Brooding and Pondering

Isolating the Active Ingredients of Depressive Rumination With Exploratory Factor Analysis and Structural Equation Modeling

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Depressive rumination, as assessed by Nolen-Hoeksema's Response Styles Questionnaire (RSQ), predicts the onset, chronicity, and duration of depressed mood. However, some RSQ items contain depressive content and result in a heterogeneous factor structure. After the a priori elimination of items potentially confounded with depressed item content, Treynor, Gonzalez, and Nolen-Hoeksema identified two factors within the remaining RSQ rumination sub-scale that were differentially related to depression: brooding and pondering. However, Treynor et al. used a nonstandard form and administration of the RSQ. The present study sought to address these methodological idiosyncrasies and replicate the factor structure of Treynor et al. through exploratory factor analysis and structural equation modeling. Findings support the brooding and pondering solution and demonstrate that brooding relates more strongly to depression and anxiety than does pondering.

Keywords: *response styles; depressive rumination; factor analysis; brooding; pondering*

Since its inception, considerable research has focused on the construct of depressive rumination and its association with the incidence, prevalence, and phenomenology of depression. Nolen-Hoeksema (1998) defines depressive rumination, a particular variety of rumination associated with depressed mood, as "focusing passively and repetitively on one's symptoms of distress and the meaning of those symptoms without taking action to correct the problems one identifies" (p. 216). As initially conceptualized within the framework of Nolen-Hoeksema's response style theory (1987), rumination as operationalized in the present study refers to the *characteristic* manner in which individuals respond to their own symptoms of distress or depressed mood. Despite the clarity of this

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operationalization, research into depressive rumination has generated mixed results.

Research has linked depressive rumination to the onset of depression in nondepressed individuals (Just & Alloy, 1997; Spasojevic & Alloy, 2001), the exacerbation of depressed symptoms (Kuehner & Weber, 1999), and the increased chronicity of depressed symptoms (Nolen-Hoeksema, 2000). Research using treatment-seeking samples has found rumination to be a clinically useful construct (Bagby et al., 1999; Bagby, Rector, Bacchiochi, & McBride, 2004). Bagby et al. (2004) found that distraction, but not rumination, predicted both change in depression severity over the course treatment and overall treatment outcome. Bagby et al. (1999) examined the stability of rumination in patients being treated for major depression. Their results indicated that rumination that is focused on symptoms of depression may be more relevant for the intensity of current episodes of depression and risk for recurrence, whereas rumination that is focused on the self may be more relevant for the maintenance of a current episode and risk for relapse. Although these results argue for a direct link between rumination and depression, other research refutes this claim. For example, Kasch, Klein, and Lara (2001) demonstrated that controlling for extraneous personality variables, such as self-criticism and negative temperament, eliminates the correlation between depressive rumination and the course and outcome of depressive symptoms. Despite inconsistencies, the study of depressive rumination has contributed to our understanding of depression.

One way to account for the ambiguity in the relationship between rumination and depression is an examination of the item content and factor structure of the Response Styles Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991), one of the most commonly used measures of depressive rumination (Kasch et al., 2001; Roberts, Gilboa, & Gotlib, 1998) and the focus of the studies reviewed here. For instance, item content unrelated to the construct of rumination but correlated with self-criticism and negative temperament could account for the findings of Kasch et al. (2001). The RSQ is a rationally derived self-report instrument composed of 71 questions and containing 4 subscales (rumination, distraction, problem solving, and dangerous behavior). The RSQ instructs participants to read a list of thoughts, feelings, and behaviors in which individuals commonly engage when they feel depressed. Participants then indicate how frequently they engage in these thoughts, feelings, and actions when they experience a depressed mood.

In practice, the entire measure is administered; however, responses to items on the Ruminative Responses Subscale (RRS) of the RSQ are typically the focus of research. The RRS has demonstrated excellent internal consistency ($\alpha = .89$) as well as an association with the number and severity of expressed depressive symptoms (Nolen-Hoeksema & Morrow, 1991). Subsequent research has replicated the strong internal consistency of the RSQ but demonstrated poor to moderate test–retest reliability, ranging between .39 (Kasch et al., 2001) and .61 (Just & Alloy, 1997), which represents one significant criticism of the rumination construct given that it was initially conceptualized as a characteristic response style. If the poor test–retest reliability of the RSQ is attributable to item content unrelated to rumination, refinement of this item content could improve the psychometric properties of the instrument.

Another criticism of the RRS is that its correlation with criterion measures of mood and affect may be less reflective of the relationship between depressive rumination and mood or affect and more a function of the depression-related content of several items on the rumination subscale (Roberts et al., 1998). Items such as "Think about your feelings of fatigue and achiness" or "Think about how hard it is to concentrate" are, on the surface, very similar in content to the somatic and cognitive symptoms of depression contained within the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1994). Inclusion of symptoms of depression in RRS item content may represent a confounding of the domains of depression and rumination.

Factor Structure of RSQ Rumination

One of the first factor analytic explorations of the RSQ was conducted as part of an exploration of gender differences in depression within a college sample (Butler & Nolen-Hoeksema, 1994). This study employed a 76-item version of the RSQ, containing 5 items not included in the original 71-item version (Nolen-Hoeksema & Morrow, 1991). The authors acknowledged that this 76-item version of the RSQ was "modified" (Butler & Nolen-Hoeksema, 1994; p. 338) from the original 71-item version, but the reasons for these modifications were not reported. Butler and Nolen-Hoeksema (1994) first placed 31 rumination items, a priori, on a modified version of the RRS; a similar procedure was followed for the 16 distraction items. These 31 rumination items were composed of the 22-item version of the RSQ and 9 items from

the "expanded rumination scale;" items included in the 71-item version of the RSQ and purported to assess rumination but for which no psychometric properties were reported. The 10 items with the highest item–total correlations for each of the rumination and distraction subscales were then grouped together and subjected to a principal components factor analysis. This factor analysis yielded two first-order factors, rumination and distraction. The 10-item rumination factor subsequently demonstrated adequate reliability and successfully accounted for gender differences in depression. Unfortunately, one item included in the 10-item rumination subscale, "RSQ 42. Think 'Why can't I handle things better?'" belongs to the set of "expanded rumination" items and is not included in the original 22-item RRS. Consequently, even though this version of the rumination scale demonstrated promising psychometric qualities, it is not a nested subset of items contained in the original 22-item RRS and, thus, could not be derived by researchers who administered the 22-item RRS.

At least three studies have examined the factor structure of a 21-item rumination subscale of the RSQ and extracted factors associated with symptom-focused rumination, which describe drawing one's attention to the symptoms of depression he or she may be experiencing. These studies also extracted a factor capturing a phenomenon of critical self-focus (Bagby & Parker, 2001; Cox, Enns, & Taylor, 2001; Roberts et al., 1998). Fresco, Frankel, Mennin, Turk, and Heimberg (2002) conducted an exploratory factor analysis of the standard 22-item version of the rumination subscale along with the 16-item Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) to better understand similarities and differences in the structure of depressive rumination and worry. Fresco et al. (2002) obtained two rumination factors, designating them as active cognitive appraisal and dwelling on the negative. Although the focus of that article was a comparison of depressive rumination to worry, the two-factor RRS solution also emerged when PSWQ items were excluded. Dwelling on the negative, as compared with active cognitive appraisal, correlated more strongly with criterion measures of mood and anxiety, and it shared many items with the symptom-based rumination factors from the previous studies (Bagby & Parker, 2001; Cox et al., 2001; Roberts et al., 1998). Despite notable differences across the studies reviewed here, a consistent finding is that items that reflect the drawing of one's attention to the symptoms of depression aggregate into a factor of symptom-focused rumination. In three of the studies, items also aggregated into discrete factors of negative self-focus/self-blame (Bagby & Parker, 2001; Cox et al., 2001; Roberts et al., 1998). One potential interpretation is that the items confounded with the measurement of depression symptoms had been isolated into a single factor, thus permitting the measurement of a purified measure of rumination in the remaining factors.

Working from this premise, Treynor, Gonzalez, and Nolen-Hoeksema (2003) conducted an exploratory factor analysis of the RSQ rumination subscale examining the underlying covariance structure after rationally eliminating items influenced by this depression content. They started with an expanded, 25-item version of the RSQ rumination subscale used by Butler and Nolen-Hoeksema (1994). This version of the rumination subscale included the original 22 items, plus 2 additional items from the 71-item RSQ ("RSQ 14. Think 'What am I doing to deserve this?'" and "RSQ 42. Think 'Why can't I handle things better?'") and one item not found on the original 71-item RSQ ("RSQA. Think 'I won't be able to concentrate if I keep feeling this way'"). These additional RSQ items have been included in alternate versions of the rumination subscale in the past. However, prior to conducting the analysis, 15 of the original 25 items examined in this study were rationally eliminated, owing to the similarity of the depressed thoughts, feelings, or behaviors assessed by these RSQ items with items on the Beck Depression Inventory (BDI). The remaining 10 items were subjected to an exploratory factor analysis, yielding 2 first-order factors: *pondering* (actively seeking an understanding and solution to one's problems) and *brooding* (drawing one's attention to one's problems and their consequences). Similar to previous factor analyses, these first-order rumination factors differed in their association to depression. Brooding demonstrated a stronger correlation with depression and depressive symptoms than did pondering. Interestingly, one common thread of these factor analytic studies is that two potentially meaningful factors remain, each demonstrating a differential association with depression once symptom-focused items are removed from the RRS (Treynor et al., 2003) or allowed to load on a separate factor (Bagby & Parker, 2001; Cox et al., 2001; Roberts et al., 1998).

Limitations of the Brooding and Pondering Solution

Three facets of Treynor et al.'s (2003) methodology limit the immediate generalizability of the findings.

First, Treynor et al. used an atypical version of the RRS that differs in item content from the more commonly used 22-item version of the RRS. Two of these items, *RSQ 14* and *RSQ 42,* were drawn from the expanded rumination scale used by Butler and Nolen-Hoeksema (1994), and are not typically included as a part of the rumination subscale. One additional item does not appear in any other study reviewed here and, consequently, may represent item content new to the RSQ.

Second, although Treynor et al. (2003) claimed to remove all items from the RSQ potentially confounded with depressed item content, one can argue that some items might continue to show a strong association with depression. Two items from the Treynor et al. (2003) pondering factor directly reference depressed mood: "RSQ 18. Analyze recent events to try to understand why you are depressed" and "RSQ 53. Analyze your personality to try to understand why you are depressed." The rational elimination rule described by Treynor et al. (2003, p. 249) says that they "removed depression-related items," and thus, these two items seem as likely candidates for elimination if adopting a strict, conservative, interpretation of the rule.

Finally, administration of the RRS in the Treynor et al. (2003) study was also nonstandard. The customary paper-and-pencil administration was modified for administration during an oral telephone interview. Research demonstrating the effects of interview administration as opposed to a paper-and-pencil administration for the RSQ is unavailable; however, previous research with other assessment measures has demonstrated that the modality of assessment can greatly affect the type, form, and number of responses obtained (Kendall, Butcher, & Holmbeck, 1999). Specifically, a change to oral administration could easily have reduced the degree to which individuals felt comfortable openly describing their thoughts, feelings, and behaviors. It is therefore possible that a self-report administration of the RSQ could significantly change the obtained factor structure.

The Present Study

The present study sought to replicate and extend the conclusions of Treynor et al. (2003) while simultaneously addressing the previously identified limitations. All participants completed a paper-and-pencil version of the 71-item version of the RSQ plus those items unique to the Treynor et al. analysis. In Study 1, two exploratory factor analysis (EFA) models were evaluated to identify an optimal factor structure using methodology

similar to that used by Treynor et al. (2003). One model contained the eight unambiguously depression-free items plus RSQ Items 18 and 53, replicating the Treynor et al. solution. An EFA consisting of the 8 unambiguously depression-free items was also evaluated. The superior EFA factor structure that emerged in the first sample was further evaluated using structural equation modeling (SEM) in a separate sample of college students (Study 2) and a sample of individuals at-risk for developing depression (Study 3) to examine mood and affect correlates of this factor structure.

Method

Participants

Participants for the EFA (Study 1) were 680 undergraduate students (70% female) who completed the study for course credit. The racial composition of this sample was 46% Caucasian, 28% African American, 8% Asian/Asian American, 3% Hispanic, 6% of mixed racial heritage, and 9% of individuals who described themselves as "other." The average age of this sample was 19.5 years ($SD = 3.96$). Twenty-eight participants were excluded because they failed to complete all the relevant RSQ items used in the EFA. Excluded participants did not differ significantly from included participants on any available study measures.

Participants for the first SEM (Study 2) were 724 undergraduate students (67% female) who completed the study for course credit. The racial composition of this sample was 38% Caucasian, 39% African American, 12% Asian/Asian American, 3% Hispanic, 8% of mixed racial heritage, and less than 1% of participants who described themselves as Native American or Middle Eastern. The average age of this sample was 20.36 ($SD = 3.96$). Twenty participants were excluded for failing to complete all 8 of the RSQ items used in the SEM analysis. Excluded participants did not differ significantly from included participants on any available study measures.

Participants for the second SEM (Study 3) were 67 freshmen college students (66% female) identified as being at high risk for depression (e.g., high scores on measures of dysfunctional attitudes and depressogenic inferential styles) as a part of the Temple–Wisconsin Cognitive Vulnerability to Depression (CVD) Project (Alloy & Abramson, 1999; Alloy et al., 2000). These participants were from the Temple site of the CVD project only, because only Temple participants completed

the RSQ. The average age of this sample was 18.45 years (SD = 1.40). The racial composition of this sample was 69% Caucasian, 19% African American, 6% Asian/Asian American, 3% Hispanic, and 3% of participants who described themselves as "other." The high-risk status of this sample is demonstrated by the findings that they showed higher lifetime prevalence rates (Alloy et al., 2000) and higher prospective incidence rates (Alloy et al., 1999; 2006) of major and minor depressive disorders than a comparison group of low-risk individuals with nondepressogenic cognitive styles.

Measures

The RSQ (Nolen-Hoeksema & Morrow, 1991) is a self-report instrument consisting of a core of 71 items, but which has also been used in a 76-item version. The items are measured on a 4-point, Likert-type scale with ratings ranging from "almost never" to "almost always." The RSQ is designed to assess an individual's characteristic tendency to engage in ruminative, distracting, problem solving, or dangerous coping behavior when feeling depressed. The entire 71-item scale was administered for the present study. Twenty-four items from the full 71-item scale, the original 22-item RRS plus the two additional expanded rumination items used by Treynor et al., were originally considered for inclusion in these studies. The 10 items that most closely conform to the items retained by Treynor et al. (Studies 1 to 3) were the focus of attention in the current study. Reliability for the traditional 22-item version of the RRS was comparable with the findings of past research ($\alpha \sim$ .90) for all studies.

The BDI (Beck, Rush, Shaw, & Emery, 1979) is a 21-item measure assessing the presence and severity of depressive symptoms. For each item, participants evaluate four conceptually related statements, each statement describing a level of severity for a particular depressive symptom and record which statement most describes the way that they feel. Statements for each item are coded from 0 to 3 in ascending severity of depressive content. Scores below 9 are considered to show no appreciable depressive mood, whereas higher scores suggest increasingly more severe and debilitating depressive mood, thought, and behavior (Kendall et al., 1999). Meta-analysis of BDI studies has demonstrated good internal consistency (α = .84) and moderate test–retest reliability (r = .69; Yin & Fan, 2000). In the current study, the BDI achieved a good internal consistency (α = .88).

The Mood and Anxiety Symptom Questionnaire–Short Form (MASQ; Watson & Clark, 1991) is a 62-item instrument designed to assess symptoms commonly occurring in the mood and anxiety disorders. Items are rated on a 1 (*not at all*) to 5 (*extremely*) Likert-type scale. These 62 items are subdivided into four subscales: General Distress Anxious Symptoms (GDA), General Distress Depressive Symptoms (GDD), Anxious Arousal (AA), and Anhedonic Depression (AD). The GDA subscale is composed of 11 items indicative of anxious mood but provides little discrimination from depressed mood (e.g., "Felt nervous," "Had an upset stomach"). The GDD subscale is composed of 12 items indicative of depressed mood but provides little discrimination from anxious mood (e.g., "Felt sad," "Felt like crying"). The AA subscale contains 17 items detailing symptoms of somatic tension and hyperarousal (e.g., "Startled easily," "Was trembling or shaking"). The AD subscale contains 8 items specifically assessing symptoms related to depression such as a loss of interest in pleasurable activities and low energy (e.g., "Felt like nothing was very enjoyable") and 14 reverse-coded items assessing positive emotional experiences (e.g., "Felt cheerful"). The MASQ was administered in the first SEM sample (Study 2). In this sample, reliability for the four MASQ subscales was found to be good to excellent (GDA, α = .84; GDD, α = .91; AA, α = .86; AD, α = .83).

Procedure

For Samples 1 and 2, introductory psychology students were given questionnaires to complete and return, including measures not related to the present study. These unrelated measures broadly assessed constructs related to mood and anxiety psychopathology for the purpose of screening for risk for these classes of disorders. However, administration times did not differ notably between the two samples, and total administration time was approximately 90 minutes. Approximately 76% of the students returned the questionnaires and in return received partial course credit. Participants in Sample 3 completed the questionnaires as part of the assessment at Time 1 of the CVD project. Participants in all samples completed the RSQ and BDI, whereas only participants in the second sample completed the MASQ. The three aforementioned samples were all samples of convenience, and unfortunate limitations resulting from this fact prevented the MASQ from being administered in all samples.

Table 1
Study 1, Model 1: A 10-Item, Two-Factor Comprehensive Exploratory Factor Analysis Solution

	Brooding	Pondering
RSQ 42: Think "Why can't I handle things better?"	**.75**	.05
RSQ 40: Think "Why do I have problems other people don't have?"	**.73**	−.00
RSQ 22: Think "Why do I always react this way?"	**.59**	.10
RSQ 30: Think about a recent situation, wishing it had gone better	**.50**	.18
RSQ 14: Think "What am I doing to deserve this?"	**.47**	.21
RSQ 53: Analyze your personality to try to understand why you are depressed	**.40**	.24
RSQ 25: Go away by yourself and think about why you feel this way	−.10	**.86**
RSQ 56: Go someplace alone to think about your feelings	.10	**.64**
RSQ 28: Write down what you are thinking about and analyze it	.07	**.40**
RSQ 18: Analyze recent events to try to understand why you are depressed	.27	.39

Note: Factor loadings in boldface indicate that the item demonstrates a loading of at least .40 on the factor with at least a .10 difference in loadings between factors.

Results

Study 1

Initial exploratory factor analyses. In the initial EFA, the 10 items included in the Treynor et al. brooding and pondering solution were submitted to common factor analysis with varimax rotation[1] using the Comprehensive Exploratory Factor Analysis (CEFA 1.10) program developed by Browne, Cudeck, Tateneni, and Mehls (2002). CEFA was employed for these analyses because it allows for the comparison of relative fit between nested models as well as models with different numbers of extracted factors. In the second model, we elected to eliminate two items, RSQ 18 and RSQ 53, because of potential confounds with the construct of depression, thereby permitting the evaluation of a more conservative model.

Model fit to the data was assessed using several fit indices in addition to the standard χ^2 statistic. The CMIN/df statistic, a modification of the χ^2 statistic intended to reduce the tendency for χ^2 to be conflated by large sample sizes (Bollen, 1989), is calculated simply by dividing χ^2 by the degrees of freedom for the overall model. Values of CMIN/df lower than 3 to 4 are considered to reflect a good fit of the model to the data. The root mean squared error of approximation (RMSEA) was also used to assess model fit, with values "close to 0.06" (Hu & Bentler, 1999, p. 1) considered to reflect adequate model fit. When reporting RMSEA, the common convention is to report the 90% confidence interval (CI), or the values between which 90% of all estimates of the RMSEA are likely to fall. Although eigenvalues are presented for each competing model, they were not used to assess model fit and are included only as supplemental information regarding the factor solutions.

In Model 1, two factors were extracted with eigenvalues greater than 1. Factor 1, with an eigenvalue of 4.00, consisted of the 5 RSQ brooding items plus RSQ 53, which had loaded onto the pondering factor in the Treynor et al. solution. Factor 2, with an eigenvalue of 1.30, consisted of 3 pondering items (RSQ 25, RSQ 56, and RSQ 28). Item RSQ 18 failed to load on either factor. This two-factor solution (χ^2 = 160.87, p < .05; CMIN/df = 6.19; RMSEA = .09; 90% CI on RMSEA = .08 to .10) demonstrated a marginally acceptable fit to the data. Table 1 displays the rotated factor loadings for all items.

In Model 2, two factors were extracted with eigenvalues greater than 1. Table 2 displays the rotated factor loadings for all items. Factor 1, with an eigenvalue of 3.30, consisted of the 5 RSQ brooding items. Factor 2, with an eigenvalue of 1.30, consisted of the 3 remaining pondering items. This two-factor solution (χ^2 = 53.88, p < .05; CMIN/df = 4.14; RMSEA = .07; 90% CI on RMSEA = .05-.09) demonstrated a good fit to the data. Given the stronger findings with Model 2, additional analyses were conducted to evaluate the internal consistency of the scale scores, their relationship to each other, and to depression. Scale scores of brooding and pondering were created by summing item responses from the two resultant factors, which correlated significantly with each other (r = .41; p < .0001). Cronbach's coefficient alpha was computed for each of the factor scores. The obtained internal consistency estimates for pondering (α = .68) and brooding (α = .80) were moderate to good overall. In this sample, a test of dependent correlations, $t(677)$ = 8.13, p < .001, Cohen's d = .65, demonstrated that brooding (r = .52) correlated more strongly with BDI scores than did pondering (r = .23).

Table 2
Study 1, Model 2: An 8-Item, Two-Factor Comprehensive Exploratory Factor Analysis Solution

	Brooding	Pondering
RSQ 42: Think "Why can't I handle things better?"	**.77**	.16
RSQ 40: Think "Why do I have problems other people don't have?"	**.74**	.13
RSQ 22: Think "Why do I always react this way?"	**.60**	.19
RSQ 14: Think "What am I doing to deserve this?"	**.53**	.27
RSQ 30: Think about a recent situation, wishing it had gone better	**.52**	.24
RSQ 25: Go away by yourself and think about why you feel this way	.12	**.84**
RSQ 56: Go someplace alone to think about your feelings	.27	**.64**
RSQ 28: Write down what you are thinking about and analyze it	.14	**.40**

Note: Factor loadings in boldface indicate that the item demonstrates a loading of at least .40 on the factor with at least a .10 difference in loadings between factors.

Table 3
Study 2: Zero-Order Correlations Between Pondering and Brooding and Measures of Mood and Depression

	Mean (SD)	Brooding	BDI	GDA	AA	GDD	AD
Pondering	5.31 (1.51)	.35*	.11*	.16*	.13*	.14*	−.03
Brooding	10.69 (2.63)		.47*	.39*	.34*	.51*	.31*
BDI	7.48 (6.29)						
MASQ							
AD	53.79 (11.18)		.51*	.43*	.33*	.63*	
GDD	22.61 (9.17)		.67*	.72*	.56*		
AA	24.95 (8.00)		.45*	.72*			
GDA	20.18 (7.18)		.51*				

Note: BDI = Beck Depression Inventory; MASQ = Mood and Anxiety Symptom Questionnaire; GDA = MASQ General Distress Anxiousness; GDD = MASQ General Distress Depressed; AA = MASQ Anxious Arousal; AD = MASQ Anhedonic Depression.
*$p < .001$.

Study 2

College sample structural equation model. The 8-item, 2-factor solution derived in Study 1 was evaluated in an independent sample. In addition, given that previous studies have shown that depressive rumination demonstrates a meaningful relationship to anxiety as well as depression (Fresco et al., 2002; Segerstrom, Tsao, Alden, & Craske, 2000), the brooding and pondering factors were evaluated with measures of both depression and anxiety symptoms. Using the SEM software EQS 6.1 (Bentler & Wu, 2004), the relationships between brooding, a latent variable with five indicators (RSQ items 14, 22, 30, 40, and 42); pondering, a latent variable with three indicators (RSQ items 25, 28, and 56); the BDI, an observed variable; and the four observed subscales of the MASQ (GDA, GDD, AA, and AD) were explored (see Table 3). Overall model fit was evaluated using the same SEM benchmarks described in Study 1.

Descriptive statistics indicated that all MASQ subscales were positively skewed to some degree, with scores on the MASQ-AA contributing most significantly to multivariate kurtosis. Given that parameter estimates derived through procedures assuming the normal distribution of data, such as the maximum likelihood procedure, may be susceptible to rejections of the null hypothesis when it is in fact true (Kline, 1998), the structural model was fit using robust variances. Robust variance estimation permits the calculation of the Satorra–Bentler statistic, a corrected χ^2 statistic used to more accurately calculate the significance of a model employing nonnormal data (Satorra & Bentler, 1994). Although the Satorra–Bentler χ^2 statistic for this model was found to be statistically significant, $\chi^2(47) = 103.96$, $p < .0001$, the χ^2/df ratio was 2.21, indicating a reasonable model fit. Additional fit indices reflected an overall good model fit (CFI = .98; RMSEA = .04; 90% CI on RMSEA = .03-.05). Given the support for the brooding

Figure 1
Study 2: Structural Model for a General College Student Sample
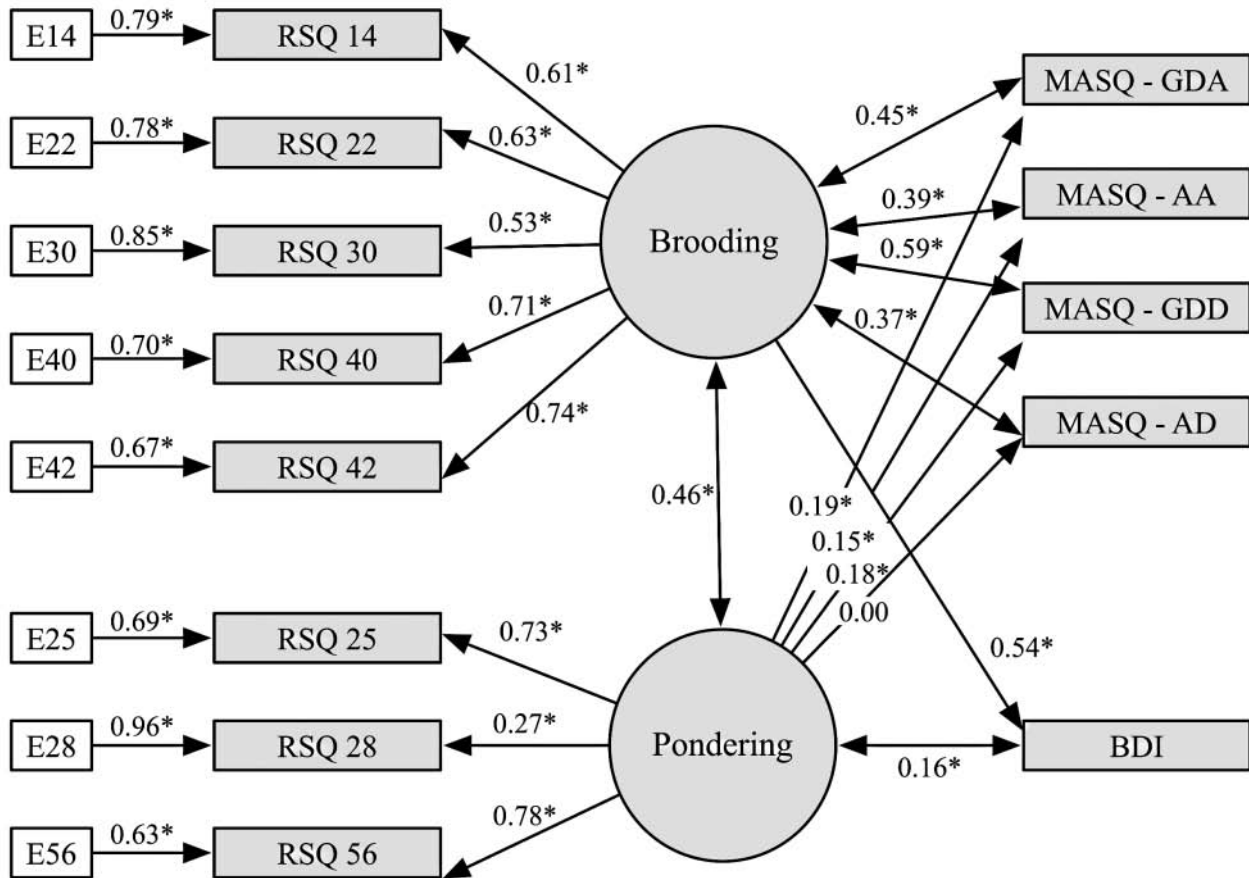
Note: Correlations among the MASQ subscales and between the MASQ subscales and the BDI were removed for clarity. See Table 2.
*Path statistically significant at $p < .05$.

and pondering solution that emerged from this structural model, factor scores were computed by summing the items associated with each factor. Brooding achieved an internal consistency similar to that in Sample 1 ($\alpha = .78$), but the internal consistency of pondering was slightly lower ($\alpha = .63$). As seen in Figure 1, the reduced internal consistency of the pondering factor may be related to low loading of item RSQ 28.

Standardized path coefficients for the model presented a clear picture of the differential relationships between brooding and pondering and measures of mood and affect. Standardized path coefficients may be interpreted similarly to effect sizes, with coefficients around .10 representing small effects, coefficients around .30 representing medium effects, and coefficients around .50 representing large effects (Kline, 1998). As illustrated in Figure 1, brooding and pondering were strongly associated, as reflected by a standardized path coefficient approaching a large effect (.46). The standardized path coefficients between brooding and the MASQ subscales were in the medium effect size range, and the standardized coefficient between brooding and the BDI exceeded the convention for a large effect. These medium to large effect sizes observed between brooding and the criterion measures were consistently larger than the standardized coefficients observed between pondering and the MASQ subscales and the BDI, which were less than or slightly greater than the

convention for a small effect size (<.20). This pattern of results supports the hypothesis that brooding is more strongly associated with the experience of mood and affect, particularly maladaptive mood such as depression, anxiety, and the interplay of anxious and depressed mood.

Study 3

At-risk sample. Given the favorable results of Study 2, a similar model testing the association of the brooding and pondering constructs to symptoms of depression was evaluated in a sample of individuals showing cognitive vulnerability to depression. As with Study 2, brooding and pondering were established as latent variables and the strength of the relationship of these two variables to symptoms of depression as assessed by observed BDI scores was examined.

Again, descriptive statistics for this model suggested the use of robust variance estimation. Although both the RSQ items and the BDI were positively skewed to some degree, scores on the BDI appeared to contribute most significantly to multivariate kurtosis. The nonsignificant Satorra–Bentler χ^2 statistic demonstrated a good model fit [$\chi^2(23) = 15.40$, *ns*]. Furthermore, the small χ^2/df ratio of .67 and additional fit indices further supported the good fit of the model to the data (CFI = 1.00; RMSEA = .00; 90% CI on RMSEA = .00-.04). Given the support for the brooding and pondering solution that emerged from this structural model, factor scores were computed by summing the items associated with each factor. Brooding achieved a similar internal consistency to that in Samples 1 and 2 ($\alpha = .79$), but the internal consistency of pondering remained marginal ($\alpha = .64$). Again, RSQ item 28 demonstrated a low loading on the pondering factor.

Association of mood and affect scales to brooding and pondering. Standardized path coefficients for both the maximum likelihood and robust variance models presented a clear picture of the differential relationships between brooding and pondering and depressed mood for this model. As illustrated in Figure 2, brooding and pondering were found to be strongly associated, as reflected by a standardized path coefficient exceeding the convention for a medium effect size (.39). Again, the standardized path coefficient between brooding and the BDI exceeded the convention for a medium effect size,

approaching the convention for a large effect (.43), whereas the coefficient observed between pondering and the BDI failed to reach the convention for a small effect size (.04). These results further support the hypothesis that brooding is more strongly associated with the experience of depressed mood.

Discussion

The present study supports the brooding and pondering factor solution of the RSQ first proposed by Treynor et al. (2003) and extends the generalizability of that solution using the more commonly available RSQ rumination item set. As noted above, Treynor et al. (2003) identified a two-factor solution among the rumination items in the RSQ that were not confounded by the measurement of depression, dysphoria, or related symptoms. However, the rumination items used in their study differed from the commonly used item set. Thus, by adopting the Treynor et al. (2003) methodological strategy of rationally eliminating affectively confounded items, a similar two-factor brooding and pondering solution emerged from exploratory factor analysis (Sample 1) and was replicated using SEM (Samples 2 and 3). In the current study, the brooding factor, as compared with the pondering factor, demonstrated a significantly stronger relationship to criterion measures of depression and anxiety.

The most important methodological enhancement of the brooding and pondering solution over earlier factor solutions is the lack of affective or symptom content in the items—thereby addressing a limitation raised by others (Roberts et al., 1998; Segerstrom et al., 2000) of tautology with the measurement of depression. Even after eliminating items contaminated by depressive content, brooding demonstrated a strong relationship to depression and anxiety symptoms, whereas pondering did not. Conversely, pondering was relatively unrelated to depression or anxiety. These findings, in line with past factor analyses of the RSQ (Bagby & Parker, 2001; Cox et al., 2001; Roberts et al., 1998), suggest that the active ingredient of rumination most associated with depression may include elements of negative self-focus or self-blame. Clearly, this finding is in agreement with traditional cognitive theories of depression, where negative beliefs or schema about the self contribute to the development of depressed mood (cf. Beck, 1976), and more contemporary theoretical models that view

Figure 2
Study 3: Structural Model for College Students at Risk for Depression
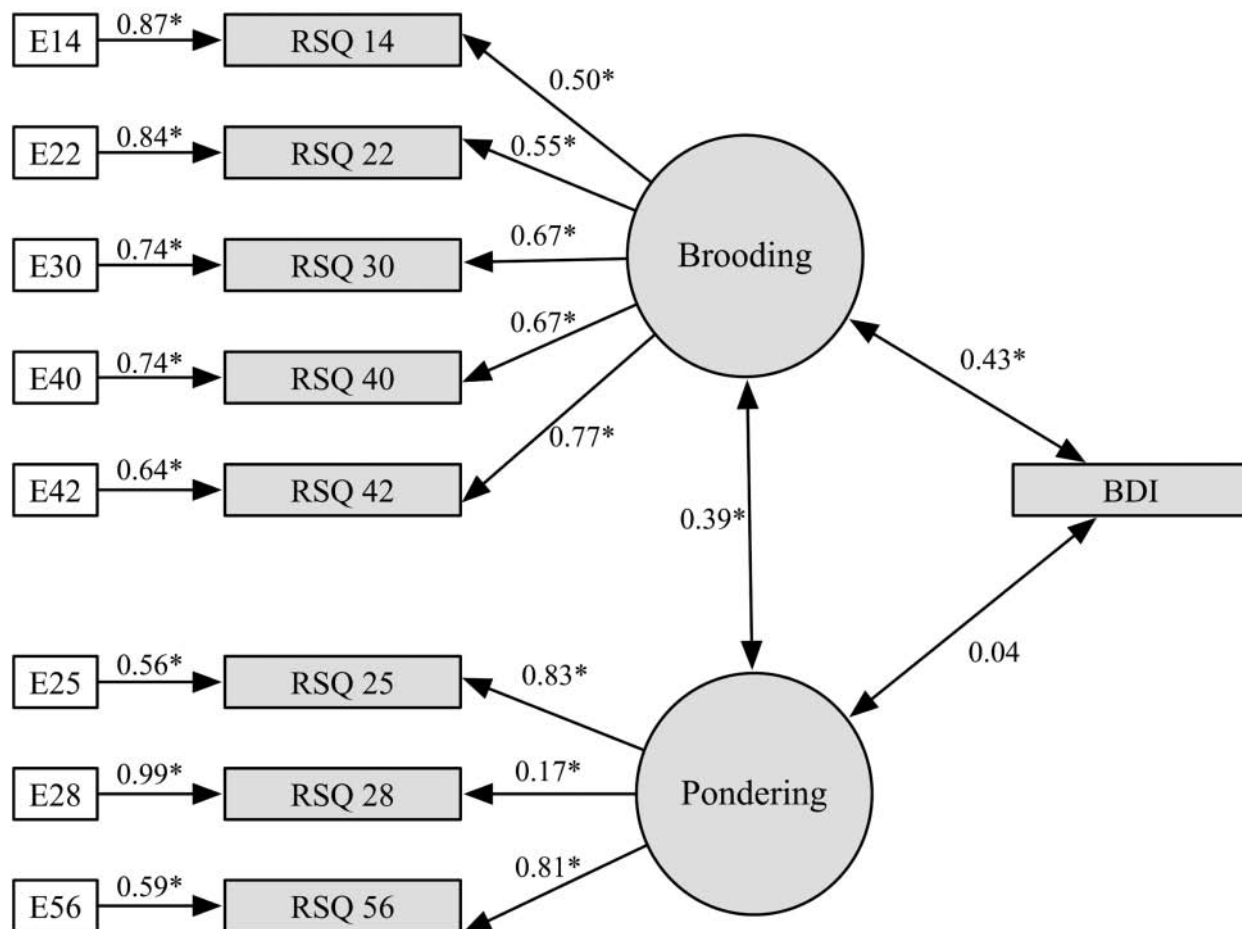
*Path statistically significant at $p < .05$.

cognitive phenomena in terms of the manner in which individuals process the negative events and negative emotions that arise in their life (cf., Barnard & Teasdale, 1991; Teasdale, 1999). Specifically, Teasdale (1999) proposes a complex multilevel relationship between cognitive and emotional processing and distinguishes between explicit higher-order conceptual processing, which involves primarily rule-based learning, and more rapid, associational processing. Of most relevance to major depression is what Teasdale (1999) called mindless emoting, which is associated with purely reactive, sensory-driven emoting without focal awareness of conceptual or schematic meanings. Individuals engaged in this mode of mind demonstrate thinking characterized as

rigid, with interlocked processing patterns such as repetitive, ruminative, and negatively self-focused thinking. The potential net effect of mindless emoting is that individuals experience ineffective emotional processing. Consistent with this approach, a growing body of research is investigating and demonstrating that depressive rumination is associated with emotional avoidance (Fresco, Armey, Turk, Mennin, & Heimberg, 2007; Haigh, Rytwinski, Moore, & Fresco, 2007; Moulds, Kandris, Starr, & Wong, 2007; Watkins & Moulds, 2005). Like worry (cf. Borkovec, Alcaine, & Behar, 2004; Borkovec, Ray, & Stöber, 1998), depressive rumination is regarded as a verbal linguistic strategy that promotes abstract thinking, which, in the short run, provides an escape or avoidance of

physiological or emotional arousal but comes at the cost of poor emotional processing. A fruitful area of future research will be to elucidate the avoidance function of depressive rumination and to see whether targeting rumination for its avoidance function in the context of treatment will produce superior and lasting treatment gains (cf., Watkins et al., 2007).

Moreover, the present study sought to address one specific and focused question: Does the factor solution offered by Treynor et al. (2003) stand up to psychometric and empirical investigation when the more customary set of items are used in a standard paper-and-pencil administration? Our conclusion that there is general soundness and fidelity to the construct of brooding does not negate the potential impact of conceptualizing depressive rumination as consisting of facets that also include symptom-focused rumination (Bagby & Parker, 2001; Cox et al., 2001; Roberts et al., 1998). This issue is also open and ripe for future empirical investigation.

Limitations

Although the findings from the current study are largely encouraging, there are two limitations that deserve mention and that may need to be addressed before wide generalizability of the findings can occur. The first limitation worth noting is that of the fit indices of the SEM model in Study 2 were adequate but not optimal. Model fit was somewhat improved in a sample of individuals possessing cognitive risk for the development of depression. Unfortunately, owing to the small sample size of the cognitive risk group, these results must be considered preliminary. The stability of the brooding and pondering factor solution identified in Study 3 should be further examined in a larger sample of persons who are at risk for depression or currently depressed.

Second, the reliability of the pondering factor, particularly in Samples 2 and 3, was at the lower bound of acceptability. This relatively low level of reliability is likely a function of a limited number of items comprising the factor and the poor performance of item RSQ 28 as compared with the other two items. Thus, although structural models conforming to the one derived in the current EFA demonstrated acceptable to good fit of the data, the models call into question the retention of the pondering factor altogether. As a post hoc test, we elected to solve models consisting of a single latent brooding factor that covaried with observed measures of depression (Samples 2 and 3) and anxiety (Sample 2) symptoms. In both

cases, the models evidenced comparable fit indices to their counterparts that retained the pondering factor.[2] These findings raise questions regarding the utility of pondering as a stable and distinct facet of depressive rumination, potentially indicating that brooding represents a more parsimonious one-factor solution contained within the rumination subscale. At least in its current form, the pondering subscale does not demonstrate psychometric properties to support its continued use. Perhaps with an infusion of new items, pondering will demonstrate a distinct contribution to our understanding of the relationship of depressive rumination to emotional problems. Clearly, there is growing interest as to whether there are beneficial forms of self-reflection (cf. Kross, Ayduk, & Mischel, 2005; Rytwinski, Moore, Armey, Fresco, & Nolen-Hoeksema, 2006).

Future Research

Finally, the present study provides a psychometric refinement of the measurement of depressive rumination, but many important questions remain unanswered—most notably, the issue of consistency over time. As mentioned above, a major criticism of the original RSQ was the lack of stability over time of a measure that theoretically assesses a dispositional characteristic. Given that depression itself is recognized as a phenomenon that varies over time and that the original RSQ may have unwittingly been measuring depression, the variability in rumination scores may be attributable to the natural fluctuation in levels of depression. With scales such as brooding and pondering that are ostensibly free of mood-related content, there may be a greater chance of demonstrating stability over time of scores in the absence of some intervening event such as treatment. Given that both brooding and pondering are considered stable traits, future research will need to find adequate test–retest reliability for one or both of these constructs. The lack of this important finding could either call into question the adequacy of the RSQ for assessing rumination or the nature of the construct as state or trait. However, answers to these questions await future research using a longitudinal design.

Given the preliminary evidence that exists, both in the current investigation and that of Treynor et al. (2003), for two components of rumination, future research should begin to identify cognitive processes that may differentiate these two constructs. For example, research has shown that an abstract, distanced form of rumination, versus a concrete, self-immersed

type, mediates the effects of rumination on negative affect (Kross et al., 2005). It is possible that these processes differentiate brooding and pondering and account for the differential pattern of item interrelationship observed in our study and Treynor et al. (2003). This would also imply that pondering represents a kind of beneficent rumination, whereas brooding represents the more maladaptive form, but future research will also be necessary to determine the relationship of these two constructs to both negative affect (in the case of brooding) and, possibly, more adaptive outcomes (such as improved problem solving in the case of pondering).

One final area needing further research is the examination of the psychometric properties and predictive validity of the brooding and pondering solution in psychiatric or treatment populations. Treynor et al. (2003) obtained a large, demographically diverse community sample. The current study used three ethnically diverse college student samples, and one of the samples included college students who were cognitively vulnerable to depression. Still, in Treynor et al. (2003) and the current study, the samples were relatively free of concurrent depression. Although the participants in Sample 3 were college students, at-risk participants in the CVD project did go on to experience a disproportionate number of depressive episodes relative to a low-risk group in the subsequent 2.5 years (Alloy et al., 1999, 2004). Future research would benefit from further confirmation of the brooding and pondering solution in symptomatic samples as well as more sophisticated designs to examine how brooding may serve an emotional avoidance function or whether it tends to prolong or worsen the course of depression.

Notes

1. Based on the recommendations of Floyd and Widaman (1995), common factor analysis was chosen over principal components analysis. Common factor analysis is preferable when one wishes to understand the relationships among manifest variables to suspected latent variables. Furthermore, estimates derived from common factor analysis tend to hold up better than estimates derived from principal components analysis to confirmatory replication with new data. Given the overlap between first-order rumination factors, the common factor analysis was also conducted with oblique rotation, which allows factors to correlate with one another. The results obtained in this analysis were nearly identical to the ones derived with varimax rotation. Details of this analysis are available from the first author.

2. Fit indices for the brooding-only model in Sample 2 with robust variance estimation, $\chi^2(24) = 65.71$, $p < .0001$, $\chi^2/df = 2.74$, CFI = .98, RMSEA = .05. Fit indices for the brooding-only model in Sample 3 with robust variance estimation, $\chi^2(8) = 14.65$, $p = .07$, $\chi^2/df = 1.83$, CFI = .95, RMSEA = .08.

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