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On the measurement of rumination: A psychometric evaluation of the ruminative response scale and the rumination on sadness scale in undergraduates

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Abstract

Rumination is considered a specific cognitive vulnerability factor that is thought to play a prominent role in the maintenance of depressive symptoms. The present study investigated the psychometric properties of two measures of rumination, the ruminative response scale (RRS) and the rumination on sadness scale (RSS) in undergraduates ($N = 331$). A joint factor analysis yielded three factors, ‘rumination on causes of sadness’, ‘symptom-based rumination’, and ‘rumination on sadness’. The internal consistency of the rumination factors was good and the test–retest stability over a 6-month period of time was moderate. Support was also found for the construct validity of the rumination factors. Finally, the ‘rumination on the causes of sadness’ factor was found to moderate the relation between depression measured at baseline and at 6-month follow-up. More specifically, baseline depression was a strong predictor of future depression but this was particularly true for high ruminating individuals. Implications of the results and directions for future research are provided. © 2006 Elsevier Ltd. All rights reserved.

Keywords: Rumination; Depression; Self-report questionnaires; Psychometric properties

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1. Introduction

Mood regulation strategies refer to thoughts and behaviors intended to maintain, change, or eliminate emotional states (Rusting & Nolen-Hoeksema, 1998). Coping strategies can be applied to regulate mood by acting externally on the world (problem-focused coping) or acting internally to change beliefs or attention (emotion-focused coping). Depression has been associated with excessive use of emotion-focused coping strategies, in particular rumination (Nolen-Hoeksema, 1998). Ruminative responses involve a pattern of behaviors and thoughts that focus one's attention on depressive symptoms and the implications and consequences of these symptoms for the individual in order to gain insight (Nolen-Hoeksema, 1991). The response styles theory was originally developed to account for gender differences in responding to negative mood (e.g., depression), with women being more likely to engage in ruminative responses thereby amplifying their symptoms and extending the depressive episode, and men being likely to distract themselves from depressed mood, thereby dampening their symptoms (Nolen-Hoeksema, 1987, 1990, 1991; Nolen-Hoeksema, Larson, & Grayson, 1999). Meanwhile, it is generally accepted that individual differences in ruminative responses to negative mood may account for differences in duration and severity of these moods (e.g., Teasdale & Dent, 1987).

Rumination can be conceptualized as a dimensional construct allowing for examination in clinical as well as non-clinical samples. Several longitudinal, correlational, and experimental studies conducted in clinical and non-clinical populations have supported the proposition of the response styles theory that a ruminative response style may not only predict the onset of depressive symptoms but may also be predictive of longer duration and more severe depressive symptoms (e.g., Just & Alloy, 1997; Lyubomirsky & Nolen-Hoeksema, 1993; Nolen-Hoeksema, 1991, 1997; Nolen-Hoeksema & Morrow, 1991, 1993; Nolen-Hoeksema, Morrow, & Frederickson, 1993; Nolen-Hoeksema, Parker & Larson, 1994). Empirical support for the mood-improving effects of distraction is less convincing (e.g., Lam, Schuck, Smith, Farmer, & Checkley, 2003; Kuehner & Weber, 1999; Nolen-Hoeksema & Morrow, 1993). The ambiguous effects of distraction on the relieve of depressive mood can be explained by Wegner's theory, which posits that suppressing thoughts via distraction may increase, rather than decrease, the severity of emotional symptoms (Muris, Merckelbach, & De Jong, 1993; Wegner, 1994; see also Wegner, Schneider, Carter, & White, 1987).

The measurement of rumination as conceptualized by Nolen-Hoeksema and co-workers was advanced by the development of the ruminative response scale (RRS), which is a subscale of the response styles questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991). The RRS consists of 22 items that assess responses to dysphoric mood that are focused on the self, on symptoms, and on possible causes and consequences of moods. Over the years, the RRS has undergone some changes but the different forms are highly similar. Several studies have addressed the factor structure and the psychometric properties of the RRS. To begin with, Roberts, Gilboa, and Gotlib (1998) conducted an exploratory factor analysis on RRS scores of 299 undergraduates and retained a three-factor model of which the factors were labeled 'symptom-based rumination', 'introspection and self-isolation', and 'self-blame'. In the same study, a confirmatory factor analysis showed an adequate fit for this three-factor model in a second sample of 317 undergraduates.

The psychometric properties of the RRS have also been investigated in clinical samples. For example, Lam, Smith, Checkley, Rijdsdijk, and Sham (2003) conducted an exploratory factor analysis on RRS scores of 109 depressed outpatients and obtained a four-factor model of which the first three factors closely resembled the factor structure found by Roberts et al. (1998). The fourth factor was labeled ‘analyze to understand’ but this factor did not show a significant association with self-reported severity of depression symptoms. It should be noted that in both studies, only 15 items were retained in the final factor solutions, as the remaining items did not show a substantial loading on any of the factors. Furthermore, an exploration of the reliability and validity of the subscales was not a central issue in these studies. Bagby and Parker (2001) conducted an exploratory factor analysis on RSQ scores of 168 depressed outpatients and retained two rumination factors in addition to one distraction factor. The rumination factors were labeled ‘symptom-focused rumination’ and ‘self-focused rumination’. The internal consistency coefficients of the symptom-focused rumination factor and self-focused rumination scale were adequate ($\alpha = .76$ and $\alpha = .77$, respectively). Surprisingly, both subscales failed to demonstrate an association with symptom variables (i.e., duration of current depressive episode and number of previous depressive episodes) or treatment variables (i.e., treatment outcome and decrease in depressive symptoms). An exploratory factor analysis by Cox, Enns, and Taylor (2001) of RRS scores of 142 depressed outpatients yielded an almost identical factor structure compared to Bagby and Parker (2001).

Some authors have expressed concerns about the content overlap of items of the RRS with items of measures of depression such as the BDI (see Conway, Csank, Holm, & Blake, 2000; Treynor, Gonzalez & Nolen-Hoeksema, 2003). Treynor et al. (2003) dealt with the overlap by constructing a new rumination measure by selecting items of the RRS that did not show overlap with items of the BDI. An exploratory factor analysis indicated that this measure comprised two factors of which the first factor was labeled ‘reflection’ and the second factor ‘brooding’. Treynor et al. (2003) reported adequate internal consistency and test–retest stability (1 year time interval) for the reflection subscale ($\alpha = .72$ and $r = .60$, respectively) and the brooding subscale and ($\alpha = .79$ and $r = .62$, respectively). Further, it was found that both reflection and brooding were associated with high concurrent levels of depression. Over time, however, brooding was related to higher levels of depression, whereas reflection was linked to lower levels of depression. These results suggest that in the long run, reflection may be more adaptive as it may possibly lead to effective problem solving (Treynor et al., 2003).

The content overlap of RRS items with items of the BDI led Conway et al. (2000) to the development of the RSS, a new measure of rumination as an alternative to the RRS. Items were derived with the goal of assessing various aspects of rumination specifically related to sadness and distress. The RSS contains 13 items and an exploratory factor analysis has shown that these items comprise one factor. Conway et al. (2000) reported good internal consistency of the RSS ($\alpha = .91$) and adequate test–retest stability over a 2- to 3-week period ($r = .70$). The convergent and discriminant validity of the scale was supported using a large battery of questionnaires.

Taken together, the RRS is well supported by a theoretical model and a number of empirical studies. The RSS is a relatively new instrument assessing depressive rumination. It remains to be determined how the RSS relates to the RRS. As rumination may be a multi-component process, there is a need for studies that examine convergence and divergence in multiple self-report measures of rumination (see Siegle, 2000). This way, an

increased specificity in the prediction of the maintenance of depressive symptoms over time can be obtained. The present study sought to examine the extent to which the RRS and RSS represent similar or different aspects of rumination. First, a joint (exploratory) factor analysis was conducted in which all RRS and RSS items were included. If the RRS and RSS reflect different aspects of rumination, then RRS items and RSS items should load on their corresponding RRS factor(s) and RSS factor(s) respectively. Second, reliability (i.e., internal consistency and test–retest stability) of the retained factors was assessed as well as their construct validity by comparing them to scores on related (i.e., depression, trait anxiety, neuroticism) and unrelated measures (i.e., fear of spiders, aggression). In line with the prediction of Conway et al. (2000), RSS factor(s) should show weaker associations with depressive symptoms compared to RRS factor(s). Finally, in accordance with the response styles theory, which considers rumination as a good candidate to predict the maintenance of depressive symptoms over time, we explored the extent to which the obtained rumination factors in interaction with baseline depression, predicted depression scores at 6 months follow-up. We hypothesized rumination to moderate the relation between baseline depression and future depression scores, such that baseline depression would be a strong predictor of future depression scores, especially in high ruminating individuals.

2. Method

2.1. Participants

A total number of 192 undergraduates (150 females) of Maastricht University participated in this study. Mean age of the sample was 21.1 years ($SD = 2.6$). During the Spring of 2003, all 192 participants completed the RRS and RSS as well as an additional set of questionnaires (see below). From these 192 undergraduates, 73 individuals (61 females) participated in an experimental pain induction study 6 months later (see Roelofs, Peters, Deutz, Spijker, & Vlaeyen, 2005) and were requested to complete a set of questionnaires, including the RRS and RSS. For the purpose of the factor analysis, another 140 undergraduates (108 females) of Maastricht University completed the RRS and RSS during the Spring of 2005. Mean age of this sample was 22.0 years ($SD = 2.5$). No exact information about participants' ethnicity was available but the vast majority of the individuals were Caucasian (more than 95%). Participants received some candy in turn for their participation.

2.2. Measures

2.2.1. Rumination

The ruminative response scale (RRS; Nolen-Hoeksema & Morrow, 1991; Dutch version: Raes, Hermans, & Eelen, 2003) includes 22 items describing responses to depressed mood that are self-focused, symptom-focused, and focused on the possible causes and consequences of dysphoric mood. Each item is rated on a Likert scale ranging from 1 (almost never) to 4 (almost always). The rumination on sadness scale (RSS; Conway et al., 2000; Dutch version: Raes et al., 2003) is a 13-item self-report measure of rumination of sadness. Respondents indicate the extent to which each item reflects their responses to sadness on a 5-point Likert scale ranging from 1 (not at all) to 5 (very much). The RRS and

RSS are both reliable and valid measures of rumination (see for an overview [Luminet, 2004](#)).

2.2.2. Neuroticism

Neuroticism was measured with a subscale of the shortened and revised Eysenck personality questionnaire (EPQ; [Eysenck & Eysenck, 1991](#)), which consists of 12 dichotomous items ('yes' or 'no'). Reliability and validity of the neuroticism scale of the EPQ is supported (e.g., [Eysenck & Eysenck, 1991](#)).

2.2.3. Depression

The Zung depression scale ([Zung, 1965](#)) is a 20-item inventory of depression. Items are rated on a 4-point Likert scale ranging from 1 (none or a little bit of the time) to 4 (most or all of the time). The Zung is a reliable and valid measure of depression (e.g., [Kozeny, 1987](#)).

2.2.4. Trait anxiety

The trait version of the state-trait anxiety inventory (STAI-T; [Spielberger, Gorsuch, & Lushene, 1970](#)) is a self-report measure of trait anxiety containing 20 items rated on a 4-point Likert scale ranging from 1 (almost never) to 4 (almost always). Reliability and validity have been well documented (e.g., [Spielberger et al., 1970](#)).

2.2.5. Fear of spiders

The fear of spiders questionnaire (FSQ; [Szymanski & O'Donohue, 1995](#)) is an 18-item self-report measure of specific anxiety related to spiders. Items are rated on an 8-point scale ranging between 0 (fully agree) to 7 (fully disagree). Reliability and validity of the FSQ are good ([Muris & Merckelbach, 1996](#); [Szymanski & O'Donohue, 1995](#)).

2.2.6. Aggression

The aggression questionnaire (AQ; [Buss & Perry, 1992](#)) comprises 29 items scored on a 5-point Likert scale ranging from 1 (extremely like me) to 5 (extremely unlike me). Reliability and validity of the AQ have been well documented ([Buss & Perry, 1992](#); [Meesters, Muris, Bosma, Schouten, & Beuving, 1996](#)).

For all questionnaires, higher scores reflect higher levels of the underlying (person) characteristic that the questionnaire presumes to measure.

2.3. Procedure

At baseline ($t = 1$), all participants completed a set of questionnaires in a fixed order, including the RRS, RSS, Zung, STAI-T, EPQ, FSQ, and the AQ. Participants completed the measures in a conference room in groups of five to ten students. A research assistant was always available to provide assistance and to ensure confidential and independent responding. Six months later ($t = 2$), 73 participants completed the RRS, RSS, Zung, STAI-T, and the EPQ. The questionnaires administered at $t = 2$ were completed individually in our laboratory in sound-attenuated rooms. The procedure for the additional participants for the factor analysis was similar to that followed at the $t = 1$ assessment. These subjects completed the RRS and RSS in small group session under the supervision of a research assistant.

2.4. Statistical analyses

2.4.1. Factor structure

A joint factor analysis was conducted in which scores on items of the RRS and the RSS of were subjected to a principal components analysis with an oblique (i.e., direct oblimin) rotation. Oblique rotation seemed most appropriate as this method allows the obtained factors to be intercorrelated. Parallel analysis was used to determine the number of factors to retain. Factor loadings $> .40$ were interpreted.

2.4.2. Reliability

Reliability of the rumination factors was examined by assessing internal consistency by means of Cronbach α and test–retest stability by computing intraclass correlation coefficients (ICC) over the 6-month time interval.

2.4.3. Construct validity

The construct validity of the obtained rumination factors was examined by computing Pearson correlation coefficients with related and unrelated measures ($t = 1$). The degree to which the strength of association between each of the expected rumination factors and self-reported depression (Zung), trait anxiety (STAI-T), and neuroticism (EPQ) differed was tested by means of Z-tests (see Cohen & Cohen, 1983), that allow for a comparison of two correlated correlation coefficients with a variable in common based on the same sample. No substantial correlation coefficients were expected between the rumination factors and either FSQ or aggression AQ. To control for increased type I error due to multiple testing, α was set at .01.

2.4.4. Prediction of depressive symptoms

The influence of rumination as reflected by the retained factors at baseline ($t = 1$) on the maintenance of symptoms of depression at 6 months follow-up ($t = 2$) was assessed by means of linear regression analyses. A stepwise regression analysis was conducted in which rumination scores were entered on the first step, controlling for baseline depression and gender. On the second step, the interaction between baseline depression and rumination was entered. α was set at .05 for this analysis.

3. Results

3.1. Joint factor analysis on items of the RRS and RSS

Before addressing the main results, it should be noted that there were no differences on mean rumination scores between the 192 participants who completed the RRS and RSS at $t = 1$, and the 140 additional undergraduates who filled out these measures some 2 years later. Consequently, the data from these samples were combined. One individual had too many missings ($> 10\%$) and was dropped from the analyses, leaving a total number of 331 individuals for the factor analysis, descriptive statistics, and the assessment of the internal consistency reliability. Parallel analysis is a state-of-the-art and highly recommended procedure for determining the number of factors to retain in an exploratory factor analysis (see Zwick & Velicer, 1986). In short, parallel analysis involves the extraction of eigenvalues from random data sets that parallel the actual data set with regard to the

number of cases and variables. We used the SPSS-based parallel analysis program of O'Connor (2000). The first five randomly generated eigenvalues that correspond to the 95th percentile of the distribution of random data eigenvalues obtained with 100 replications were 1.76, 1.65, 1.57, 1.52, and 1.47. Parallel analysis assumes a normal distribution of the items. Most items were normally distributed as indexed by the skewness and kurtosis (range between -1 and $+1$), except for items 7 and 11 of the RRS and item 8 of the RSS, which were positively skewed. Therefore, polychoric correlations (i.e., correlations that do not assume a normal distribution) were computed by LISREL 8.30 (PRELIS) and were used as input for the exploratory factor analysis. The first five eigenvalues that were generated by the exploratory factor analyses were 15.11, 2.33, 1.92, 1.46, and 1.28. It is clear that the first three eigenvalues from the actual data are larger than the corresponding first three 95th percentile random data eigenvalue. This indicates that three factors should be retained.

The three rotated factors accounted for 43.1%, 6.7%, and 5.5% of the variance respectively and the communalities ranged between .33 and .71. The first factor consisted of both RRS and RSS items and was labeled 'rumination on causes of sadness'. It should be noted that the context in which rumination on causes of sadness occurs is either alone (e.g., self-isolation) or unspecified. The second factor was referred to as 'symptom-based rumination', which consisted mainly of RRS items. The third factor was labeled 'rumination on sadness' and comprised mainly of RSS items. Table 1 presents the factor loadings (i.e., pattern coefficients) of all items. Each item loaded uniquely on their corresponding factor, except for items 12 and 20 of the RRS, which had loadings just below the predefined criterion of .40. There were a few items with secondary loadings (i.e., items 1, 3, and 11 of the RSS and item 13 of the RRS). The three factors were substantially intercorrelated (Pearson r 's ranged between $= .68$ and $.80$). The correlations corrected for attenuation ranged between .86 and .88 indicating that the factors are distinct.

Table 2 presents descriptive statistics of the rumination scales and the other measures used in the present study. Total scores on the rumination scales were calculated by summing scores of individual items that loaded on the corresponding factor. Three remarks with respect to the descriptive data should be made. First, no differences were observed between rumination scores on baseline and at 6 months follow up. Second, baseline scores of the rumination scales from individuals who participated at $t = 2$ did not differ from scores of the total sample at $t = 1$. Finally, no significant gender differences were observed for the rumination scales and the other questionnaire's scores except for the FSQ, with females displaying higher fear of spider levels than males [$F(1,191) = 10.5$, $p = .001$, $\eta^2 = .05$].

In two additional analyses, scores on the RRS and RSS were factor analyzed separately. The procedure for these analyses was similar to that of the joint factor analysis (factor loadings not shown). For the RRS, the first three eigenvalues generated by means of parallel analysis were 1.58, 1.47, and 1.40. The first three eigenvalues that were generated by the exploratory factor analysis were 8.01, 1.73, and 1.21, suggesting two RRS factors. The two RRS factors closely resembled the 'rumination on causes of sadness' (i.e., items 6, 9, 10, 11, 17, 18, 20, 21, and 22) and the 'symptom-based rumination' (i.e., items 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 15, 16, and 19) scales obtained in the joint factor analysis and accounted for 44% of the variance. For the RSS, the first two eigenvalues generated by means of parallel analysis were 1.42 and 1.31. The first two eigenvalues generated by the exploratory factor analysis were 6.28 and 1.17, suggesting a one-factor solution. All items loaded on

Table 1

Factor structure obtained from a joint factor analysis of the RRS and the RSS items ($N = 331$)

Item	Item description	Factor 1	Factor 2	Factor 3
RRS 18.	Go someplace alone to think about my feelings	.76	.03	.03
RRS 10.	Go away by yourself and think about why you feel this way	.74	.21	.18
RRS 6.	Analyze recent events to try to understand why I am depressed	.72	.22	.09
RRS 21.	Isolate yourself and think about the reasons why I feel sad	.72	.26	.06
RSS 2.	Repeatedly analyze and keep thinking about reasons for sadness	.70	.04	.16
RRS 17.	Analyze my personality to try to understand why I am depressed	.68	.13	.16
RRS 22.	Try to understand yourself by focusing on depressed feelings	.68	.19	.10
RRS 11.	Write down what I am thinking about and analyze it	.67	.10	.05
RSS 10.	Repeatedly thinking about what sadness is by concentrating on feelings and try to understand them	.56	.10	.37
RSS 11.	Thinking long enough about sadness will have a deeper meaning that I will understand myself better	.51	.15	.48
RSS 3.	Search my mind many times to try and figure out if there is anything about my personality that have led to feel this way	.48	.01	.44
RRS 9.	Think Why do I always react this way?	.46	.23	.09
RRS 12.	Think about a recent situation wishing it had gone better	.31	.24	.16
RRS 20.	Listen to sad music	.27	.10	.20
RRS 14.	Think about how sad I feel	.13	.73	.02
RRS 16.	Think about how I don't feel up to doing anything	.14	.72	.18
RRS 2.	Think I won't be able to do my job/work because I feel so badly	.01	.70	.08
RRS 5.	Think about how passive and unmotivated I feel	.15	.68	.11
RRS 8.	Think Why can't I get going?	.10	.68	.02
RRS 3.	Think about my feelings of fatigue and achiness	.06	.67	.03
RRS 4.	Think about how hard it is to concentrate	.09	.64	.08
RRS 1.	Think about how alone I feel	.16	.60	.09
RRS 15.	Think about shortcomings, failings, faults, mistakes	.05	.56	.25
RRS 19.	Think about how angry you are with yourself	.20	.43	.31
RSS 1.	Difficulty getting myself to stop thinking about how sad I am	.04	.42	.40

Table 1 (continued)

Item	Item description	Factor 1	Factor 2	Factor 3
RSS 8.	If people talk or ask a question it feels as though they interrupt a silent conversation I have with myself about my sadness	.01	.05	.75
RSS 7.	I lie in bed and keep thinking about my lack of motivation and wonder whether it will ever return	.25	.33	.72
RSS 6.	Keep wondering about how I was happy at other points in life	.05	.03	.68
RSS 9.	Wondering about meaning of life and find clues that may understand sadness	.27	.02	.66
RSS 5.	Search my mind repeatedly for events or experiences in childhood that may help understand sad feelings	.30	.18	.63
RSS 4.	Get absorbed in thinking about why I am sad and find it difficult to think about other things	.18	.17	.58
RSS 13.	Exhausting myself by thinking about myself and the reasons for my sadness	.24	.14	.55
RRS 13.	Think Why do I have problems that other people don't have?	.12	.40	.50
RSS 12.	Thinking about problems to try and examine where things went wrong	.37	.16	.40
RRS 7.	Think about how I don't seem to feel anything any more	.04	.36	.39

Note: RRS = ruminative response scale; RSS = rumination on sadness scale. Factor loadings on the corresponding factors are displayed in bold.

this factor, which accounted for 48% of the variance. The factor was comparable to the 'rumination on sadness' scale obtained in the joint factor analysis.

3.2. Reliability of the rumination scales

Internal consistency reliabilities (Cronbach α) of the 'rumination on causes of sadness', the 'symptom-based rumination', and the 'rumination on sadness' scales were very good (see Table 3). Test–retest stability was assessed over the 6-month time-interval. Modest test–retest correlations were found for the 'rumination on causes of sadness' (ICC = .43), the 'symptom-based rumination' (ICC = .53) factor, and the 'rumination on sadness' factor (ICC = .53).

3.3. Construct validity

Table 3 presents a correlation matrix, depicting the associations between the rumination scales and the other self-report measures ($t = 1$). As can be seen in Table 3, moderate Pearson correlation coefficients were found between the rumination factors and depression

Table 2
Descriptive statistics of the questionnaire scores

	Baseline ($t = 1$) $N = 331$		Six months ($t = 2$) $N = 73$	
	M	SD	M	SD
Rumination (causes)	24.5	7.7	22.6	7.5
Rumination (symptoms)	22.5	6.2	20.9	5.7
Rumination (sadness)	27.3	8.8	24.6	8.0
Depression (Zung)	34.5	6.8	34.2	6.3
Trait anxiety (STAI-T)	36.0	9.3	34.9	8.2
Neuroticism (EPQ)	4.2	2.9	3.9	2.8
Fear of spiders (FSQ)	18.0	25.0	—	—
Aggression (AQ)	63.3	12.4	—	—

Note: Rumination (causes) = 'rumination on causes of sadness', Rumination (symptoms) = 'symptom-based rumination', Rumination (sadness) = 'rumination on sadness'. STAI-T = trait version of the state-trait anxiety inventory, EPQ = Eysenck personality questionnaire, FSQ = fear of spiders questionnaire, AQ = aggression questionnaire.

Table 3
Correlation matrix of self-report measures

	Rumination (causes)	Rumination (symptoms)	Rumination (sadness)	α
Rumination (causes)	—			.90
Rumination (symptoms)	.68*	—		.87
Rumination (sadness)	.80*	.76*	—	.90
Depression (Zung)	.27*	.49*	.47*	.82
Trait anxiety (STAI-T)	.35*	.49*	.53*	.92
Neuroticism (EPQ)	.34*	.53*	.45*	.79
Fear of spiders (FSQ)	.07	.11	.14	.96
Aggression (AQ)	.10	.26*	.26*	.82

Note: Correlations are computed on baseline data ($N = 192$) while α 's are computed on the total sample ($N = 331$). Rumination (causes) = 'rumination on causes of sadness', Rumination (symptoms) = 'symptom-based rumination', Rumination (sadness) = 'rumination on sadness'. STAI-T = trait version of the state-trait anxiety inventory, EPQ = Eysenck Personality questionnaire, FSQ = fear of spiders questionnaire, AQ = aggression questionnaire.

* $p < .01$.

(Zung), trait anxiety (STAI-T), and neuroticism (EPQ). Compared to 'rumination on causes of sadness, the 'symptom-based rumination' and 'rumination on sadness' factors were more strongly associated with depression ($Z = 5.47$, $p < .001$ and $Z = 6.22$, $p < .001$, respectively), anxiety ($Z = 3.56$, $p < .001$ and $Z = 5.82$, $p < .001$, respectively), and neuroticism ($Z = 3.80$, $p < .001$ and $Z = 3.46$, $p = .001$, respectively). The differences in degree of association between the rumination factors and depression, trait anxiety, and neuroticism did not reach statistical significance. Further, the rumination scales were more strongly associated with depression than with either FSQ or aggression AQ (Z 's > 2.92 , p 's $< .002$) providing support for the construct validity (i.e., discriminant validity) of the

Table 4

Results of regression analyses predicting symptoms of depression ($t = 2$) as a function of baseline rumination and depression ($t = 1$), while controlling for gender ($N = 73$)

Model summary	Predictors	β	SE	p
<i>Rumination on causes of sadness</i>				
Step 1: $R^2 = .43$, $F(3,69) = 19.2$, $p < .001$	Rumination (causes)	.06	.09	.55
	Baseline depression	.63	.09	<.001
	Gender	-.16	.09	.09
Step 2: $R^2 = .47$, $F(4,68) = 16.9$, $p < .001$	Baseline depression*Rumination (causes)	1.54	.64	.02
<i>Symptom-based rumination</i>				
Step 1: $R^2 = .43$, $F(3,69) = 19.0$, $p < .001$	Rumination (symptoms)	.02	.11	.88
	Baseline depression	.63	.11	<.001
	Gender	-.16	.09	.07
Step 2: $R^2 = .42$, $F(4,68) = 14.9$, $p < .001$	Baseline depression*Rumination (symptoms)	.37	.72	.60
<i>Rumination on sadness</i>				
Step 1: $R^2 = .46$, $F(3,69) = 21.1$, $p < .001$	Rumination (sadness)	.20	.11	.07
	Baseline depression	.53	.10	<.001
	Gender	-.15	.09	.10
Step 2: $R^2 = .45$, $F(4,68) = 15.6$, $p < .001$	Baseline depression*Rumination (sadness)	.02	.62	.97

rumination factors. Interestingly, a significant correlation was also found between the ‘symptom-based rumination’ and ‘rumination on sadness’ scales and aggression.

3.4. Prediction of depressive symptoms

Before conducting the linear regression analyses, normality of the dependent variables was checked as well as possible outliers (Cook’s distances) and the degree of collinearity between the independent variables. There were no serious deviations from normality, no outliers, and there was no substantial collinearity between the independent variables. As may be expected, baseline depression was the best predictor of future depressive symptoms. The interaction between ‘rumination on causes of sadness’ and baseline depression was also predictive of future depressive symptoms (see Table 4). In clarifying this interaction, we examined simple slopes at three levels of the moderator (i.e., rumination on causes of sadness): the mean, one standard deviation below, and one standard deviation above the mean (see O’Connor, 1998). The relation between baseline depressive symptoms and future depressive symptoms was non-significant for one standard deviation below the mean, ($\beta = .28$, $SE = .16$, $p = .09$) but was significant for the mean ($\beta = .52$, $SE = .10$, $p < .001$) and for one standard deviation above the mean ($\beta = .77$, $SE = .10$, $p < .001$).

4. Discussion

The present study investigated the psychometric properties of two measures of rumination, the ruminative response scale (RRS; Nolen-Hoeksema & Morrow, 1991) and the rumination on sadness scale (RSS; Conway et al., 2000), in a sample of undergraduates. A joint (exploratory) factor analysis on RRS and RSS scores yielded a

three-factor model. Factors were labeled 'rumination on causes of sadness', 'symptom-based rumination', and 'rumination on sadness'. It should be noted that it is unclear to what extent the 'symptom-based rumination' scale was formed due to a 'wording effect'. That is, most items from this scale share the word 'think'. Although these items appear to have a specific component of ruminative thinking in common, it cannot be ruled out that the wording of these items might have contributed to the emergence of this factor. The content of the factors obtained in the joint factor analysis showed strong resemblance to the rumination factors obtained in previous factor analytic studies (e.g., Bagby & Parker, 2001; Cox et al., 2001; Treynor et al., 2003). Additional separate factor analyses on the RRS items and the RSS items yielded a two-factor model for the RRS, with factors largely comparable to the 'rumination on causes of sadness' and 'symptom-based rumination', and a one-factor model for the RSS, which resembled the original RSS. Surprisingly, the current study did not find evidence for gender differences on the rumination scales, which is in contrast to other studies (e.g., Mezulis, Abramson, & Hyde, 2002). One possible explanation for the failure to find gender differences on the rumination scales might be due to the absence of gender differences on the depression measure. It has been suggested that the gender difference in rumination mediates the gender difference in depression such that the gender difference in depression becomes non-significant when controlling for gender differences in rumination (e.g., Butler & Nolen-Hoeksema, 1994; Nolen-Hoeksema et al., 1999).

Further examination of the psychometric properties of the obtained rumination factors indicated that the internal consistency (Cronbach α 's) was very good. Test–retest stability over a 6-month period of time was moderate. These reliability data are largely in keeping with previous research, except for the test–retest stability, which was somewhat lower as compared to test–retest stability coefficients as found in clinical populations (see Luminet, 2004). It is possible that in non-clinical individuals, the completion of measures of rumination is influenced to a greater extent by fluctuations in current mood state than is the case with individuals who are clinically depressed.

The construct validity of the rumination scales was supported by significant although moderate associations with depression, trait anxiety, and neuroticism. Thus, rumination was not specifically related to depression but to negative affect in general. These findings are in line with previous research linking rumination to depression as well as anxiety (e.g., Nolen-Hoeksema, 2000). This raises the question as to whether rumination might be linked to general negative affectivity or neuroticism, which is thought to be a common component of anxiety and depression (see Clark & Watson, 1991). Roberts et al. (1998) found evidence to suggest that rumination mediates the effects of neuroticism on vulnerability to depression, and this seems to indicate that rumination might reflect an important cognitive manifestation of neuroticism (see also Muris, Roelofs, Rassin, Franken & Mayer, 2005). The correlations between the rumination scales and measures of spider fear and aggression were significantly smaller than those between the rumination scales and self-reported depression. This can be taken as evidence for the construct validity, in particular the discriminant validity, of the rumination scales. Further, 'symptom-based rumination' and 'rumination on sadness' were more strongly associated with depressive symptoms than 'rumination on causes of depression'. However, the 'symptom-based rumination' and 'rumination on sadness' scales were not differently related to depressive symptoms, suggesting that the attempt of Conway et al. (2000) to create a rumination measure with less item overlap than the RRS with measures of depression was only partly successful. It

remains yet undetermined how much of the relation between symptom-based rumination and depressive symptoms is really due to item content overlap and how much is due to the process of rumination.

With respect to the prediction of future depression scores, scores on the ‘rumination on causes of sadness’ scale interacted with baseline depression scores in predicting future depression scores. More specifically, baseline levels of depressive symptoms were predictive of future depressive symptoms and this was particularly true for individuals with higher levels of ‘rumination on causes of sadness’. Other studies have also shown that people who are prone to ruminate when distressed, will experience more severe and prolonged episodes of depression than non-ruminators (e.g., Just & Alloy, 1997; Lyubomirsky & Nolen-Hoeksema, 1993; Nolen-Hoeksema, 1991; Nolen-Hoeksema & Morrow, 1991), but these studies used the total score on the RRS as an index for rumination. The results of the present study suggest that at least in non-clinical individuals, there is a need to differentiate between components of rumination in rumination research.

Three limitations of the present study need to be addressed. First, given the importance of gender differences in rumination style (Nolen-Hoeksema, 1987, 1990), a limitation of the current study is that the sample size was too small to assess factorial invariance as a function of gender. Second, it should be noted that the sample was predominantly female limiting the generalizability of the results to males. Third, only a small subsample of the initial $t = 1$ sample participated in the follow-up assessment and so one could argue that selection bias might have influenced the results. However, as there were no significant differences in mean rumination scores on the $t = 1$ assessment between participants and non-participants, it does not seem to be the case that individuals high on rumination did not participate in the follow-up assessment. Despite these limitations, it seems increasingly clear from past research that how people respond to their mood state has an important influence on the intensity and duration of those states. Such responses can be important targets of effective psychological interventions (see for an overview Papageorgiou & Wells, 2004). For example, strategies such as rumination-cued activation, which involves teaching depressed people to notice when they are ruminating and to use this as a cue to activate themselves (Addis & Martell, 2004; Martell, Addis, & Jacobson, 2001), and mindfulness-based cognitive therapy (Segal, Williams, & Teasdale, 2002), which has been developed as a new approach to prevent depressive relapse, may exert their effects through reducing ruminative responses. It is also important to clarify what rumination scales actually intend to measure. In this context, Siegle (2000) has argued for the urge to define the various types of rumination as it is clear that these different scales of rumination may tap different phenomena. The current study used exploratory factor analysis to examine the factor structure of two rumination questionnaires. Clearly, there is a need for confirmatory factor analysis to test the factor structure obtained in the present study as well as the other factor models outlined in the introduction. Furthermore, the utility of the obtained rumination factors warrant further investigation in clinical samples to increase our knowledge about specific aspects of rumination that may constitute a cognitive vulnerability factor to depression.

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