



## An experiential avoidance conceptualization of depressive rumination: Three tests of the model

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### ARTICLE INFO

#### Article history:

Received 7 September 2008

Received in revised form

27 June 2010

Accepted 12 July 2010

#### Keywords:

Rumination

Worry

Experiential avoidance

### ABSTRACT

This study examined an experiential avoidance conceptualization of depressive rumination in 3 ways: 1) associations among questionnaire measures of rumination, experiential avoidance, and fear of emotions; 2) performance on a dichotic listening task that highlights preferences for non-depressive material; and 3) psychophysiological reactivity in an avoidance paradigm modeled after the one used by Borkovec, Lyonfields, Wisner, and Deihl (1993) in their examination of worry. One hundred and thirty-eight undergraduates completed questionnaire measures and participated in a clinical interview to diagnose current and past episodes of depression. Of those, 100 were randomly assigned to a rumination or relaxation induction condition and participated in a dichotic listening task, rumination/relaxation induction, and depression induction. Questionnaire measures confirmed a relationship between rumination status and avoidance; however, no significant effects were found in the dichotic listening task. Psychophysiological measures indicated no difference in physiological response to a depression induction among high ruminators (HR). However, low ruminators (LR) in the relaxation condition exhibited a larger IBI response than LR in the rumination condition. Overall, these results provide partial support for an avoidance conceptualization of depressive rumination. Implications of these findings are discussed.

Published by Elsevier Ltd.

Depressive rumination refers to the tendency of some individuals to recursively mull over the symptoms, causes and consequences of their negative affect (Nolen-Hoeksema, 1991). Rumination has been linked to longer and more severe depression, delayed recovery from depression, increases in suicidal ideation, and impairments in problem solving, motivation, and concentration (Eshun, 2000; Lyubomirsky, Kasri, & Zehm, 2003; Lyubomirsky & Tkach, 2004; Siegle, Sagrati, & Crawford, 1999; Smith, Alloy, & Abramson, 2006). Rumination has also prospectively predicted major depression over a 2.5-year follow-up (Nolen-Hoeksema, 2000; Spasojevic & Alloy, 2001). Given that depression affects 1 in every 5 adults (Angst, 1995), a greater understanding of the nature of rumination may aid in the design and implementation of intervention strategies that target ruminative response styles, and, thus, lessen and/or prevent depression.

Several theories have been proposed to explain the negative effects of rumination. The most widely known is Nolen-Hoeksema's

(2004) Response Style Theory which suggests that rumination negatively impacts individuals in four crucial ways: 1) through the activation of negative thoughts and memories, rumination exacerbates the impact of depressed mood on thinking and increases the likelihood that individuals will make depressogenic inferences in regard to their current circumstances, 2) rumination interferes with problem solving and, thus, 3) impedes the implementation of successful strategies to overcome negative mood, and 4) rumination alienates potential social supports resulting in a loss of support. Other models have proposed that rumination is harmful because of its relationship to right hemisphere activation, its activation of negative beliefs regarding rumination and oneself, and/or its interference with positive restructuring of negative memories (Martin, Shrira, & Startup, 2004; Matthews & Wells, 2004; Papageorgiou & Wells, 2004). Although support for some of these models has been obtained (e.g. rumination has been linked to impediments in problem solving and activation of negative self-relevant information), an alternative hypothesis is that rumination is a manifestation of experiential avoidance (Lyubomirsky & Nolen-Hoeksema, 1995; Lyubomirsky, Tucker, Caldwell, & Berg, 1999; Mellings & Alden, 2000).

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Avoidance models have been applied to many types of psychopathology. For example, Hayes, Wilson, Gifford, Follette, and Strosahl (1996) proposed that experiential avoidance, a tendency to avoid contact with certain aspects of private experiences, is characteristic of many forms of psychopathology, including substance abuse, obsessive-compulsive disorder, panic disorder, and borderline personality disorder. Experiential avoidance is presumed to be harmful because it prevents individuals from effectively responding to emotional stimuli and often has the paradoxical effect of increasing avoided material (Hayes et al., 2004; Wenzlaff & Wegner, 2000). Avoidance has also been described as a fundamental process in generalized anxiety disorder (GAD) in Borkovec's (1994) model, which postulates that worry serves to distract individuals from deeper, more emotional, topics. This avoidance of emotionally arousing material through worry then provides a false, and reinforcing, sense of control over emotions, which ultimately prevents the individual from effectively processing their negative emotion. Given the high rate of comorbidity of GAD and depression (60%; Brown, Campbell, Lehman, Grisham, & Mancill, 2001), and the high correlations of measures of rumination and worry ( $r = .66$ ; Beck & Perkins, 2001), it may be that rumination, like worry, serves an avoidance function. More specifically, it may be that ruminators avoid the experience of sadness through recursive cognition.

Consistent with an avoidance conceptualization of rumination, studies have reported a direct link between self-reported depressive rumination and experiential avoidance (Cribb, Moulds, & Carter, 2006; Smith, Hughes, & Alloy, 2005; Smith et al., 2007). In addition, several studies have demonstrated a link between rumination and avoidant behaviors. For example, Lyubomirsky, Kasri, Chang, and Chung (2006) reported that, among women who had previously received a diagnosis of breast cancer, ruminating women waited 2 months longer than non-ruminators to report their initial symptoms to their health care professionals. The authors concluded that rumination contributed to a delayed response to symptoms, which supports the hypothesis that high ruminating individuals may avoid dealing with emotionally threatening material. Similarly, Smith et al. (2007) reported that high ruminating individuals reported significantly more cutting behavior than low ruminators, which has been construed as a way for individuals to get relief from aversive emotional experiences (Linehan, 1993). High ruminating individuals also reported using substance use as a coping strategy significantly more than low ruminators, which also suggests a preference for escape from negative emotions (Nolen-Hoeksema, 2007; Smith et al., 2007). These studies all point to a link between depressive rumination and purposeful avoidance of negative emotions.

The goal of the current study was to explore whether an experiential avoidance conceptualization explains the negative effects of depressive rumination. Other investigations of experiential avoidance have used a variety of methodologies to examine the avoidance construct. For example, a widely used self-report measure of experiential avoidance is the Acceptance and Action Questionnaire (AAQ; Hayes et al., 2004) and preliminary studies have found an association between self-reported rumination and high scores on the AAQ (Cribb et al., 2006; Smith et al., 2005). A dichotic listening task has also been used as a behavioral measure of avoidance in worry (Laguna, Ham, Hope, & Bell, 2004). In this task, high worrying individuals demonstrated greater recall of non-threatening words, even when instructed to attend to threatening content presented simultaneously. This indicates a shift in attention away from anxiety provoking content, and thereby suggests that these individuals were demonstrating experiential avoidance. Similarly, it was expected that high ruminating individuals would

also shift their attention away from depressive content in our modified dichotic listening task.

Another indicator of avoidance lies in physiological response to aversive stimuli. Specifically, experiential avoidance has been linked to discordance between self-reported mood and arousal and physiological indices of arousal. For example, in a classic study of worry in GAD, Borkovec, Lyonfields, Wiser, and Deihl (1993) pre-selected individuals who were afraid of public speaking and had them worry or relax prior to imagining giving a public speech (an exposure to a feared stimulus). They found that individuals in the worry condition showed less heart rate response to this exposure, whereas individuals who relaxed showed greater heart rate response. These findings suggest that individuals who worried suppressed their heart rate response, and thereby avoided the physiological reaction to the feared stimulus. Similarly, other studies have also linked discrepancies between self-reported affective response and physiological indicators of response to experiential avoidance (Feldner, Zvolensky, Eifert, & Spira, 2003; Sloan, 2004). As a whole, these studies indicate that worry, avoidance of emotional state, and overall tendency to avoid experiences are related to a specific pattern of response to emotional stimuli: higher levels of self-reported negative mood and arousal and lower levels of physiological arousal. It was expected that rumination would also produce this pattern of high self-reported negative affect and attenuated physiological arousal during a sad mood induction.

Given the variety of methods available to assess avoidance, and the preliminary support for a link between rumination and avoidance, this study aimed to build upon this work by investigating an avoidance conceptualization of rumination in 3 ways: via 1) self-report questionnaire measures of avoidance, 2) a behavioral index of avoidance (shift in attention away from depressive content during a modified dichotic listening task), and 3) a discrepancy between self-reported emotional response and physiological response to a sad mood induction. The third index of avoidance was explored by replicating the paradigm of Borkovec et al. (1993) in their examination of avoidance and worry. Given that worry and rumination frequently co-occur, and that worry and rumination are both repetitive cognitive processes, this seemed like an appropriate methodology to test avoidance in rumination. Therefore, their paradigm was modified in this study such that high ruminating (HR) and low ruminating (LR) participants were instructed to either ruminate or relax prior to completing a sad mood induction task while heart rate response was recorded.

In addition to examining an avoidance model of rumination, this study also aimed to address some of the limitations of previous research in this area. For example, concerns have been raised regarding the face validity of the AAQ, the wide range of constructs measured by the AAQ (e.g. beliefs about emotions, avoidant behaviors, fears about the consequences of emotions, cognitive activities related to avoidance), and evidence that the AAQ actually may be measuring negative affectivity as opposed to avoidance. Therefore, the current study included an additional self-report measure of avoidance, the Affective Control Scale, which quantifies fear of emotional responses (ACS; Williams, Chambless, & Ahrens, 1997). It was hoped that the ACS would be a more pure index of avoidance given its focus primarily on metacognitive beliefs about emotion that drive avoidance, and its relationship to other avoidant processes such as worry (Roemer, Salters, Raffa, & Orsillo, 2005). However, because the AAQ is a widely used measure of experiential avoidance and has previously been used to relate to rumination, it was also included.

In addition, this study aimed to address limitations of the original Borkovec et al. (1993) paradigm. One criticism of Borkovec et al.'s (1993) study is that it did not control for baseline levels of

physiological activation in worriers; therefore, the blunted physiological response observed in worriers may have been due to increased physiological response to worry itself (Peasely-Miklus & Vrana, 2000). In support of this blunting hypothesis, Peasely-Miklus and Vrana (2000) reported that high worrying individuals showed a significant physiological response from baseline to a worry induction, and they did not exhibit an additional physiological response to the subsequent fear induction (Peasely-Miklus & Vrana, 2000). The authors concluded that although the heart rate suppression effect from Borkovec et al.'s (1993) study was replicated (i.e. there was no change in heart rate from the worry to fear inductions), it may be because participants were already activated from the worry induction. To control for this possibility, the present study obtained baseline measures of physiological response prior to the rumination induction and the blunting effect was specifically tested. In addition, this study included a measure of analytical thinking, which is hypothesized to be characteristic of rumination, to expressly test whether or not the rumination induction was effective in eliciting more ruminative thought, and, conversely, whether the relaxation induction was successful in circumventing rumination in HR individuals.

In sum, this study examined an experiential avoidance conceptualization of depressive rumination using 3 methodologies. It was expected that 1) individuals who reported high levels of rumination would score higher on self-report measures of experiential avoidance than LR, 2) HR individuals would remember a greater number of neutral words (indicating a shift in attention away from depressive material) than LR during a dichotic listening task, and 3) HR individuals would report greater emotional response to a sad mood induction than LR, but demonstrate less of a physiological response to the sad mood induction. In addition, it was expected that the blunting hypothesis would not be supported by these data (i.e. heart rate would not increase in response to the rumination induction). This is the first study to directly test this conceptualization of rumination, and it adds to the current literature by examining multiple indices of avoidance (self-report, behavioral, physiological), and exploring an alternative hypothesis.

## Methods

### Participants

#### Description of participants

**Phase 1.** One hundred and thirty-eight Temple University undergraduates participated in Phase 1 of the study (see Table 1). The mean age of the sample was 19.51 and 84% of the participants were female. The ethnic breakdown of the sample was 63% Caucasian ( $n = 85$ ), 18% African American ( $n = 25$ ), 2% Hispanic American

( $n = 3$ ), 7% Asian American ( $n = 10$ ), 3% Not American (Foreign,  $n = 4$ ), and 7% Other ( $n = 9$ ).

**Phase 2.** Of the 138 participants who completed Phase 1, 100 participated in Phase 2 of the study (see Table 1). The mean age of the Phase 2 sample was 19.65 and 88% of the participants were female. The ethnic breakdown of the Phase 2 sample was 62% Caucasian ( $n = 58$ ), 18% African American ( $n = 17$ ), 2% Hispanic American ( $n = 2$ ), 8% Asian American ( $n = 7$ ), 3% Not American (Foreign,  $n = 3$ ), and 7% Other ( $n = 6$ ). The HR group consisted of 46 participants and 54 participants were classified as LR. Forty-eight participants were randomly assigned to the rumination induction condition and 49 were assigned to the relaxation induction condition.

#### Inclusion/exclusion criteria

Participants were excluded from the study if they: were under 18 years of age, and thereby required parental permission to participate; if they had received a diagnosis of high blood pressure; if they had a pacemaker device; if they took cardiac dysfunction, anxiolytic, or stimulant medications; or if they reported undergoing anesthesia or using alcohol, marijuana, morphine or cocaine within 24 h prior to their Phase 2 appointment. Participants were asked to refrain from ingesting caffeine or nicotine for 4 h prior to their Phase 2 appointment.

In addition, individuals were excluded from Phase 2 if they were believed to be too vulnerable to complete the depression induction. Specifically, 14% of participants ( $n = 19$ ) who completed Phase 1 were excluded from Phase 2 because they met criteria for current depression, were believed to be at risk for suicide, or were potentially entering a depressive episode at Phase 1, but did not yet meet full criteria (i.e., met symptom criteria, but not duration criteria for a major depressive episode). Significantly more HR than LR participants were excluded based on these criteria ( $\chi^2(1) = 5.6$ ,  $p = .02$ ,  $\phi = .21$ ).

#### Procedure

##### Screening

Participants were recruited from undergraduate psychology courses via completion of the Response Styles Questionnaire (RSQ) as part of a packet of measures that students could use to fulfill their research requirements. In addition, flyers posted around campus advertised a website where students could complete the RSQ and be entered to win a monetary prize. Participants who scored 1 standard deviation above the mean (HR) on the Rumination scale of the RSQ, or scored at or below the mean (LR) were invited to participate in Phase 1. Chi-square analyses indicated that an equal number of HR and LR participants were recruited from each source ( $\chi^2(1) = .35$ ,  $p = .56$ ,  $\phi = .06$ ). There were no differences between participants recruited from each source on age, ethnicity, or sex (age,  $t(93) = .66$ ,  $p = .51$ ,  $d = .14$ ; ethnicity,  $\chi^2(5) = 5.28$ ,  $p = .38$ ,  $\phi = .24$ ; sex,  $\chi^2(1) = .19$ ,  $p = .67$ ,  $\phi = .04$ ).

**Phase 1.** Phase 1 consisted of completion of a diagnostic interview, followed by completion of the questionnaire measures administered in random order. Individuals were informed that the study could potentially consist of 2 sessions, and only a subset of individuals would be asked to participate in the second session. Those who qualified for the study were given a thorough explanation of the study and were invited to participate in Phase 2. Individuals who verbally consented were scheduled for Phase 2 and received a sheet reminding them to refrain from recreational drug or alcohol use 24 h prior to the study and to refrain from ingesting caffeine or nicotine 4 h prior to the study. Individuals who met DSM-IV criteria

**Table 1**  
Demographic characteristics of the sample.

	Phase 1 ( $n = 140$ )		Phase 2 ( $n = 100$ )			
	Rumination status		Rumination dtatus		Condition assignment	
	High	Low	High	Low	Relax	Rumination
Sex (% female)	78%	90%	86%	88%	87%	87%
Mean age	19.88	19.13	20.07	19.30	19.70	19.57
Age standard deviation	2.07	1.3	2.31	1.37	1.89	1.81
Ethnicity						
% Caucasian	69%	56%	67%	59%	60%	65%
% African American	7%	29%	7%	28%	23%	13%
% Other	24%	15%	26%	13%	17%	22%

for current depression, who were believed to be at risk for suicide, or who may have been entering a depressive episode at Phase 1, were not invited to participate in Phase 2 and were given appropriate referrals if indicated.

**Phase 2.** Participants who consented were randomly assigned to the rumination or relaxation condition. Initially, participants completed a measure of drug and alcohol use in the past 24 h and completed the Beck Depression Inventory (BDI; Beck, Rush, Shaw, & Emery, 1979). Individuals who reported recent drug, alcohol, nicotine, or caffeine use were rescheduled for a later time. Physiological recording devices were then attached to participants' chests and they completed the following sequence of tasks:

- 1) 5-min baseline recording period (baseline 1)
- 2) dichotic listening task, followed by surprise word recognition test
- 3) another 5-min baseline recording period (baseline 2)
- 4) 8-min rumination or relaxation induction (rumination/relaxation induction)
- 5) 8-min imagery script mood induction (depression induction)
- 6) second 8-min rumination or relaxation induction; the data from this recording were not used for the current study
- 7) 5-min final baseline period (rest)
- 8) 2-min amusing film clip to increase positive mood (film)

Inter-beat interval was monitored continuously throughout the baselines, rumination/relaxation induction, depression induction, and rest periods. After each task, participants completed questionnaires about self-reported mood and thought content. At the end of the session, participants viewed a film clip that has been shown to lift mood (Gross & Levenson, 1995). For this sample, participants reported a significant increase in mood valence from the rest to film task ( $t(98) = 8.2, p < .001, d = 1.15$ ), suggesting that this film was successful in lifting mood.

#### *Dichotic listening task*

The dichotic listening task was modeled after Laguna et al.'s (2004) modified dichotic listening paradigm that was used to assess cognitive avoidance in high vs. low worriers. In Laguna et al.'s study, participants were presented with a neutral or worry story in the dominant ear, while neutral words were presented in the unattended ear. For the current study, participants were instructed to attend to the information being played in their dominant ear (as determined by the handedness questionnaire) and ignore the information from the other channel. Participants heard 2 stories, a neutral script and a failure script, presented in counterbalanced order. As each script was playing, 180 of the 270 non-threatening words used in Laguna et al. (2004) were presented in the non-dominant ear, 90 during each script, at a rate of 1 word every 2 seconds. This was followed by a surprise word recognition test that consisted of all 270 words from Laguna et al.'s (2004) word list.

#### *Instructions*

**Rumination and relaxation induction instructions.** To induce rumination, participants read 28 items from Nolen-Hoeksema and Morrow's (1991) commonly used rumination induction. The task asks participants to focus on symptoms such as, "the physical sensations in your body," which are presented in a series. Participants received these instructions: "As you read the items, use your imagination and concentration to think about the causes, meanings, and consequences of the items. Spend a few moments visualizing and concentrating on each item, attempting to make sense of and understand the issues raised by each item." As in Borkovec

et al.'s (1993) paradigm, participants in the relaxation condition were instructed to relax and focus on their breathing.

In this sample, analytical thinking, which is believed to be a crucial characteristic of ruminative thinking, increased among participants who completed the rumination induction ( $t(49) = -3.78, p < .001, d = .78$ ); whereas individuals who were assigned to the relaxation induction condition showed a significant decrease in analytical thinking ( $t(49) = 2.44, p = .02, d = .50$ ) after the relaxation induction. This suggests that the rumination and relaxation inductions were successful.

**Depression induction instructions.** Borkovec et al. used an imaginal exposure to a feared stimulus in their paradigm (imagine giving a speech). To replicate this with sad mood, a depression-inducing imaginal exposure was used. In a review of mood induction procedures, imagination-based mood induction procedures were among the most effective and have been reported to effectively induce depressed mood in up to 100% of participants (Gerrards-Hesse, Spies, & Hesse, 1994; Martin, 1990). The procedure used in this study is one that has been used in other investigations of rumination and depressive mood (Blackhart & Kline, 2005; Morrow & Nolen-Hoeksema, 1990) and effectively produces changes in participants' self-reported mood. In a study that compared several classes of stimuli and physiological response in individuals with GAD, the authors concluded that stimulus type (actual, imagined, or abstract) differentially affects physiological responses, and the physiological blunting effects of worry are most often observed with imagined stimuli (Castaneda & Segerstrom, 2004). Therefore, an imagined depression-inducing stimulus was also used in this study.

Mood was induced using an imagery script developed by Morrow and Nolen-Hoeksema (1990) in their examination of rumination. It asks participants to vividly imagine the death of their mother and has been shown to increase self-reported negative mood (Blackhart & Kline, 2005; Morrow & Nolen-Hoeksema, 1990). For this study, the instructions were modified so that participants were instructed to imagine the death of a "loved one" instead of their mother. Given that rumination differs from worry in its focus on themes of loss, it is expected that this script is an appropriate corollary to the imagined stimulus in Borkovec et al.'s paradigm (Beck, Brown, Steer, Eidelson, & Riskind, 1987; Papageorgiou & Wells, 1999). Participants reported a significant decrease in mood valence from the rumination induction to depression induction tasks ( $t(98) = -9.38, p < .001, d = 1.34$ ), which suggests that this induction successfully induced negative mood.

#### *Measures*

##### *Diagnostic interview*

**Past and/or current episodes of depression.** The depression section of the Schedule for Affective Disorders and Schizophrenia-Lifetime (SADS-L; Endicott & Spitzer, 1978) diagnostic interview was used to exclude individuals in a depressive episode at the time of the study. The SADS-L used in the study was from the Cognitive Vulnerability to Depression (CVD) Project (Alloy et al., 2000). Interviewers in this study were blind to participants' rumination status. The inter-rater reliability in the CVD project was excellent ( $\kappa > .90$ ); it was expected to be similar for this study.

##### *Questionnaire measures*

**Response style.** The Rumination subscale of the Response Styles Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991; Nolen-Hoeksema, Morrow, & Frederickson, 1993) is a 22-item questionnaire that assesses the way an individual typically responds to negative affect. The Rumination subscale has demonstrated high

internal consistency ( $\alpha = .89$ ; Nolen-Hoeksema & Morrow, 1991) and its test–retest reliability is moderate ( $r = .47$  over 1 year; Just & Alloy, 1997) to high ( $r = .80$  over 5 months; Nolen-Hoeksema, Parker, & Larson, 1994). In the current sample, the internal consistency was .96. In studies of university students or community samples, the Rumination scale has been found to predict prospective episodes of major depression (Just & Alloy, 1997; Nolen-Hoeksema, 2000; Spasojevic & Alloy, 2001).

**Demographic questionnaire.** A demographic questionnaire was used to obtain information about age, sex, ethnicity, and current and permanent contact information.

**Handedness questionnaire.** The Edinburgh Handedness Inventory (EHI; Oldfield, 1971) was used to assess handedness for the dichotic listening task. The EHI is the most widely used self-report measure of handedness and is comprised of 10-items that ask respondents to indicate which hand they use to perform everyday tasks. Scores range from +100 (totally right handed) to –100 (totally left-handed). The EHI has demonstrated a 14-week test–retest reliability of .75 for right-handed individuals, and .86 for left-handed individuals (McMeekan & Lishman, 1975), and a 4 week test–retest reliability of .91 (McFarland & Anderson, 1980). EHI status has also predicted observed hand preference on actual tasks (Bishop, Ross, Daniels, & Bright, 1996).

**Experiential avoidance.** The Acceptance and Action Questionnaire (AAQ; Hayes et al., 2004) is a 9-item self-report designed to measure emotional avoidance. Respondents rate the degree to which each statement applies to them on a Likert scale (1 = never true to 7 = always true). Zvolensky and Forsyth (2002) reported an internal consistency of .70 in their non-clinical sample. The internal consistency in our sample was .74. The AAQ shows good concurrent validity in terms of its ability to predict higher levels of anxiety and depression (Hayes et al., 1996).

**The Affective Control Scale.** The Affective Control Scale (ACS; Williams et al., 1997) was used as an additional measure of avoidance and indexes individuals' fear of emotional responses. The ACS has 42 items that index 4 emotional domains (anger, anxiety, positive emotions, and depression). Respondents rate the degree to which each statement applies using a Likert scale ranging from 1, "very strongly disagree" to 7, "very strongly agree." The ACS has shown good internal consistency for both the full scale (Cronbach's  $\alpha = .92$ ) and subscales ( $\alpha$ 's range from .72 to .91). In an undergraduate sample, the test–retest reliability was .77 (Williams et al., 1997). The full scale internal consistency in the current sample was .95, with subscale reliabilities of: anger,  $\alpha = .80$ ; positive emotions,  $\alpha = .86$ ; depression,  $\alpha = .92$ ; anxiety,  $\alpha = .94$ . Each of the ACS subscales has predicted panic symptoms in the laboratory, suggesting that each is a valid indicator of fear of emotion (Williams et al., 1997).

**Worry.** Worry was measured using the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990), a 16-item measure that assesses a general tendency to worry excessively. In undergraduates, the PSWQ has demonstrated high internal consistency (Cronbach's  $\alpha = .91$ –.95; Meyer et al., 1990) and good test–retest reliability over ten weeks ( $r = .92$ ; Meyer et al., 1990). The PSWQ has correlated highly with other self-report measures of worry, such as the Worry Domains Questionnaire, and the Student Worry Questionnaire, as well as with measures of other repetitive thought constructs like rumination ( $r$ 's = .57–.78; Davey, 1993; Van Rijsoort, Emmelkamp, & Vervaeke, 1999).

**Depressive symptoms.** The Beck Depression Inventory (BDI; Beck et al., 1979) is a 21-item, self-report measure that assesses the presence and severity of depressive symptoms. This measure has been validated for student samples (Bumberry, Oliver, & McClure, 1978; Hammen, 1980). In addition, in a non-clinical population, the internal reliability is good ( $\alpha = .81$ –.86) and the test–retest reliability ranges from .48 to .86 (Beck, Steer, & Garbin, 1988). The internal consistency in the current sample was .87.

**Subjective mood ratings.** Mood ratings were obtained using Lang's (1980) Self-Assessment Manikin (SAM). The SAM rating scale allows participants to indicate their current mood state along 2 dimensions: arousal and valence. The SAM is a non-verbal measure and it requires individuals to select one of nine figures from each dimension (arousal and valence) that best captures their current mood. The SAM has demonstrated high levels of convergent validity with other self-report measures of mood (Bradley & Lang, 1994).

**Analytical thinking.** Participants were also asked to complete a measure of analytical thinking, a thinking style that is characteristic of rumination (Watkins & Teasdale, 2004). The scale is comprised of 7 items that rate level (0, never – 5, constantly) of concern with understanding and making sense of their emotions. The internal consistency in this sample was .88.

#### Psychophysiological measures

**Heart rate.** This study aimed to replicate the avoidance paradigm of Borkovec et al. (1993). That study used heart rate as an index of physiological response; thus, heart rate was also used in this study. Heart rate was recorded continuously using a Contact Precision Instruments bioamplifier. Two Beckman standard electrodes, placed on the participant's chest, were used to assess heart rate. PSYLAB 7 software detected R-waves and recorded the inter-beat interval (IBI) in ms.

#### Plan for data analyses

##### Preliminary analyses

Demographic differences for HR and LR and those assigned to the rumination vs. relaxation condition were examined using *t*-test comparisons for continuous variables (e.g. age) and chi-square analyses for categorical variables (e.g. gender, ethnicity). In addition, a correlation matrix to explore relationships between the groups and the dependent variables was completed (see Table 2).

##### Main hypotheses

The plan for evaluating the main study hypotheses was as follows:

- 1) Differences between HR and LR on questionnaire indices of avoidance were tested using univariate ANCOVAs with age, sex, and ethnicity as covariates. Covariates were identified by the preliminary correlation analyses and group difference analyses.
- 2) Differences between HR and LR on the dichotic listening task were tested using a repeated measures rumination status by story type ANCOVA, with percent of words correctly recalled during each story as the dependent variable.

**Table 2**  
Correlation matrix.

	Rumination status	BDI	PSWQ
Rumination status			
BDI	.57*		.55*
PSWQ	.55*	.58*	

\* $p < .01$ .

Note. BDI = Beck Depression Inventory; PSWQ = Penn State Worry Questionnaire.

3) The discordance between self-reported emotional response and physiological response to the mood inductions were tested in 2 ways. First, a rumination status by condition assignment MANCOVA on SAM valence and SAM arousal ratings for each period was performed to identify differences in self-reported response. Next, to identify differences in physiological response between groups, a rumination status by condition assignment ANCOVA was performed with the change in IBI from the rumination/relaxation induction to the depression induction as the dependent variable.

#### Blunting hypothesis

The blunting hypothesis was tested using a repeated measures ANCOVA on IBI from baseline 1 to baseline 2 and to the rumination/relaxation induction.

## Results

### Preliminary analyses

Analyses were conducted to determine whether the HR and LR groups, and individuals assigned to the rumination vs. relaxation condition (Phase 2 participants only), differed systematically on demographic variables. Given that the equality of variances assumption was not met for age data, variance corrected results are reported. For participants in Phase 1 ( $n = 138$ ), the HR ( $n = 69$ ) and LR ( $n = 68$ ) groups differed significantly on sex ( $\chi^2(1) = 3.47$ ,  $p = .06$ , marginal significance,  $\phi = .16$ ), age ( $t(112.91) = -2.53$ ,  $p = .01$ ,  $d = .44$ ), and ethnicity ( $\chi^2(5) = 13.06$ ,  $p = .02$ ,  $\phi = .31$ , see Table 1). In order to control for these differences, sex, age, and ethnicity were entered as covariates in all Phase 1 analyses.

For participants in Phase 2 ( $n = 100$ ), there were no significant differences in sex, age, or ethnicity based on condition assignment (rumination,  $n = 48$ ; relaxation  $n = 49$ ); however, the HR ( $n = 46$ ) and LR ( $n = 54$ ) groups significantly differed on several demographic variables (see Table 1). The HR and LR groups did not differ on sex ( $\chi^2(1) = .15$ ,  $p = .70$ ,  $\phi = .004$ ), but there was a marginally significant difference between the groups on age such that the LR were slightly younger than the HR ( $t(64.96) = 1.92$ ,  $p = .06$ , marginal significance,  $d = .39$ ). In addition, the ethnic composition of the HR and LR groups was also significantly different ( $\chi^2(5) = 13.46$ ,  $p = .02$ ,  $\phi = .37$ ), such that Caucasian participants did not differ in terms of rumination group status ( $\chi^2(1) = .07$ ,  $p = .80$ ,  $\phi = .03$ ), but significantly fewer African American participants were LR ( $\chi^2(1) = 8$ ,  $p = .005$ ,  $\phi = .67$ ). Follow-up analyses could not be performed on the other ethnic group categories because of the low numbers of participants in those groups. In order to control for

these differences, age and ethnicity were entered as covariates in all analyses of Phase 2 data.

In addition, it was expected that rumination status would be related to both worry and depression. Consistent with this prediction, rumination status was significantly correlated with both worry (PSWQ) and current symptoms of depression (BDI; see Table 2). Thus, worry was entered as a covariate in all analyses in order to control for the overlap between worry and rumination. Likewise, current depressive symptoms were statistically controlled in all Phase 2 analyses in order to isolate the effects of rumination independent of current mood.<sup>1</sup>

### Main hypotheses

#### Questionnaire indices of avoidance

It was expected that the HR group would report significantly higher levels of experiential avoidance (AAQ) and fear of emotions (ACS) than the LR group. Consistent with predictions, HR reported significantly more experiential avoidance ( $F(1, 126) = 38.49$ ,  $p < .001$ ,  $\eta^2 = .23$ ) and greater fear of emotions ( $F(1, 131) = 41.61$ ,  $p < .001$ ,  $\eta^2 = .24$ ) than LR (see Table 3). Further, rumination status was related to fear of all emotions indexed by the ACS subscales, including positive emotions (anger,  $F(1, 131) = 25.80$ ,  $p < .001$ ,  $\eta^2 = .16$ ; positive,  $F(1, 131) = 6.91$ ,  $p = .01$ ,  $\eta^2 = .05$ ; depression,  $F(1, 131) = 44.72$ ,  $p < .001$ ,  $\eta^2 = .25$ ; anxiety,  $F(1, 131) = 37.28$ ,  $p < .001$ ,  $\eta^2 = .22$ ; see Table 3). In line with other studies, HR also reported greater current depressive symptoms than LR ( $F(1, 92) = 42.31$ ,  $p < .001$ ,  $\eta^2 = .30$ ).

#### Behavioral index of avoidance: differences in dichotic listening response

The interaction of rumination status and story type on neutral words recalled was not significant ( $F(1, 89) = 2.05$ ,  $p = .16$ ,  $\eta_p^2 = .02$ , see Fig. 1). Further, the main effect of rumination status was also not significant ( $F(1, 89) = .39$ ,  $p = .53$ ,  $\eta_p^2 = .004$ , see Fig. 1). Thus, contrary to predictions, the HR and LR groups did not differ in their recall of neutral words during the dichotic listening task.

#### Replication of avoidance paradigm

*Self-reported emotional response.* Consistent with the patterning of avoidance, it was expected that HR participants in the rumination condition would report the highest levels of self-rated negative mood and arousal throughout the rumination induction, depressive mood induction, and rest periods. There was a significant interaction of condition assignment and rumination status on ratings of valence during the rumination/relaxation induction period ( $F(1, 83) = 4.41$ ,  $p = .03$ ,  $\eta_p^2 = .05$ , see Fig. 2). Bonferroni

**Table 3**  
Mean scores and results for questionnaire data.

	Mean scores		df	F-Statistic	p-Value	$\eta^2$
	Rumination status					
	High	Low				
AAQ	39.45	31.19	126	38.49	<.001	.23
ACS						
Total	3.77	2.93	123	42.52	<.001	.24
Anger	3.93	3.05	131	25.8	<.001	.16
Positive emotion	3.10	2.73	131	6.91	.01	.05
Depression	4.07	2.83	131	44.72	<.001	.25
Anxiety	4.17	3.12	131	37.28	<.001	.22
BDI	9.38	2.81	92	42.31	<.001	.30

AAQ = Acceptance and Action Questionnaire; ACS = Affective Control Scale; BDI = Beck Depression Inventory.

<sup>1</sup> Due to concerns from reviewers about the large number of covariates in this study (5 in Phase 1 analyses and 4 in Phase 2 analyses), all analyses were also run without covariates to see if any differences in findings emerged when the variance due to the covariates was not partialled out. Overall, the results did not change. However, a difference was found for the analysis of IBI response to the depression induction such that the interaction of rumination status and condition assignment is no longer significant ( $F(1, 91) = 1.63$ ,  $p = .21$ ,  $\eta_p^2 = .02$ ) when the covariates are removed. Follow-up analyses indicate that removal of age and BDI continues to produce a marginally significant result, whereas removal of ethnicity or PSWQ as a covariate produces a non-significant result (age,  $F(1, 83) = 2.94$ ,  $p = .09$ ,  $\eta_p^2 = .03$ ; BDI,  $F(1, 83) = 2.95$ ,  $p = .09$ ,  $\eta_p^2 = .03$ ; ethnicity,  $F(1, 83) = 2.51$ ,  $p = .12$ ,  $\eta_p^2 = .03$ ; PSWQ,  $F(1, 83) = 2.47$ ,  $p = .12$ ,  $\eta_p^2 = .03$ ). However, the follow-up analyses for the interaction were originally run without using covariates, so the main finding regarding the physiological response hypothesis (i.e. HR's IBI response did not change regardless of condition status, and LR's IBI response to the depression induction differed based on condition) was not affected by covariates and is appropriate to interpret.

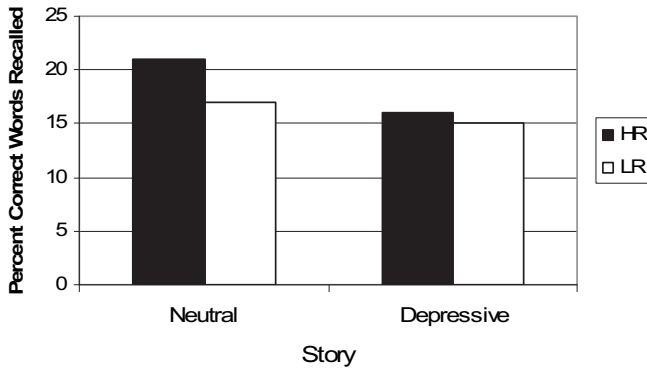


Fig. 1. Non-significant interaction of rumination status and story type on percentage of neutral words correctly recalled during dichotic listening task.

corrected follow-up analyses of the interaction indicated that there was a trend for HR in the rumination condition to report significantly greater negative mood than LR ( $t(45) = 2.41, p = .02$ , see Fig. 2,  $d = .72$ ). No interaction effects were found for valence or arousal for the depression induction (valence,  $F(1, 83) = .10, p = .75, \eta_p^2 = .001$ ; arousal,  $F(1, 83) = 1.36, p = .25, \eta_p^2 = .02$ ), and rest periods (valence,  $F(1, 83) = .30, p = .59, \eta_p^2 = .004$ ; arousal,  $F(1, 83) = .03, p = .86, \eta_p^2 = .000$ ), or for arousal during the rumination/relaxation induction period ( $F(1, 83) = .84, p = .36, \eta_p^2 = .01$ ). No differences in mood valence were found between LR and HR in the relaxation condition ( $t(47) = -.88, p = .39, d = .26$ ), or for LR across conditions ( $t(48) = -1.65, p = .11, d = .48$ ) or for HR across conditions ( $t(44) = 1.67, p = .10, d = .50$ ).

There was also a significant main effect of condition on SAM arousal ratings for the rumination/relaxation induction; individuals in the rumination condition reported greater arousal than individuals in the relaxation condition ( $F(1, 83) = 6.97, p = .01, \eta_p^2 = .08$ ). No other main effects were found for rumination status or condition assignment. It was noted that there was also a main effect of depressive symptoms (BDI) on SAM valence ratings for the rumination/relaxation and depression induction tasks (rumination/relaxation,  $F(1, 83) = 5.08, p = .03, \eta^2 = .05$ ; depression,  $F(1, 83) = 8.24, p = .005, \eta^2 = .08$ ). Thus, it may be that potential differences in reported mood during the rumination/relaxation and depression tasks between HR and LR is better accounted for by differences in depressive symptoms.

**Physiological response to inductions.** Consistent with the patterning of avoidance, it was also expected that HR individuals in the rumination condition would exhibit the lowest levels of physiological response to the mood induction. The interaction of

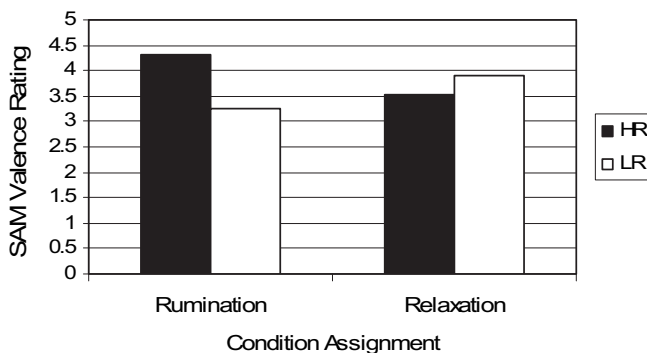


Fig. 2. Significant interaction effect of condition assignment and rumination status on SAM valence ratings during the rumination/relaxation induction.

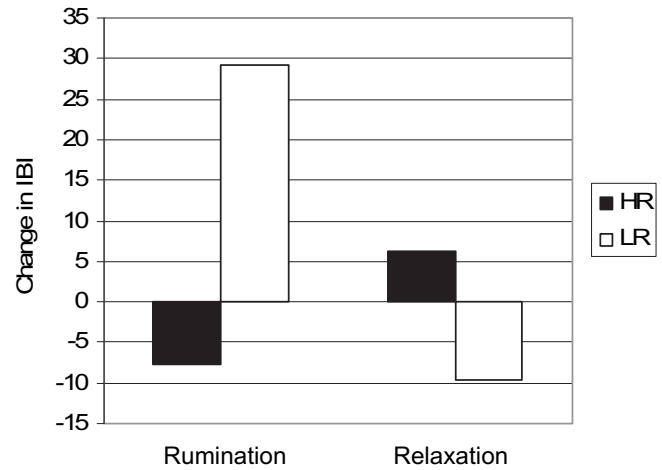


Fig. 3. Marginally significant interaction of rumination status and condition on change in IBI from the rumination/relaxation induction to the depression induction.

rumination status and condition assignment was marginally significant for changes in IBI ( $F(1, 82) = 2.84, p = .10, \eta_p^2 = .03$ , see Fig. 3). Follow-up analyses indicated that LR participants' IBI response significantly differed in the relaxation condition vs. the rumination condition ( $t(49) = 2.80, p = .007, d = .80$ ). No differences were found in HR participants' IBI across conditions ( $t(42) = -.03, p = .97, d = .01$ ), and HR and LR individuals' IBI did not significantly differ for either condition (rumination,  $t(45) = -.95, p = .35, d = .28$ ; relaxation,  $t(46) = .99, p = .33, d = .30$ ). Overall, this suggests that LR participants showed a differential response to the rumination vs. the relaxation conditions on IBI.

**Examination of blunting hypothesis**

The blunting hypothesis was tested by assessing whether HR individuals' lack of physiological response to the depression induction was due to an initial response to the rumination/relaxation induction. The sphericity assumption for the repeated measures ANCOVA was not met; therefore, Greenhouse–Geisser corrected results are reported. The interaction between rumination status and condition assignment was not significant (IBI,  $F(1, 105.48) = 2.02, p = .15, \eta_p^2 = .03$ , see Fig. 3) and no difference in IBI response based on rumination status was observed.

Rumination status and condition assignment did not significantly interact with task (baseline 1, baseline 2, or rumination/relaxation; IBI rumination status,  $F(1, 105.44) = .83, p = .44, \eta_p^2 = .01$ ; IBI condition assignment,  $F(1, 105.44) = 1.34, p = .27, \eta_p^2 = .02$ ). No relationship between rumination status and physiological change from baseline to rumination/relaxation induction was observed.

**Discussion**

This study examined an experiential avoidance conceptualization of depressive rumination among HR and LR individuals using questionnaire, behavioral, and psychophysiological indices of avoidance. In line with other studies, rumination status was significantly related to both worry and current symptoms of depression, such that HR reported more worry and symptoms of depression than LR.

**Questionnaire indices of avoidance**

In line with predictions, a relationship between rumination status and avoidance was evident on self-report questionnaire

measures of avoidance. HR individuals reported significantly greater experiential avoidance, as measured by the AAQ, and fear of emotions, as measured by the ACS, than LR individuals. Further, HR reported greater fear of emotion on each of the emotion subscales (anger, depression, anxiety, positive emotions). This suggests that HR individuals may experience discomfort in response to any intense emotion, regardless of valence. One potential criticism of the AAQ is that it taps into many different constructs; for example, items on the AAQ ask about beliefs about emotions, behaviors related to avoidance, fears about the consequences of negative emotions, metacognitions, and cognitive activities related to avoidance (such as daydreaming). Further, some of these items may conceptually overlap with symptoms of depression (“when I feel depressed or anxious, I am unable to take care of my responsibilities”). In contrast, the ACS is a purer measure of fear of emotions because items on the ACS focus solely on fear of the experience of emotions, and fear of the consequences of those emotions to self and others. The convergence of both of these measures in terms of their relationship to rumination status suggests that rumination is related to a wide range of self-reported avoidant phenomena.

#### *Behavioral indices of avoidance: dichotic listening task*

Contrary to predictions, there was no evidence of behavioral avoidance in the dichotic listening task. Rumination status did not interact with the neutral vs. depressive story on the percentage of words correctly recalled. Further, there was no main effect of rumination status, such that HR and LR did not differ in their overall recall of words, regardless of story. This suggests that the HR group did not show overall deficits in word recall. However, it was noted that the percentage of words recalled was lower in this sample (12–21%) than in Laguna et al.'s (2004) sample (28–45%). Therefore, it may be that the low overall percentage of words correctly recalled in this sample precluded finding any differences in recall between the rumination groups. Overall, these findings suggest that HR and LR individuals in this sample did not differ in their attention allocation during the presentation of neutral and depressive stories, and the predictions of an avoidance conceptualization were not supported by these findings.

#### *Replication of avoidance paradigm*

##### *Self-reported emotional response*

In addition to baseline differences in physiology, this study aimed to replicate and extend Borkovec et al.'s (1993) avoidance paradigm, which reported a discrepancy between reported anxiety and a physiological index of anxiety in worriers. Similarly, it was expected that HR individuals in the rumination condition would report elevated levels of negative mood in response to the depression induction, but would not show a commensurate physiological response on IBI. Contrary to predictions, HR did not report greater negative valence or arousal than LR during the depression induction or rest periods. Instead, there was a trend for HR to report significantly greater negative mood during the rumination induction. In addition, individuals in the rumination condition, regardless of rumination status, reported greater arousal during the rumination induction than the relaxation induction, which suggests that it was the rumination induction, not overall tendency to ruminate, that related to self-reported emotional response to the rumination induction.

The expected self-reported mood response of HR to the depression induction was not observed. One potential explanation for this is that symptoms of depression (as indexed by the BDI) were significantly related to valence ratings during the depression and rumination/relaxation inductions, and were marginally related

to arousal ratings during the depression induction. Thus, it may be that the greater reported emotional response observed in other studies was due to differences in baseline symptomatology, as opposed to differences based on rumination status. Overall, further examination of the relationship between current depressive symptoms, rumination, and self-reported emotional response to depression induction is indicated. Although the difference in self-reported response to the mood induction among HR vs. LR individuals was not supported in this study, both HR and LR individuals reported a significant, but equal, decrease in mood in response to the depression induction after controlling for symptoms of depression.

#### *Physiological response to inductions*

The second portion of Borkovec et al.'s (1993) paradigm predicts differential physiological response to an emotion induction. Thus, we expected that HR individuals in the rumination condition would not exhibit a physiological response to the depression induction. Contrary to predictions, HR individuals in the rumination vs. relaxation condition did not differ in their IBI response to the depression induction.

One possible explanation for this is that HR individuals were ruminating during the relaxation condition despite being instructed to relax. However, HR in the relaxation condition reported significantly less analytical thinking than HR in the rumination condition ( $t(44) = 5.12, p < .001, d = 1.54$ ), and HR and LR in the relaxation condition did not differ in their level of analytic thinking ( $t(47) = 1.04, p = .30, d = .03$ ). This suggests that HR in the relaxation condition engaged in thinking styles that characterize rumination significantly less than HR in the rumination condition. Overall, this suggests that HR individuals, regardless of whether they ruminated before the depression induction or not, did not display a significant change in IBI in response to the depression induction. Thus, although ruminators exhibited less analytical thinking during the relaxation induction, it may be that a more purposeful change in cognitive style, such as that produced by mindfulness meditation interventions, is needed to elicit IBI response. This is in line with Broderick's (2005) findings, which suggested that mindfulness meditation produced significantly less negative mood than rumination or distraction. It may be that purposeful focusing on emotion may be required to elicit physiological response in HR persons. Another explanation for this finding is that HR individuals, despite lower levels of analytical thought during the relaxation induction, began ruminating in earnest during the depression induction and this may have blunted their IBI response. Consistent with this, HR reported significantly more analytical thinking during the depression induction than LR ( $t(97) = 4.39, p < .001, d = .89$ ). This suggests that there may be a fundamental difference between worry and rumination, such that rumination may not need to be activated in advance of a negative emotion to affect physiological response.

Overall, the response of HR individuals to the depression induction does not replicate the findings of Borkovec et al. (1993) with high worrying individuals. However, this study also included a LR comparison group, and LR individuals in the relaxation condition exhibited a significantly greater IBI response to the depression induction than LR individuals in the rumination condition. This suggests that individuals who do not regularly engage in ruminative strategies, and were not prompted to ruminate during the study, exhibited a physiological response to the depression induction that was not observed in the other groups. One explanation for this finding is that rumination, whether characteristic or temporarily induced, inhibited emotional response to the depression induction in this sample, in line with predictions of an avoidance model. Additional research is needed to clarify this finding.



### Blunting hypothesis

An additional goal of this study was to examine whether the blunting effect described by Peasely-Miklus and Vrana (2000) in worry was also operating in rumination. Specifically, we examined whether or not the blunted physiological response observed in HR persons could be better accounted for by an initial physiological response to the rumination induction. Contrary to the predictions of the blunting hypothesis, a relationship between rumination status and physiological response to the rumination or relaxation induction was not observed.

### Implications for avoidance conceptualization of depressive rumination

The current study supports some aspects of an experiential avoidance conceptualization of rumination, but not others. It adds to the current literature by introducing a new model of depressive rumination that addresses a few of the limitations of the major theories of rumination. For example, an avoidance model of rumination places depressive rumination in the context of experiential avoidance theories more generally, and provides an explanation for the overlap between rumination and worry without assuming that they are the same construct. Similarly, this model provides an explanation for the common co-occurrence of depression and anxiety, specifically, that they both arise from maladaptive attempts to avoid emotional experience. In addition, the model makes predictions about ruminators' behavioral and physiological responses to negative affect, which allows for more varied research methodologies. This model is also compatible with the other theories of rumination that converge on the hypothesis that rumination interferes with problem solving and/or other adaptive responses to negative affect. Consistent with this, an avoidance conceptualization of rumination proposes that rumination interferes with certain aspects of emotional experience, which may be necessary for effective processing (Foa & Kozac, 1986) and effective problem solving. However, given that not all predictions of the model were supported in this study, further study of this model with more varied samples is warranted.

### Summary and limitations

Acknowledging that these findings only partially support an avoidance conceptualization of rumination, limitations of the current study should be recognized. In particular, there were some anomalies in the current sample that should be considered. For example, the sex difference in rumination has been widely reported; however, our Phase 2 HR and LR participants did not differ in their sex composition, which may limit the generalizability of these findings. It should be noted that there was a trend for a sex difference in the Phase 1 sample, but it was not entirely clear why the sex difference in rumination was not duplicated in the Phase 2 sample. Given that participants who were currently depressed at Phase I were excluded from the Phase 2 sample, and these excluded participants were primarily HR females, it is possible that this eliminated sex differences in rumination in the remaining Phase 2 participants. Alternatively, it may be that the high rate of females in the Phase 2 sample (88%) precluded any group differences from emerging; however, this is an area for further inquiry in a more balanced sample.

In addition, the HR and LR groups differed on their ethnic composition, such that fewer African American participants were HR than LR. No other studies of rumination have reported ethnic differences in rumination, although differences in the relationship between rumination and depression among Japanese adults have

been reported (Sakamoto, Kambara, & Tanno, 2001). Conversely, other studies with similarly diverse samples from the same university, who were also selected for cognitive vulnerabilities to depression, did not find a difference between HR and LR on ethnicity; therefore, it may also be an anomaly of this particular sample (Smith, Grandin, Alloy, & Abramson, 2006). Unfortunately, the sample size for this study was too small to examine the main hypotheses separately for each ethnic group, but these data suggest that ethnic differences in rumination and its experiential avoidance function is an area that warrants further inquiry in larger, diverse samples.

Another limitation of the sample is that individuals who were deemed to be at risk for experiencing adverse effects due to the depression induction were excluded from the study. This excluded individuals who currently met criteria for a major depressive episode, but also individuals who were believed to be at risk for suicide, or potentially entering a depressive episode, despite not meeting duration criteria. Thus, HR individuals in our sample reported a minimal level of depressive symptoms on average, although the range of depressive symptoms reported (0–25) suggests that some individuals were experiencing moderate symptoms of depression at the time of the study. Given that 14% of the Phase 1 sample, the majority of which were HR, was excluded because of elevated levels of depression, these findings may not generalize to the full range of high ruminating individuals. Related to this, this study only included individuals who reported high or low levels of rumination; thus, it does not capture the full range of ruminating individuals and cannot confirm that the same findings would occur in mid-range ruminators. Future studies should examine the avoidance hypothesis in individuals with a full range of rumination levels.

A further limitation of the current study is the placement of the rumination or relaxation induction in the experimental procedure. Although the goal of this study was to replicate and extend the findings of Borkovec et al. (1993) in worriers, important differences in the time period focus of worry and rumination may have impacted the generalizability of the findings. Specifically, worry has been related to a greater focus on future, whereas rumination is often focused more highly on past events (Papageorgiou & Wells, 1999; Watkins, Moulds, & Mackintosh, 2005). Given rumination's increased focus on past events, a rumination induction prior to a depression induction may not fully capture the impact of rumination on emotional experience. For example, a rumination induction following a negative mood induction may best capture the nature of rumination, such as in Watkins' (2004) and Broderick's (2005) studies. Future studies should examine whether the placement of the rumination induction has a differential effect on physiological response to a negative mood induction.

Debate has also emerged over the nature of the construct of depressive rumination. Specifically, it has been suggested that depressive rumination, as measured by the RSQ, may actually be a multi-factored construct that captures both negative and potentially positive forms of self-focus (Roberts, Gilboa, & Gotlib, 1998; Treynor, Gonzales, & Nolen-Hoeksema, 2003). Factor analytic studies of the RSQ confirm that a certain subtype of rumination, characterized by brooding, may account for the harmful effects of rumination, whereas more reflective forms of self-focus do not relate to depressive symptoms. In the current study, rumination status was determined based on the entire rumination subscale of the RSQ; therefore, the multi-factored nature of rumination was not considered. Future research should examine how an experiential avoidance conceptualization of rumination applies to all factors of the RSQ.

In sum, some support for an avoidance conceptualization of rumination was garnered. However, it is important to note that the

findings that support the avoidance model in this study are largely based on self-report indices, whereas the behavioral findings were non-supportive of an avoidance model and the psychophysiological findings were less conclusive. Regardless, these findings may have important implications for the treatment of ruminators. For example, these findings suggest that ruminators who present for treatment of depression have negative beliefs about experiencing emotions that may interfere with their ability to activate the full spectrum of negative emotional experience. Further, it may be that treatment for depression that incorporates active experiencing of emotions, or challenges negative metacognitive beliefs related to experiencing emotions, may be more successful in activating effective problem solving and ameliorating depressive symptoms. In line with this, therapies that have included a mindfulness meditation component (Jain et al., 2007; Kenny & Williams, 2007; Ramel, Goldin, Carmona, & McQuaid, 2004) have demonstrated efficacy in reducing both rumination and symptoms of depression, and reduced risk of relapse in previously depressed individuals (Teasdale et al., 2000). Further, Ramel et al. (2004) reported that the decrease in depressive symptoms was accounted for by the decrease in rumination. Thus, rumination may indeed be an important point of intervention for individuals with depression, and corrective experiences that modify negative beliefs about emotional experience may be an important part of treatment for rumination. Further study of an avoidance model of rumination, as well as changes in avoidance with treatment for rumination and depression, may help us better understand how to intervene in this maladaptive cognitive process.

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