

# Repetitive Thought and Emotional Distress: Rumination and Worry as Prospective Predictors of Depressive and Anxious Symptomatology

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**Abstract** Repetitive thought processes have been implicated in vulnerability to both anxiety and depression. The present study used a prospective design to examine the ability of worry and rumination to predict these two forms of emotional distress over time. Participants were 451 college students (273 females) who completed self-report measures of rumination, worry, depression, and anxiety at two time points separated by 6–8 weeks. Results indicated that both worry and rumination prospectively predicted anxiety, whereas neither thought process prospectively predicted depressive symptomatology. Although females reported elevated levels of worry and rumination compared to males, gender did not moderate any of these effects. Based on these findings, it appears that repetitive thought in the form of both worry and rumination contributes to anxiety, whereas neither thought process contributed to the development of depressive symptomatology in the present sample. Post-hoc analyses raise the possibility that previously documented associations between rumination and depression may have been partially driven by criterion contamination between measures of these constructs (see J. E. Roberts, E. Gilboa, & I. H. Gotlib, 1998).

**Keywords** Rumination · Worry · Repetitive thought · Depression · Anxiety · Emotional distress

## Introduction

Theory and research suggest that repetitive, uncontrollable, thoughts contribute to both anxiety and depression (Borkovec, Robinson, Pruzinsky, & DePree, 1983; Nolen-Hoeksema, 1991). Specifically, rumination has been theoretically implicated in depression, whereas worry has

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been implicated in anxiety. Nolen-Hoeksema (1991) defined depressive rumination as repetitive thoughts concerning the causes and consequences of depressive symptoms. For example, depressive rumination may involve thinking about how childhood experiences have contributed to one's current mood state. Likewise, worry has been defined as "a chain of thoughts and images, negatively affect-laden, and relatively uncontrollable; it represents an attempt to engage in mental problem solving on an issue whose outcome is unknown but contains the possibility of one or more negative outcomes" (Borkovec et al., 1983). For example, worry may involve thinking about the implications of potentially being laid off from one's job.

Previous research has repeatedly demonstrated that rumination is involved in risk for depressive symptoms and episodes. For instance, experimental manipulations inducing rumination suggest that rumination leads to prolonged and intensified depressed mood (Lyubomirsky, Caldwell, & Nolen-Hoeksema, 1998; Morrow & Nolen-Hoeksema, 1990; Nolen-Hoeksema & Morrow, 1993; Trask & Sigmon, 1999). Moreover, prospective studies suggest that rumination contributes to the persistence of depressed mood and symptoms over time (Morrow & Nolen-Hoeksema, 1990; Nolan, Roberts, & Gotlib, 1998; Nolen-Hoeksema, McBride, & Larson, 1997; Nolen-Hoeksema, Parker, & Larson, 1994). Rumination has also been shown to predict the onset of depressive episodes (Just & Alloy, 1997; Nolen-Hoeksema, 2000) and poor treatment response among depressed patients with negative cognitive styles (Ciesla & Roberts, 2002). Furthermore, rumination mediates the association between depressive symptoms and several risk factors for depression, such as negative cognitive style, self-criticism, and neediness (Spasojevic & Alloy, 2001).

Research examining worry as a vulnerability to other forms of anxiety is more complicated and less conclusive in part because there have been limited tests of worry as a prospective predictor of anxiety. Consistent with the vulnerability hypothesis, there is considerable evidence suggesting that worry can dampen the parasympathetic nervous system (Borkovec, Ray, & Stober, 1998; Thayer, Friedman, & Borkovec, 1996). Such reductions in vagal tone may be expressed as rapid heart beat and other symptoms of anxiety. At the same time, worry seems to be associated with increased central nervous system arousal. For example, in cross-sectional research, Borkovec and colleagues (1983) found that worry was associated with greater feelings of anxiety and muscle tension as well as difficulty refocusing thoughts. Moreover, individuals with GAD, a disorder defined by persistent worry, endorsed more physical symptoms of anxiety, such as trembling, restlessness, fatigue, tension, and shortness of breath compared to controls and individuals with Social Phobia (Hoyer, Becker, & Roth, 2001). Of most theoretical relevance, a path analysis examining the causal relationship between worry and anxiety suggested that worry predicted anxious arousal, whereas anxiety did not predict worry (Gana, Martin, & Canouet, 2001).

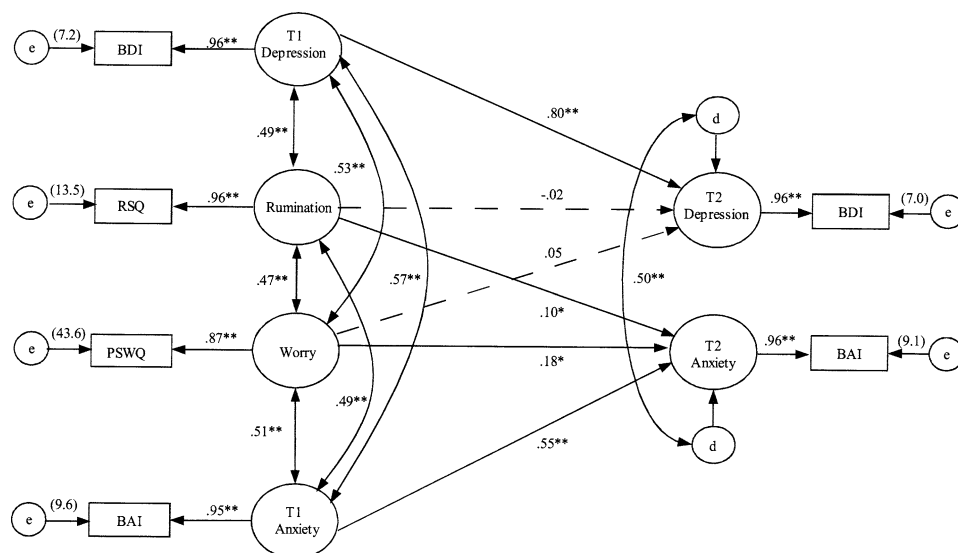
Although the majority of research has examined worry in relation to anxiety and rumination in relation to depression, a handful of studies have investigated potential links between worry and depression and between rumination and anxiety. For example, several studies have found elevated levels of worry among individuals suffering from Major Depressive Disorder (Chelminski & Zimmerman, 2003; Starcevic, 1995), and one study found that experimentally induced worry contributed to both anxious and depressed mood (Andrews & Borkovec, 1988). Moreover, Nolen-Hoeksema (2000) found rumination to be a significant prospective predictor of symptoms of both depression and anxiety controlling for initial levels of symptomatology. Likewise, Blagden and Craske (1996) found that rumination prolongs experimentally induced anxious mood. These studies raise the possibility that rumination may be involved in anxiety (in addition to depression) and that worry may be involved in depression (in addition to anxiety).

More recently, research has begun to examine both worry and rumination in the same studies. For instance, in an attempt to empirically examine the similarities and differences between

rumination and worry, Fresco and colleagues (2002) conducted an exploratory factor analysis with a commonly used measure of worry, the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990), and a commonly used measure of rumination, the Response Styles Questionnaire (RSQ; Nolen-Hoeksema, & Morrow, 1991). Fresco and colleagues (2002) found support for a four factor solution comprised of two factors from the worry scale, (“worry engagement” and “absence of worry”), and two factors from the rumination scale (“dwelling on the negative” and “active cognitive reappraisal”). Results of the study offer support for the conceptualization of worry and rumination as distinct, yet related processes. Specifically, each of the four factors contained items from just one of the two measures of repetitive thought suggesting that these measures are tapping distinct constructs. However, the worry engagement and dwelling on the negative factors produced a strong correlation ( $r = .46$ ), suggesting that rumination and worry are likely similar processes. Furthermore, in this cross-sectional study, worry (specifically ‘worry engagement’) and rumination (specifically ‘dwelling on the negative’) were each strongly associated with symptoms of both depression and anxiety, suggesting that these forms of repetitive thought contribute to non-specific emotional distress. In contrast, two other recent studies raise the possibility that rumination and worry both play a stronger role in the development of symptoms of anxiety compared to depression. Specifically, Segerstrom and colleagues (Segerstrom, Tsao, Alden, & Craske, 2000) examined a latent variable consisting of both worry and depressive rumination that they labeled “repetitive thought.” Whereas repetitive thought prospectively predicted symptoms of anxiety (marginally) over a one week period in their college student sample, it was not associated with future symptoms of depression. In the second study, Muris and colleagues (Muris, Roelofs, Meesters, & Boomsma, 2004) found that items from measures of rumination and worry loaded on separate factors. In these cross-sectional data, rumination and worry were both more strongly associated with symptoms of anxiety compared to symptoms of depression. Furthermore, rumination no longer significantly predicted depressive symptomatology after worry was statistically controlled.

Although the three studies discussed above present a somewhat mixed picture concerning whether repetitive thought contributes to non-specific emotional distress versus specific types of symptomatology, two of these studies suggest that repetitive thought plays a stronger role in anxiety compared to depression. Unfortunately, all but one of these studies have been based on cross-sectional designs, and therefore cannot address the question of whether these forms of repetitive thought play a role in the development of depressive and anxious symptomatology over time. Furthermore, this past research has largely ignored potential gender differences in the associations between repetitive thought and emotional distress (cf. Muris et al., 2004), which is surprising given that repetitive thought may contribute to the greater risk for depression among females (Butler & Nolen-Hoeksema, 1994). It may be that rumination and worry have a stronger impact on females compared to males. On the other hand, rumination and worry may have equally strong effects across gender, but women may simply be more likely to engage in these forms of repetitive thought.

The present study used structural equation modeling to test the specificity of worry and rumination as predictors of symptoms of anxiety and depression over a 6–8 week prospective interval. The hypothesized structural model included the predicted relationships between all exogenous and endogenous variables, as well as the hypothesized covariances among these variables (see Fig. 1). The goal of the structural model was to examine the ability of worry to predict time ( $T$ ) 2 levels of both anxiety and depression and the ability of rumination to predict T2 levels of both depression and anxiety, controlling for initial levels of both anxiety and depression. Statistically significant paths from rumination to both T2 depression and anxiety as well as paths from worry to T2 anxiety and depression accompanied by a good overall model



**Fig. 1** Structural equation model of repetitive thought and symptomatology (*dashed lines* represent statistically nonsignificant paths. Values in parentheses represent the calculated measurement error associated with each measure in our sample; BDI, Beck Depression Inventory; BAI, Beck Anxiety Inventory; RSQ, Response Styles Questionnaire; PSWQ, Penn State Worry Questionnaire; *d*, disturbance; *e*, error term; \* $p < .05$ ; \*\* $p < .01$ )

fit would suggest that rumination and worry are not unique predictors of depression and anxiety respectively, but instead predict general emotional distress. Alternately, statistically significant paths from rumination to T2 depression but not T2 anxiety and from worry to T2 anxiety but not T2 depression accompanied by a good overall model fit would offer support for rumination and worry as specific predictors of depression and anxiety respectively. Finally, on an exploratory basis, we tested whether model fit and theoretically relevant path coefficients varied by gender.

## Method

### Participants

Participants were undergraduates enrolled in introductory psychology courses at the University at Buffalo over the course of several academic semesters who were invited to participate in a study examining “thoughts and feelings.” Approximately one-third of the participants ( $n = 169$ ) were selected for a separate study containing the same study questionnaires on the basis of elevated depressive symptomatology (Beck Depression Inventory-II  $\geq 10$ ). In order to examine these relationships among individuals with a range of depressive and anxious symptomatology, the remaining two-thirds of participants ( $n = 374$ ) were recruited regardless of their depressive symptomatology. The total sample consisted of 543 individuals (216 male, 329 female), while 451 individuals returned to complete follow-up questionnaires 6–8 weeks later. Participants from the initial sample who did not return for the T2 follow-up session did not significantly differ on any variable measured in this study from those who completed questionnaires at both time

points (all  $p$ 's > .12).<sup>1</sup> The majority of participants who completed measures at both time points identified themselves as first year students (43.9%), while 26.7% were Sophomores, 19.2% were Juniors, and 9.9% were Seniors. Participants' ages ranged from 17 to 56 years (Mean = 20.3,  $SD = 4.2$ ). The majority of participants who completed measures at both time points identified their race as Caucasian (59.6%), while 20.8% were Asian, 8.6% were African American, 6.2% were Hispanic, and 3.7% were Native American or some other race. Finally, in terms of religion, 39.7% of participants who returned for both time points identified themselves as Catholic, 12.1% were Protestant, and the remainder were Jewish, Hindu, Muslim, Buddhist, or some other religion.

## Measures

### *Beck anxiety inventory (BAI; Beck, Epstein, Brown, & Steer, 1988)*

The BAI is a self-report measure of cognitive and somatic symptoms of anxiety. The BAI contains 21 questions rated on a Likert scale from 0 to 3, anchored at 0 = not at all and 3 = severely, I could barely stand it. Total scores range from 0 to 63, with higher scores signifying greater anxious symptomatology. According to research by Beck and colleagues (1988), the BAI demonstrated good test-retest reliability over a 1-week period ( $r = .75$ ) and high internal consistency in patient samples with anxiety disorders ( $\alpha = .92$ ). Moreover, Beck and colleagues (1988) also found that the BAI has good discriminant validity in distinguishing anxious from non-anxious groups. Furthermore, it had a moderate correlation with scores on the Hamilton Anxiety Rating Scale ( $r = .51$ ), but only a small correlation with scores on the Hamilton Depression Rating Scale ( $r = .25$ ). In the present sample, test-retest reliability over the 6–8 week interval was adequate ( $r = .63$ ) and internal consistency of this measure was high at both time points (T1:  $\alpha = .91$ ; T2:  $\alpha = .93$ ).

### *Beck depression inventory-II (BDI-II; Beck, Steer, & Brown, 1996)*

The BDI-II is a 21-item self-report measure of current depressive symptomatology. In terms of psychometric properties, Sprinkle and colleagues (2002) reported a high test-retest reliability ( $r = .96$  over a period of between 1 and 12 days) for this measure among a college population and a strong correlation between this measure and depressive symptoms assessed by the Structured Clinical Interview for DSM-IV Axis I Disorders ( $r = .83$ ). Moreover, in the present sample, test-retest reliability over the six to eight week interval was good ( $r = .73$ ) and internal consistency of the BDI was high at both time points (T1:  $\alpha = .92$ ; T2:  $\alpha = .93$ ).

### *Penn state worry questionnaire (PSWQ; Meyer et al., 1990)*

The PSWQ is a 16-item measure designed to capture the generality, excessiveness, and uncontrollability of pathological worry. Sample items on the PSWQ include, “My worries overwhelm me” and “I worry all the time.” Items are rated on a 5-point Likert scale anchored at 1 = not at all typical of me and 5 = very typical of me. The PSWQ has demonstrated good test-retest reliability ( $r \geq .74$  over a period of between 2 to 10 weeks; (Meyer et al., 1990)), high internal consistency

<sup>1</sup>Given the large number of individuals who did not return for the T2 follow-up session ( $n = 92$ ), we chose to conduct the final analyses with and without these individuals. Results with and without these individuals were virtually identical and we therefore decided to exclude individuals who did not return for the T2 follow-up session from the final analyses in an attempt to be conservative.

( $\alpha = .93$ ; Brown, Antony, & Barlow, 1992), as well as good convergent and discriminant validity among both non-patient and patient populations (Brown, Antony, & Barlow, 1992; Meyer et al., 1990). In the present sample, internal consistency of the PSWQ was adequate ( $\alpha = .76$ ) and test-retest reliability was good ( $r = .81$ ).

### *Response styles questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991)*

The 22-item Ruminative Response Scale (RRS) from the RSQ was used to measure an individual's tendency to ruminate when faced with depressive symptoms. Participants are asked to indicate what they "generally do when feeling down, sad, or depressed" using a 4-point Likert scale anchored at 0 = almost never and 4 = almost always. The RRS consists of items measuring how often people engage in responses that are self-focused (e.g., "think 'Why am I the only person with these problems'"), symptom-focused (e.g., "focus on the fact that I am always tired"), and focused on the causes and consequences of having a depressed mood (e.g., "think 'I won't be able to do my job/work because I feel so badly'"). The RRS has demonstrated a good 5-month test-retest reliability ( $r = .80$ , (Nolen-Hoeksema et al., 1994) as well as high internal consistency ( $\alpha = .89$ ) and validity in terms of predicting depression (Nolen-Hoeksema & Morrow, 1991). Moreover, internal consistency of the RRS in the present sample was high ( $\alpha = .92$ ) and test-retest reliability was good ( $r = .75$ ).

### Procedure

Participants came to the laboratory to complete a battery of questionnaires in return for course credit. This battery of questionnaires included the BDI, BAI, PSWQ, and RSQ, to assess levels of depression, anxiety, worry, and rumination, respectively. Approximately 6–8 weeks later, participants returned to the laboratory and completed the same battery of questionnaires to assess changes in levels of the above variables.

## Results

### Descriptive statistics

Zero-order correlations, means, and standard deviations for the measured variables can be seen in Table 1. According to conventional guidelines for self-report measures of depression and anxiety, the sample was mildly depressed and anxious (T1 mean BDI = 13.9; BAI = 14.5). Although there were high correlations between both T1 and T2 levels of depression ( $r = .76$ ,  $p < .01$ ) as well as between T1 and T2 levels of anxiety ( $r = .67$ ,  $p < .01$ ), mean levels of both depression and anxiety significantly decreased over time (depression:  $t(450) = 3.91$ ,  $p < .001$ ; anxiety:  $t(450) = 2.85$ ,  $p < .05$ ). In terms of gender, females scored significantly higher on measures of several relevant variables, including depression at both time points (T1: mean female = 15.1; male = 11.9;  $t(448) = 3.65$ ,  $p < .001$ ; T2: mean female = 13.6; male = 11.1;  $t(448) = 2.63$ ,  $p < .01$ ), anxiety at both time points (T1: mean female = 15.7; male = 12.5;  $t(448) = 3.21$ ,  $p < .01$ ; T2: mean female = 4.5; male = 11.5;  $t(448) = 2.77$ ,  $p < .01$ ), and worry (mean female = 51.2; male = 44.6;  $t(448) = 5.24$ ,  $p < .001$ ). Moreover, there was a marginally significant gender difference on rumination with females scoring higher than males (mean female = 49.5; male = 47.3;  $t(448) = 1.76$ ,  $p = .08$ ). Finally, the gender difference on worry remained significant after controlling for T1 levels of depression and anxiety ( $F(3,446) = 13.73$ ,  $p < .001$ ).

**Table 1** Correlations, means, and standard deviations among all measured variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	<i>M</i>	<i>SD</i>
BDI cognitive	—														2.2	1.2
BDI somatic	.75	—													8.2	5.6
BAI cognitive	.57	.53	—												6.7	4.8
BAI somatic	.47	.47	.76	—											7.8	6.3
BDI cognitive2	.74	.60	.50	.44	—										1.9	1.2
BDI somatic2	.59	.67	.49	.47	.77	—									7.5	5.5
BAI cognitive2	.47	.44	.59	.54	.59	.58	—								2.2	1.2
BAI somatic2	.41	.44	.55	.63	.52	.56	.80	—							2.3	1.4
Rumination1	.54	.50	.50	.42	.49	.42	.42	.41	—						15.3	4.6
Rumination2	.53	.49	.47	.40	.48	.42	.44	.39	.83	—					15.8	4.3
Rumination3	.55	.47	.47	.39	.50	.38	.41	.37	.83	.79	—				17.6	5.2
Worry1	.50	.46	.49	.41	.43	.41	.43	.40	.41	.40	.40	—			16.2	4.3
Worry2	.52	.46	.50	.42	.46	.41	.45	.42	.43	.42	.43	.86	—		17.3	5.4
Worry3	.55	.48	.53	.43	.49	.42	.46	.44	.41	.40	.41	.84	.82	—	15.3	4.5

Note. BDI, Beck Depression Inventory; BAI, Beck Anxiety Inventory.

However, the gender difference on rumination was not significant after controlling for T1 levels of depression and anxiety ( $F(3,445) = 0.40, p > .05$ ).

#### Structural equation model

Given that we did not obtain multiple measures for constructs of interest, we tested the hypothesized structural model using single indicator latent variables. In other words, each construct was comprised of a single indicator and a single corresponding measurement error. Following procedures described in Bollen (1989), we computed the measurement error for each indicator by multiplying the variance associated with that measure in the present sample by one minus the internal consistency of that measure in the present sample. The single indicator latent variable approach represents an improvement upon the traditional path analysis using manifest variables in that it allows us to model the random measurement error for each indicator based upon the variance and internal consistency of that measure within the present sample.

In an attempt to satisfy the assumption of multivariate normality underlying maximum-likelihood estimation, we conducted square root transformations on non-normally distributed single indicator latent variables (variables with values greater than  $|1|$  on skew and kurtosis). Both T1 and T2 measures of depression and anxiety were non-normally distributed and subsequently underwent a square root transformation. Following this transformation, both the skew and kurtosis of each of the four transformed variables, as well as multivariate normality, were improved. Subsequent analyses were conducted with the transformed as well as with the non-transformed values of the non-normally distributed variables; T1 and T2 depression and anxiety. Given that the results were highly similar in both sets of analyses, the analyses using the non-transformed variables are presented below.

Model estimation was performed using the maximum-likelihood estimation method in AMOS (Arbuckle, 2004) to examine fit to variance-covariance matrices. As recommended by Hu and Bentler (1998) and Quintana and Maxwell (1999), several fit indices were used to assess goodness of fit for the models: the comparative fit index (CFI; values greater than .95 indicating good fit), the root-mean-square error (RMSEA; values less than .06 indicating good fit), and the  $\chi^2/df$

(values less than 2.0 indicating good fit). Furthermore, we also used the chi-square difference test to compare the relative fit of nested models.

### Hypothesized structural model

To examine the relationship between rumination, worry, anxiety, and depression, we tested a structural model including direct paths from both rumination and worry to T2 depression as well as paths from both rumination and worry to T2 anxiety. To control for associations between T1 and T2 depression and anxiety, this model also included direct paths from T1 depression to T2 depression and from T1 anxiety to T2 anxiety. This model produced an excellent fit to the data,  $\chi^2(2, N = 451) = 3.28, p > .05$ , CFI = 1.00, RMSEA = .04,  $\chi^2/df = 1.64$ . Of most theoretical interest, rumination was a significant predictor of T2 anxiety ( $\beta = .10, p < .05$ ), but *not* T2 depression ( $\beta = -.02, p = .72$ ). Likewise, worry was a significant predictor of T2 anxiety ( $\beta = .18, p < .01$ ), but *not* T2 depression ( $\beta = .05, p = .31$ ) (see Fig. 1).

In order to more closely examine the relative impact of each non-significant path (the path from rumination to T2 depression and the path from worry to T2 depression) on overall model fit, we statistically removed each theoretically relevant path systematically by setting each path coefficient to 0, one at a time, while allowing the remaining three path coefficients in the model to vary freely. A significant decrement in overall model fit, as evidenced by the  $\chi^2$  difference test, would suggest that the inclusion of the removed path in the model is necessary to maximize overall model fit. In order to identify the most parsimonious model, only theoretically relevant paths leading to significant improvement in overall model fit were retained. First, we removed the path from rumination to T2 depression, while allowing the other three paths to vary freely. Removing this path did not lead to a significant decrement in overall model fit ( $\chi^2$  difference (1,  $N = 451$ ) = 0.13,  $p > .05$ ), suggesting that the path from rumination to T2 depression can be removed. Next, we removed the path from worry to T2 depression, while allowing the other three paths to vary freely. Removing this path also did not lead to a significant decrement in overall model fit ( $\chi^2$  difference (1,  $N = 451$ ) = 1.02,  $p > .05$ ), suggesting that the path from worry to T2 depression can be removed. The two statistically significant paths of theoretical relevance were retained in the final model; a path from worry to T2 anxiety ( $\beta = .16, p < .01$ ), and a path from rumination to T2 anxiety ( $\beta = .11, p < .05$ ). This final model produced an excellent fit to the data,  $\chi^2(4, N = 451) = 4.31, p > .05$ , CFI = 1.00, RMSEA = .01,  $\chi^2/df = 1.08$ .

### Gender differences in structural models?

In order to determine whether portions of the structural model varied across gender, we conducted multiple group analyses examining gender as a moderator of theoretically relevant paths (Byrne, 2001). We began with a freely estimated base model in which all four theoretically relevant paths, along with factor loadings and covariances, varied freely across gender. We subsequently compared the freely estimated model to a model in which we constrained all structural paths to be equal across gender. Support for gender differences in the model would be found if constraining the structural paths in the model to be equal across genders led to a significant decrement in overall model fit compared to the freely estimated model. In contrast, constraining all paths in the model across gender did not lead to a significant decrement in overall model fit ( $\chi^2$  difference (6,  $N = 451$ ) = 3.82,  $p > .05$ , suggesting that the structural relationships in the present model did not significantly vary across gender. Furthermore, after constraining each theoretically relevant path (paths from T1 rumination to T2 depression, from T1 worry to T2 depression, from T1



rumination to T2 anxiety, and from T1 worry to T2 depression) to be equal across genders separately, one at a time, there were no significant decrements in overall model fit, again suggesting that there were no significant gender differences in any of these theoretically relevant paths.

### Supplemental analyses

In light of the large body of research supporting the association between rumination and depression (Lyubomirsky et al., 1998; Morrow & Nolen-Hoeksema, 1990; Nolan et al., 1998; Nolen-Hoeksema et al., 1997; Nolen-Hoeksema et al., 1994), our findings are somewhat surprising. We therefore conducted follow-up analyses testing whether specific dimensions of rumination predicted changes in depression over time. To do so, we conducted a principal axis factor analysis on the Response Styles Questionnaire (RSQ) with a promax rotation. Three factors emerged with eigenvalues greater than one, while a scree test also suggested three factors. The first factor accounted for 34.5% of the total variance, the second factor accounted for 7.5% of the total variance, and the third factor accounted for 3% of the total variance. Each item on the RSQ was assigned to the factor that it loaded most heavily on. Factor loadings ranged from .35 to .77. Similar to the results of Roberts and colleagues (1998), the content of Factor 1 was saturated by items related to the experience of depressive symptoms (labeled ‘Symptom-related’), the content of Factor 2 was related to the tendency to self isolate in response to depression (labeled ‘Self-isolation’), and the content of Factor 3 was related to the tendency to engage in an analytic processing style (labeled ‘Self-analysis’). Items from the 14-item Symptom-related factor ( $\alpha = .90$ ) include “Think about your feelings of fatigue and achiness,” “Think about how hard it is to concentrate.” and “Think about how passive and unmotivated you feel”, items from the 4-item Self-isolation factor ( $\alpha = .75$ ) include “Isolate yourself and think about the reasons why you feel sad,” “Go away by yourself and think about why you feel this way,” and “Go someplace alone to think about your feelings,” while items from the 4-item Self-analysis factor ( $\alpha = .77$ ) include “Analyze recent events to try to understand why you are depressed,” “Analyze your personality to try to understand why you are depressed,” and “Write down what you are thinking and analyze it.”

Next, we substituted each of these dimensions of rumination for the full rumination score in the model displayed in Fig. 1. In these models, the Self-isolation factor failed to predict T2 depression ( $\beta = -.03, p > .05$ ), but was a significant predictor of T2 anxiety ( $\beta = .12, p < .01$ ). Likewise, Self-analysis failed to predict T2 depression ( $\beta = -.04, p > .05$ ), but was a significant predictor of T2 anxiety ( $\beta = .12, p < .01$ ). In contrast, the Symptom-related factor predicted both T2 depression ( $\beta = .15, p < .05$ ) and T2 anxiety ( $\beta = .15, p < .05$ ), whereas worry predicted T2 anxiety ( $\beta = .15, p < .05$ ), but not depression ( $\beta = .07, p > .05$ ) in this model. Moreover, this overall model provided a good fit to the data,  $\chi^2(2, N = 451) = 4.54, p > .05, CFI = 1.00, RMSEA = .05, \chi^2/df = 2.27$ .

In light of recent factor analytic findings by Treynor and colleagues (2003) using the RSQ, we substituted each of their three factors for the whole rumination scale. Specifically, we created single indicator latent variables from their brooding, reflective pondering and symptom-related factors. We then substituted each of these scores for the full rumination measure in the model displayed in Fig. 1. In these models, Brooding failed to predict T2 depression ( $\beta = -.10, p > .05$ ), but was a significant predictor of T2 anxiety ( $\beta = .12, p < .05$ ). Likewise, Reflective Pondering failed to predict T2 depression ( $\beta = .06, p > .05$ ), but was a significant predictor of T2 anxiety ( $\beta = .13, p < .05$ ). In contrast, Symptom-related rumination predicted both T2 depression ( $\beta = .14, p < .01$ ) and T2 anxiety ( $\beta = .18, p < .05$ ), whereas worry predicted T2 anxiety ( $\beta = .20, p < .01$ ), but not T2 depression ( $\beta = .05, p > .05$ ) in this model. Moreover,

the overall model provided a good fit to the data,  $\chi^2 (2, N = 451) = 4.04, p > .05$ , CFI = 1.00, RMSEA = .05,  $\chi^2/df = 2.02$ .

## Discussion

The present study is one of the first empirical investigations to examine the specificity of worry and rumination as prospective predictors of anxiety and depression. Results of structural equation modeling indicated that both worry and rumination prospectively predicted symptoms of anxiety, whereas neither form of repetitive thought prospectively predicted symptoms of depression. These results suggest that repetitive thought in the form of rumination and worry is particularly important in the development of anxious symptomatology over time, but may be relatively less important in the development of depressive symptomatology. Furthermore, these effects did not vary across gender. In other words, repetitive thought played an equivalent role in the course of anxious symptomatology among males and females. Likewise, the impact of repetitive thought on the course of depressive symptomatology was not statistically significant among either males or females.

Our findings concerning the impact of repetitive thought on symptoms of anxiety suggest the need for future research to determine if rumination and worry contribute to the development of full-blown anxiety disorders. Given that GAD is in part defined by worry, it seems most likely that repetitive thought would play an important role in the development of this clinical condition. In addition to GAD, future research should also examine whether rumination and worry contribute to the development of other anxiety disorders, such as Panic Disorder and Social Phobia. Consistent with the possibility that repetitive thought plays a role in more serious clinical forms of anxiety, some recent research suggests that rumination is a risk factor for the development of mixed anxiety/depression (Nolen-Hoeksema, 2000).

If repetitive thought does play an important role in the etiology of anxiety disorders, our data suggests that it does so equally strongly among males and females. In other words, although females are at greater risk for a variety of anxiety disorders (Pigott, 1999), the impact of rumination and worry on symptoms of anxiety does not appear to be any greater among females compared to males. On the other hand, our data suggests that females are more likely to engage in both worry and rumination, which may put them at greater risk compared to males (who are less prone to these forms of repetitive thought). It would therefore be important for future research to examine how and why women are predisposed to engage in these forms of unproductive repetitive thought.

Our finding suggesting that both worry and rumination predict anxiety, but not depression, is consistent with past research by Segerstrom and colleagues (2000). These investigators found that a latent variable “repetitive thought,” consisting of both worry and rumination, predicted anxious symptomatology over a one week prospective interval among college students, whereas repetitive thought failed to prospectively predict depressive symptomatology. In contrast, a sizable body of literature has demonstrated a link between rumination and depression among both analogue and clinical samples (Ciesla & Roberts, 2002; Lyubomirsky et al., 1998; Morrow & Nolen-Hoeksema, 1990; Nolan et al., 1998; Nolen-Hoeksema et al., 1997; Nolen-Hoeksema, Morrow, & Fredrickson, 1993; Nolen-Hoeksema et al., 1994). How can our findings (and those of Segerstrom et al. (2000)) be reconciled with this large body of research?

In attempting to answer this question, we begin by highlighting factors that do *not* appear to be responsible for the discrepancy between our findings and past work. First, we used the same measure of rumination as most of these past studies, the Response Styles Questionnaire (RSQ) (Nolan et al., 1998; Nolen-Hoeksema et al., 1994). Moreover, in the present study, the RSQ demonstrated high internal consistency ( $\alpha = .92$ ) and good test-retest reliability ( $r = .75$ ),

suggesting it was measuring rumination in a reliable manner. Furthermore, similar to several of the previously cited studies, participants in the present study were college students (Morrow & Nolen-Hoeksema, 1990; Nolan et al., 1998). Finally, it did not appear to be the case that rumination played a stronger role in predicting the course of depressive symptoms among females compared to males. The size of these effects did not vary by gender in our data.

Whereas past research supports a clear distinction between worry and anxiety (Davey, Hampton, Farrell, & Davidson, 1992; Zebb & Beck, 1998), research by Roberts and colleagues (1998) has offered criticism for our current measurement of rumination due to its overlap with depressive symptomatology. In fact, our post-hoc analyses offer further support for this criticism, suggesting that previously documented links between rumination and depression may have been spurious. In these analyses, we derived specific dimensions of rumination from a factor analysis of our data, as well as from a previous factor analysis (Treyner, Gonzalez, & Nolen-Hoeksema, 2003), and examined each dimension separately. Consistent with a past factor analysis of the RSQ (Roberts et al., 1998), we found support for three dimensions of rumination involving symptom-related rumination, self-isolation, and self-analysis (labeled as self-criticism by Roberts et al. (1998)). Roberts et al. (1998) raised concern about potential criterion contamination between items on symptom-related rumination and history of experiencing more severe depressive symptomatology (see also Segerstrom et al., 2000). For example, an item such as “thinking about your poor concentration” would likely receive a zero score by a participant whose depression has never been severe enough to impact concentration. Consequently these items may inadvertently assess severity of past depression rather than rumination per se leading to spurious associations between measures of rumination and depression. As a consequence of these concerns, Treyner et al. (2003) recommended excluding these items and instead focusing on dimensions that they labeled as ‘brooding’ and ‘reflective pondering.’

Our post-hoc analyses found that symptom-related rumination predicted changes in depressive symptoms over time, whereas dimensions of rumination that did not include these “contaminated” items did not. In other words, dimensions involving self-isolation and self-analysis (derived from our factor analysis) and brooding and reflective pondering (derived from Treyner et al. (2003)) failed to prospectively predict depression. In contrast, dimensions of rumination related to symptoms of depression (derived from either our factor analysis or Treyner et al. (2003)) were statistically significant predictors of changes in depressive symptoms. These results raise the possibility that past findings demonstrating associations between rumination and depression were driven by criterion contamination. We should note though that these concerns only apply to studies using heterogenous samples that vary in their history of depression. In more homogenous samples composed of individuals who are currently depressed or who have a past history of clinical depression, this concern would be less salient—most participants would have had experience with the symptoms in question and therefore would have had the opportunity to ruminate about them.

Another potential explanation for the discrepancy between our results and past findings emerges from recent studies suggesting that the association between rumination and future depression varies as a function of individual differences that moderate the strength and/or nature of this effect. First of all, other recent studies suggest that rumination has a stronger depressogenic effect on individuals with negative cognitive styles. More specifically, the association between rumination and prolonged experimentally induced dysphoric mood (Ciesla & Roberts, 2006) and poor response to treatment for depression (Ciesla & Roberts, 2002) is stronger among participants with lower self-esteem and greater dysfunctional beliefs. Also, there are data suggesting that the effects of rumination vary depending on the mode of cognitive processing used while focusing on depressive symptoms and experiences. Specifically, rumination involving high levels of analytic thinking appears to be more strongly associated with vulnerability to depression compared

to rumination involving more concrete thinking (Watkins & Teasdale, 2001). It is possible that individuals reporting rumination in our study did not universally engage in high analysis, thereby diluting the association between rumination and future depressive symptoms. Future research should attempt to further delineate differences in processing styles among individuals reporting elevated rumination. In sum, individual characteristics may play an important role in moderating the relationship between depressive rumination and depressive symptomatology over time. However, we should also note that in our sample (as well as Segerstrom et al.'s (2000) sample) the stability coefficients were considerably higher for depression ( $r = .80$ ) compared to anxiety ( $r = .55$ ). Consequently there was less statistical power to detect an association between repetitive thought and residual change in depression compared to anxiety.

The present study contains several methodological and conceptual strengths. First, this study examined the relationships between two forms of repetitive thoughts and two types of emotional distress together in one structural model. As previously discussed, such modeling allowed us to account for the shared variance between these thought processes when considering their relationship to specific forms of emotional distress. Likewise, by including both depression and anxiety in one model, we were able to clarify the relationship between each specific form of repetitive thought and negative affect. Moreover, by using single indicator latent variables to measure each construct, we were able to isolate measurement error specific to our sample. Therefore, the use of structural equation modeling represents a methodological strength of the present study that allowed us to examine the structural relationships among worry, rumination, anxiety, and depression in a systematic manner. Finally, our prospective data allowed us to examine the degree to which worry and rumination were associated with changes in depression and anxiety over time, a prerequisite to establishing causality.

Several limitations to the present study should be noted. First, the 6–8 week prospective interval may have been too short to detect substantial changes in symptoms of anxiety and depression, and future studies might benefit from a longer time lag. Second, ideally we would have had multiple measures of each construct to serve as indicators of our latent variables. Third, there may be important interplay between worry and rumination on the one hand, and other clinically relevant factors, such as anxiety sensitivity and life stress, on the other hand. More comprehensive models will need to be tested in future research. Finally, our self-report measures of depression and anxiety may have limited ability in differentiating general distress from depressive and anxious symptomatology (Gotlib, 1984) and it is an open question as to whether these findings would generalize to individuals with clinical levels of anxiety and depression. Nonetheless, taxometric research has supported dimensional models of both depression (Prisciandaro & Roberts, 2005; Ruscio & Ruscio, 2002) and several anxiety disorders, including GAD (Ruscio, Borkovec, & Ruscio, 2001) and Posttraumatic Stress Disorder (Ruscio, Ruscio, & Keane, 2002), suggesting that the use of analogue populations may be less problematic than previously suspected. Nonetheless it would be valuable for future research to examine the role of repetitive thought processes in treatment response among patients with mood and anxiety disorder diagnoses. Such work could guide the development of interventions targeting these cognitive processes.

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