Brooding and Pondering: Isolating the Active Ingredients of Depressive Rumination with Confirmatory Factor Analysis

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Poster Presented at the Annual Meeting of the Association for Advancement of Behavior Therapy, Boston, MA, November 2003

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INTRODUCTION

Depressive Rumination

Depressive rumination, defined as the process of “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,” (Nolen-Hoeksema, 1998; p. 216) has been linked to a number of clinically significant cognitions and behaviors. Specifically, depressive rumination, as assessed by Nolen-Hoeksema’s Response Styles Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991), has been associated with the unequal prevalence rates of depression between men and women (Nolen-Hoeksema, 1987), and the onset (Just & Alloy, 1997), deteriorating course (Kuehner & Weber, 1999), chronicity (Nolen-Hoeksema, 2000), and duration of depressed mood (Just & Alloy, 1997; Nolen-Hoeksema, Morrow, & Fredrickson, 1993). Despite these findings, research into depressive rumination frequently generates mixed results.

Factor Structure of Depressive Rumination

Recent research, however, suggested that the RSQ Ruminative Response Scale (RRS) may be contaminated with depressive item content (Roberts, Gilboa, & Gotlib, 1998; Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Furthermore, research has demonstrated that the RRS is comprised of two (Bagby & Parker, 2001; Fresno, Frankel, Mennin, Turk, & Heimberg, 2002; Treynor et al., 2003) or three (Roberts et al., 1998) first order factors that show different relationships to depression symptoms. One particularly promising factor analysis of the RRS rationally eliminated items conceptually related to depression and submitted the remaining items to exploratory factor analysis (Treynor et al., 2003). A two-factor solution emerged with “brooding” demonstrating a stronger relationship to depression than “pondering.” However, generalizability of this study was limited by two methodological shortcomings: a non-standard, interview-based, administration of the RSQ and a version of the RSQ that omitted three items commonly used in previous research.

The Present Study

Given the previously demonstrated heterogeneity of the rumination construct and the association of at least one of these factors with depression, we sought to replicate and extend Treynor et al.’s (2003) two-factor solution using exploratory factor analysis (EFA) with a standard, self-report, form of the RSQ in a college sample. We then chose to test this factor solution using confirmatory factor analysis (CFA) in both a college sample and a with a sample collected as part of the Temple-Wisconsin Cognitive Vulnerability to Depression Project (Alloy et al., 2000). The obtained factor solution was further explored using criterion measures of worry and depression and anxiety symptoms.

METHOD

Participants

Participants for the EFA (Study 1) consisted of 680 undergraduate students (70% female) who completed the study for course credit. The average age of this sample was 19.5 (SD = 3.96).

Participants for the initial CFA (Study 2) consisted of 724 undergraduate students (67% female) who completed the study for course credit. The average age of this sample was 20.4 (SD = 3.96).

Participants for the second CFA (Study 3) included 67 first-year college students identified as at risk for depression (e.g., high dysfunctional attitudes and depressogenic inferential styles) as part of Alloy and Abramson’s (1999) Temple-Wisconsin Cognitive Vulnerability to Depression Project (66% female). The average age of this sample was approximately 18.45 (SD = 1.40).

In each study, participants were excluded only if they failed to complete all 13 of the RSQ items used in the EFA analysis.

Measures

The Response Styles Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991) is a 71-item self-report instrument designed to assess an individual’s characteristic tendency to engage in ruminative, distracting, problem-solving, or dangerous coping behavior in the presence of a dysphoric or stressful situation. Depressive rumination is typically assessed with the 22-item RRS subscale.

The Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) is a 16-item instrument assessing severity, generality, and uncontrollability of trait worry.

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. These 62 items are sub-divided into four subscales: General Distress Anxious Symptoms (GDA), General Distress Depressive Symptoms (GDD), Anxious Arousal (AA), and Anhedonic Depression (AD).
The Beck Depression Inventory (BDI; Beck, Rush, Shaw, & Emery, 1979) is a 21-item measure assessing the severity of depressive symptoms.

**Procedure**

For the EFA and initial CFA analyses, introductory psychology students were given questionnaires to complete and return, including measures not related to the present study. Participants in both samples completed RSQ, PSWQ, and BDI whereas only participants in the CFA sample completed the MASQ. Approximately 76% of students returned the questionnaires, were awarded partial course credit, and then debriefed.

Participants in the second CFA analysis completed the RSQ and BDI as part of the Temple-Wisconsin Cognitive Vulnerability to Depression Project (Alloy & Abramson, 1999).

**RESULTS**

**Study 1: Initial EFA – Three Factor Solution**

The 10 RSQ items comprising the Treynor et al. (2003) brooding and pondering factors (items 14, 18, 22, 25, 28, 30, 40, 42, 53, & 56) plus the 3 additional RSQ items excluded from their analyses (items 67, 68, & 70) were first examined for depressive item content. On the basis of this initial analysis, RSQ items 18 (“Analyze recent events to try to understand why you are depressed”) and 53 (“Analyze your personality to try to understand why you are depressed”) were excluded.

The remaining 11 items were submitted to common factor analysis with orthogonal varimax rotation using the Comprehensive Exploratory Factor Analysis program (CEFA; Browne, Cudeck, Tateneni & Mels, 2002). This analysis assessed whether the factors of brooding and pondering would remain stable under standard paper and pencil administration of the test with the inclusion of 3 previously omitted, "traditional" RRS items. An initial three-factor solution was extracted including factors for both brooding and pondering as well as a factor for the 3 previously omitted, "traditional" RRS items. Items were considered to load on a factor if the factor loading exceeded .40. Items were considered to load on more than one factor if the difference in factor loadings was less than .10. Table 1 illustrates the rotated factor loadings for all items in this three factor solution. This three factor solution demonstrated marginal to adequate fit statistics ($\chi^2 = 111.65, p = .004; CMIN/df = 4.47; RMSEA = .07; ECVI = .29$).

**Study 1: Initial EFA – Two Factor Solution**

Owing to the marginal fit statistics for the three factor model and the fact that the inclusion of the three “traditional” RSQ items did not alter Treynor et al.’s (2003) factor solution, a two-factor solution was tested using the remaining 8 items that comprised the brooding and pondering factors from Treynor et al.’s (2003) analysis (RSQ 14, 22, 25, 28, 30, 40, 42, & 56). Table 2 illustrates the rotated factor loadings for all items in this two factor solution. This two factor solution was superior to the three factor solution and was retained for the subsequent CFA analyses ($\chi^2 = 53.88, p = .052; CMIN/df = 4.14; RMSEA = .07; ECVI = .15$). Reliability for the brooding factor was found to be good ($\alpha = .80$) whereas reliability for the pondering factor was marginal at best ($\alpha = .68$).

**Study 2: College Sample CFA**

Using the two-factor solution obtained in the initial EFA, 8 RSQ items were submitted to CFA. As illustrated in Figure 1, the CFA model consisted of two factors representing brooding (RSQ 14, 22, 30, 40, & 42) and pondering (RSQ 25, 28, & 56). Based on Hu and Bentler’s (1999) criteria for model fit, this model showed adequate to good fit ($\chi^2 = 53.88, p < .001; CMIN/df = 4.47; TLI = .93; CFI = .95; RMSEA = .07; SRMR = .03; ECVI = .28$). Reliability for the brooding factor was found to be fairly good ($\alpha = .78$) whereas reliability for the pondering factor was unacceptable ($\alpha = .60$).

A series of tests of dependent correlations (Bruning & Kintz, 1987) were conducted to evaluate the relative association of brooding and pondering to worry, depression and anxiety. In all cases, brooding was more strongly correlated than was pondering with all measures (Table 3). In all cases, the size of the effect exceeded the convention for a small effect ($d = .20$; MASQ-GDA, MASQ-AA) and at times exceeded the convention for a medium ($d = .50$; BDI, MASQ-GDD, MASQ-AD) or large ($d = .80$; PSWQ) effect.

**Study 3: At Risk Sample CFA**

In a replication of the previous CFA findings, the same CFA model was tested in a sample of individuals at risk for depression (e.g., high dysfunctional attitudes and depressogenic inferential styles). As illustrated in Figure 2, the CFA model consisted of two factors representing brooding (RSQ 14, 22, 30, 40, & 42) and pondering (RSQ 25, 28, & 56). Based on Hu and Bentler’s (1999) criteria for model fit, this model showed adequate to good fit ($\chi^2 = 15.78, p = .672; CMIN/df = .831; TLI = 1.04; CFI = 1.00; RMSEA = 0.00; SRMR = 0.07; ECVI = .75$). The same model demonstrated adequate, but less favorable fit, in a sample of 70 participants drawn from the Temple-Wisconsin Cognitive Vulnerability to Depression Project who were identified as not being at risk for developing depression ($\chi^2 = 27.37, p = .10; CMIN/df = 1.441; TLI = .89; CFI = .93; RMSEA = 0.08; SRMR = 0.08; ECVI = .89$). Furthermore, in comparison to not at risk individuals, individuals who were at risk for depression demonstrated significantly higher levels of brooding ($F(1,135) = 40.71, p < .001; \chi^2 = .22$). However, the two groups did not differ in terms of pondering ($F(1,135) = .56, p = .46; \chi^2 = .00$).

Reliability for the brooding factor was found to be acceptable ($\alpha = .70$) whereas reliability for the pondering factor was unacceptable ($\alpha = .56$). A test of dependent correlations (Bruning & Kintz, 1987) demonstrated that brooding was more strongly correlated with depression ($r = .36$) than was pondering ($r = .02$). The magnitude of this difference ($d = .71$) approached the convention used for a large effect ($d = .80$).

**DISCUSSION**

Findings of the current study, in conjunction with the findings from Treynor et al. (2003), provide important first steps to countering some of the psychometric limitations in the measurement of depressive rumination. Specifically, 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. 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 of tautology with the measurement of depression. Even after eliminating items contaminated by affective content, brooding demonstrated a strong relationship to worry, depression, and anxiety whereas pondering was relatively unrelated to worry, depression, and anxiety.

However, these results suggest that the brooding construct is robust and may serve as a general risk factor for several types of psychopathology including worry, depression, and anxiety, the factor structure of the pondering construct is more questionable owing to poor internal consistency and its contribution to our understanding of worry, depression, and anxiety is less clear.

The present study provides an initial psychometric refinement of the measurement of depressive rumination, but many important questions remain unanswered—most notably the issue of consistency over time. One 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 depression content, there may be a greater chance of demonstrating stability over time of scores in the absence of some intervening event such as treatment. However, answers to this question await future research utilizing a longitudinal design.

Another area needing further research is the examination of the psychometric properties and predictive validity of brooding and pondering in psychiatric or treatment populations. Treynor et al. (2003) obtained a large, demographically diverse community sample. Future research would benefit from further confirmation of the brooding and pondering solution using symptomatic scales 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.

REFERENCES
Table 1. 3 Factor EFA solution.

<table>
<thead>
<tr>
<th>Item Reference</th>
<th>Description</th>
<th>Brooding</th>
<th>Pondering</th>
<th>3 Items</th>
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<tbody>
<tr>
<td>RSQ 14</td>
<td>Think “What am I doing to deserve this?”</td>
<td>.52*</td>
<td>.26</td>
<td>.10</td>
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<tr>
<td>RSQ 22</td>
<td>Think “Why do I always react this way?”</td>
<td>.60*</td>
<td>.17</td>
<td>.14</td>
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<tr>
<td>RSQ 25</td>
<td>Go away by yourself and think about why you feel this way</td>
<td>.12</td>
<td>.84*</td>
<td>.12</td>
</tr>
<tr>
<td>RSQ 28</td>
<td>Write down what you are thinking about and analyze it</td>
<td>.12</td>
<td>.37*</td>
<td>.18</td>
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<tr>
<td>RSQ 30</td>
<td>Think about a recent situation, wishing it had gone better</td>
<td>.51*</td>
<td>.22</td>
<td>.16</td>
</tr>
<tr>
<td>RSQ 40</td>
<td>Think “Why do I have problems other people don’t have?”</td>
<td>.72*</td>
<td>.11</td>
<td>.16</td>
</tr>
<tr>
<td>RSQ 42</td>
<td>Think “Why can’t I handle things better?”</td>
<td>.75*</td>
<td>.13</td>
<td>.24</td>
</tr>
<tr>
<td>RSQ 56</td>
<td>Go someplace alone to think about your feelings</td>
<td>.23</td>
<td>.61*</td>
<td>.27</td>
</tr>
<tr>
<td>RSQ 67</td>
<td>Listen to sad music</td>
<td>.12</td>
<td>.07</td>
<td>.70*</td>
</tr>
<tr>
<td>RSQ 68</td>
<td>Isolate yourself and think about the reasons you feel sad</td>
<td>.11</td>
<td>.16</td>
<td>.89*</td>
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<tr>
<td>RSQ 70</td>
<td>Try to understand yourself by focusing on your depressed feelings</td>
<td>.27</td>
<td>.10</td>
<td>.69*</td>
</tr>
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</table>

* Indicates that the item demonstrates a loading of at least .40 on the factor with at least a .10 difference in loadings between factors.
### Table 2. 2 Factor EFA solution.

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

*Note.* * Indicates 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 (CFA 1): Bivariate correlations between, brooding and pondering and measures of mood, worry, and depression.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Brooding</th>
<th>Pondering</th>
<th>Cohen’s $d$</th>
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<tbody>
<tr>
<td>Penn State Worry Questionnaire</td>
<td>.51*</td>
<td>.13*</td>
<td>.86</td>
</tr>
<tr>
<td>Beck Depression Inventory</td>
<td>.48*</td>
<td>.20*</td>
<td>.61</td>
</tr>
<tr>
<td><strong>Mood and Anxiety Symptom Questionnaire</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Distress Anxiety</td>
<td>.39*</td>
<td>.20*</td>
<td>.40</td>
</tr>
<tr>
<td>Anxious Arousal</td>
<td>.34*</td>
<td>.15*</td>
<td>.39</td>
</tr>
<tr>
<td>General Distress Depression</td>
<td>.51*</td>
<td>.22*</td>
<td>.65</td>
</tr>
<tr>
<td>Anhedonic Depression</td>
<td>.31*</td>
<td>.04</td>
<td>.55</td>
</tr>
</tbody>
</table>

*Note.* Correlations are significant at $p < .001$. 
Figure 1. Study 2 CFA model.
Figure 2. Study 3 CFA model of at risk for depression college students.