulation may be more potent for more-dysphoric populations. A low-dysphoria sample, such as in the current studies, may find it to harder to engage in a manipulation training DR mode, whereas individuals more prone to depression may be more responsive to the DR-mode training. For these reasons, it is important that the generalizability of these findings to individuals with clinical depression is empirically tested.

A fourth limitation concerns the selection of the training material used. We assumed that training would have the greatest likelihood of influencing emotional reactivity if the training itself was focused on emotional scenarios that were relevant to the subsequent negative stressor. However, we also chose to use a balance of positive scenarios and negative scenarios in order to minimize any overall mood-induction effects of the training itself. One potential limitation of this design is that the use of positive training materials may reduce the ecological validity of the training task because naturally occurring depressive rumination is focused predominantly on negative events. Further, the inclusion of positive scenarios in the training materials may dilute the effects of the training on subsequent emotional reactivity, although this has the advantage of making the current studies a more conservative test of our hypothesis. One might argue that training would have stronger effects on emotional reactivity if the training items were exclusively negative scenarios and weaker effects if the training items were exclusively neutral or positive. Nonetheless, it remains an empirical question as to whether similar effects would be found if the training materials were exclusively negative, positive or neutral.

A fifth limitation concerns the possibility that the simple measure of self-focus may conflate distinct forms of self-focus. Recent theories emphasize a distinction between ruminative self-focus motivated by threat versus reflective self-focus motivated by curiosity (Trapnell & Campbell, 1999). It may be that the distinct processing modes would have differential effects on these distinct forms of self-focus that the current experiments cannot determine.

In conclusion, we have demonstrated that it is possible to manipulate individuals' subsequent emotional reactivity by training them to adopt either a mind-set characteristic of the phenomenology of depressive rumination or a mind-set antithetical to that observed in depressive rumination. These findings suggest that it is not just cognitive biases toward or away from negative information that can cause variations in emotional reactivity, but also that the mode in which people process emotional information causally influences subsequent emotional reactivity.

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Received May 15, 2007
Revision received December 21, 2007
Accepted February 19, 2008 ■