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Rumination and worrying as possible mediators in the relation between neuroticism and symptoms of depression and anxiety in clinically depressed individuals

Jeffrey Roelofs^{a,b,*}, Marcus Huibers^{a,b}, Frenk Peeters^{b,c}, Arnoud Arntz^{a,b}, Jim van Os^d

^a Department of Clinical Psychological Science, Maastricht University, The Netherlands

^b Community Mental Health Center, Maastricht, The Netherlands

^c Department of Psychiatry, University Hospital Maastricht, The Netherlands

^d Department of Psychiatry and Neuropsychology, Maastricht University, The Netherlands

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ABSTRACT

Rumination and worrying are considered possible mediating variables that may explain the relation between neuroticism and symptoms of depression and anxiety. The current study sought to examine the mediational effects of rumination and worry in the relationships between neuroticism and symptoms of depression and anxiety in a sample of clinically depressed individuals ($N = 198$). All patients completed a battery of questionnaires including measures of neuroticism, rumination, worrying, depression, and anxiety. Results showed that in subsequent analyses, rumination and worrying both mediated the relation between neuroticism and depression and anxiety. When rumination and worrying were simultaneously entered in the mediation analysis, only rumination was found to mediate the relation between neuroticism and symptoms of anxiety and depression. Two components of rumination (i.e., brooding and reflection) were also analyzed in the mediational analysis. Both reflection and brooding were significant mediators with respect to depressive symptoms, whereas brooding was the only significant mediator in relation to anxiety symptoms. The results are discussed in the light of current theories, previous research, and recent treatment developments. Clinical implications and suggestions for future research are provided.

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Introduction

Neuroticism has been considered one of the personality traits most relevant to predisposing individuals to psychopathology, in particular depression and anxiety (e.g., Akiskal, Hirschfeld, & Yervanian, 1983; Widiger & Trull, 1992). There is good support for the associations between neuroticism and symptoms of depression and anxiety in clinical and non-clinical samples (e.g., Boyce, Parker, Barnett, Cooney, & Smith, 1991; Duggan, Lee, & Murray, 1990; Kendler, Kessler, Neale, Heath, & Eaves, 1993; Muris, Roelofs, Rassin, Franken, & Mayer, 2005; Ormel, Oldehinkel, & Brilman, 2001; Roberts & Gotlib, 1997; Saklofske, Kelly, & Janzen, 1995; Surtees & Wainwright, 1996). A number of processes have been proposed that may account for the relation between neuroticism and symptoms of depression and anxiety. More specifically, neuroticism can lead to negative biases in attention (e.g., Derryberry & Reed, 1994) and

memory (e.g., Martin, 1985), as well as to a cognitive and behavioural style of a ruminative focus on depressive symptoms (e.g., Roberts, Gilboa, & Gotlib, 1998).

There are a number of conceptualizations of rumination in the literature. For example, Martin and Tesser (1989) have defined rumination in terms of conscious thoughts around a theme that might help individuals to attain personal goals. In the context of depression, Nolen-Hoeksema (1991) has defined depressive rumination as responses that involve a pattern of behaviors and thoughts about symptoms of depression and the possible causes and consequences of these symptoms. There is evidence to suggest that depressive rumination (note that we will refer to 'rumination' from here) is related to neuroticism (e.g., Cox, Enns, Walker, Kjer-nisted, & Pidlubny, 2001; Lam, Smith, Checkley, Rijdsdijk, & Sham, 2003; Roberts et al., 1998), with some authors postulating that a ruminative response style might be considered one of the cognitive manifestations of neuroticism (e.g., Segerstrom, Tsao, Alden, & Craske, 2000). There is also good support for an association between rumination and symptoms of depression (see for reviews Lyubomirsky & Tkach, 2004 and Nolen-Hoeksema, 1998). Interestingly, recent research has shown that a ruminative

* Corresponding author. Department of Clinical Psychological Science, Maastricht University. P.O. Box 616, 6200 MD Maastricht, The Netherlands. Tel.: +31 43 3881607; fax: +31 43 3884155.

E-mail address: J.Roelofs@dep.unimaas.nl (J. Roelofs).

response style might not only be characteristic for depression but is also related to anxiety (e.g., Fresco, Frankel, Mennin, Turk, & Heimberg, 2002; Muris, Roelofs, Meesters, & Boomsma, 2004; Segerstrom et al., 2000). Thus, rumination seems to be a cognitive vulnerability factor for both depression and anxiety.

There has also been some research aimed at examining the specificity of various forms of negative thinking in psychopathology. More specifically, worry is another form of unproductive, negative, and repetitive thinking that bears strong resemblance to the construct of rumination. Worrying can be defined as an apprehensive expectation of possible negative outcomes in the future, and has traditionally been linked to anxiety (Borkovec, Robinson, Pruzinsky, & DePree, 1983). There is some debate as to whether rumination and worry are to be considered similar or different forms of repetitive thinking. Factor analytic studies have revealed that both constructs are distinctive (e.g., Fresco et al., 2002; Muris et al., 2004). However, it may also be the case that these findings reflect the wording of the materials used such that items with “worry” in their description tend to group together, whereas items with “depression” or “rumination” in their description tend to group together as well. Several other researchers have failed to find as much difference between rumination and worry (e.g., Segerstrom et al., 2000; Watkins, Moulds, & Mackintosh, 2005), where the only difference found was temporal orientation, with rumination focused on the past and worry focused on the future. Despite this debate, there is evidence to suggest that worrying is related to depression (e.g., Fresco et al., 2002; Muris, Fokke, & Kwik, in press; Muris et al., 2004; Muris et al., 2005; Starcevic, 1995) and to neuroticism (e.g., Davey & Tallis, 1994; Keogh, French, & Reidy, 1998; Muris et al., in press; Muris et al., 2005).

Taken together, the available research suggests a mediational model in which neuroticism is associated with rumination, which in turn is related to symptoms of depression and anxiety. To date, there is indeed some evidence for this mediational model in undergraduates (Muris et al., 2005; Roelofs, Huibers, Peeters, & Arntz, 2008) and in adolescents at risk for depression (Kuyken, Watkins, Holden, & Cook, 2006; Muris et al., in press). Muris et al. (2005) also found evidence for worry as a mediator in the relation between neuroticism and symptoms of anxiety and depression. However, to the authors' best knowledge, the mediation model has hitherto not been tested in clinically depressed individuals. The present study was aimed to fill this gap by investigating the mediational effects of rumination and worry in the relation between neuroticism and symptoms of depression and anxiety in clinically depressed individuals. We applied a stepwise approach to the mediational analyses, first investigating the effects of rumination and worry in separate analyses, followed by a model in which rumination and worry were entered simultaneously as mediators. We hypothesized that (1) neuroticism would correlate positively with symptoms of depression and anxiety, (2) neuroticism would be positively associated with rumination and worry; (3) rumination and worry would be associated with symptoms of depression and anxiety, and (4) the associations between neuroticism and symptoms of depression and anxiety would be reduced or eliminated when controlling for the mediating variables of rumination and worry.

With respect to predictions of the mediation model, it is important to view rumination and worry as forms of repetitive thinking, which can have constructive and unconstructive consequences (Watkins, 2008). Rumination is characterized by negatively valenced thought content (thoughts about depressive mood), a negative intrapersonal context (i.e., depressed mood, negative self-beliefs), and an abstract level of construal (i.e., thinking about meanings and implications). Worry might have both unconstructive and constructive consequences. More specifically, worry

characterized by an abstract level of construal and negative interpersonal context is unconstructive, whereas a concrete level of construal is considered constructive (see Watkins, 2008). In the current study, rumination and worry are operationalized at an abstract level of construal and are, therefore, considered to be positively associated with symptoms of anxiety and depression in the mediation analyses.

As rumination is considered a multi-component process (e.g., Siegle, 2000), we also examined the effects of two components of rumination (i.e., reflection and brooding) that have been proposed (Treyner, Gonzales, & Nolen-Hoeksema, 2003). Although there is some support from previous research that reflection might have beneficial effects on depressed mood (e.g., Joormann, Dkane, & Gotlib, 2006; Roelofs et al., 2008; Treyner et al., 2003), other studies have failed to find beneficial effects of reflection. For example, Burwell and Shirk (2007) found evidence to suggest that brooding but not reflective pondering predicted the development of depressive symptoms over time in adolescents and Rude, Maestas, and Neff (2007) have shown that changing the negative judgmental quality of items indicative of reflection resulted in a reduced relationship of reflection and depression, suggesting that reflection may have negative consequences. In accounting for the effects of reflection, Trapnell and Campbell (1999) have identified a neurotically motivated, threat-avoidant form of chronic self-focus that they labeled rumination, and an contrasting form of chronic self-focus motivated by epistemic curiosity which they referred to as reflection. The former would contribute to symptoms of psychopathology, whereas the latter form of self-focus would be associated with increased self-knowledge. The Interacting Cognitive Subsystems Theory (Teasdale & Barnard, 1993; Teasdale, Segal, & Williams, 1995) makes a difference between an analytic ruminative self-focus and an experiential form of self-focus, with the former considered to be detrimental and depressogenic and the latter to be more beneficial. Taken together, we consider both brooding and reflection as analytical forms of ruminative self-focus that involve an abstract level of construal resulting in unconstructive consequences. Therefore, we hypothesize both brooding and reflection to be positively associated with symptoms of depression and anxiety in the mediational analyses.

Method

Participants and procedure

Participants comprised a consecutive sample of 198 clinically depressed patients (56% females) who were seeking treatment at the mood disorders treatment program of the Maastricht community mental health center (RIAGG Maastricht). The center is a secondary care setting where individuals with a variety of psychiatric disorders are treated after referral by the general practitioner or other health professionals. The inclusion criterion was a primary diagnosis of major depressive disorder (MDD) as determined with the Structured Clinical Interview for DSM-IV axis I (SCID-I; First, Spitzer, Gibbon, & Williams, 1997). The SCID-I is carried out as part of the regular intake procedure within the mood disorders program by trained master's or doctoral-level psychologist, psychotherapists, psychiatrists, and senior residents in psychiatry (supervised by psychiatrists with a minimum of 5 years clinical experience). Exclusion criteria at entry were other primary diagnoses other than MDD (e.g., psychotic disorder, substance abuse), high acute suicide risk, and insufficient fluency in the Dutch language. Measurements (see *measures*) were completed as part of a naturalistic treatment study. After a complete description of the study to the participants, written informed consent was obtained. Mean age of the sample was 42.4 years (SD = 10.5; range 19–63). All patients were Caucasian. Mean total score on the 90-item version of

the Symptom Checklist (SCL-90-R; Derogatis, 1994) was 217.0 (SD = 55.4, range 98–380), indicating that the general level of distress was above average when compared to a psychiatric outpatient population (Arrindell & Ettema, 2003). The current depression lasted on average for 10 months (SD = 25) and the mean number of previous depressed episodes was 1.7 (SD = 2.8). The study protocol was approved by the local IRB.

Measures

Neuroticism

The neuroticism scale of the shortened and revised Eysenck Personality Questionnaire (EPQ-N; Eysenck & Eysenck, 1991) consists of 12 dichotomous items ('yes' or 'no') reflecting neuroticism (e.g., "Do you think you are a nervous person?"). Reliability and validity of the neuroticism scale of the EPQ are supported (e.g., Alexopoulos & Kalaitzidis, 2004; Eysenck & Eysenck, 1991).

Rumination

The Ruminative Response Scale (RRS; Nolen-Hoeksema & Morrow, 1991; 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 four-point Likert-type scale ranging from 1 (almost never) to 4 (almost always). For the purpose of the present study, total RRS scores were computed as well as scores on reflection and brooding, in line with Treynor et al. (2003).

Worry

The Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) is a 16-item self-report measure of worry designed to capture the generality, excessiveness, and uncontrollability of pathological worry. Items (e.g., "I worry all the time") have to be rated on a five-point Likert-type scale anchored 'not at all typical of me' (1) and 'very typical of me' (5). A PSWQ total score is computed by summing the scores on all items after recoding reversed items. Psychometric properties of the PSWQ are good (Meyer et al., 1990; Turk, Heimberg, & Mennin, 2004; Van Rijsoort, Emmelkamp, & Vervaeke, 1999).

Depression

The Inventory of Depressive Symptomatology (IDS; Trivedi et al., 2004) is a 30-item self-report questionnaire of symptom severity that includes the nine criterion symptoms for major depressive disorder based on the DSM-IV (e.g., mood, concentration, self-criticism, suicidal ideation, interest, energy/fatigue, sleep disturbance, decrease/increase in appetite/weight, and psychomotor agitation/retardation). Each item is rated on a four-point Likert-type scale ranging from 0 to 3. Total scores range from 0 to 84 as only increased or decreased appetite and weight are scored (i.e., 28 out of 30 items). Reliability and validity of the IDS are well documented (see Trivedi et al., 2004).

Anxiety

The Symptom Checklist Revised (SCL-90-R; Derogatis, 1994) is a 90-item self-report measure of current psychological symptom status. Each item refers to one of the nine clinical scales of which scores on the anxiety scale were used in the present study. Total scores were also reported as a global rating of psychological distress. Items are rated on a five-point Likert-type scale of which respondents have to evaluate the amount of inconvenience they have experienced in relation to complaints described in the items anchored 'not at all' (1) to 'extremely' (5). The reliability and validity of the anxiety scale and the total scale score of the SCL-90 are supported (Derogatis, Rickels, & Rock, 1976; Dinning & Evans, 1977;

Peveler & Fairburn, 1990; Schmitz, Kruse, Heckrath, Alberti, & Tress, 1999).

For all measures, higher scores reflect higher levels of the person characteristic that the questionnaire presumes to measure.

Statistical analysis

The Statistical Package for Social Sciences (SPSS) was used for computing descriptive statistics, correlations and internal consistency ratings as well as carrying out *t*-tests and regression analyses. In order to compare correlated correlation coefficients, *z*-tests were used in accordance with Cohen and Cohen (1983). In assessing mediation, it is important to make a distinction between various effects and their corresponding weights. The *total effect* (weight *c*) of an independent variable (IV) on a dependent variable (DV) is composed of a *direct effect* (weight *c'*) of the IV on the DV and an *indirect effect* (weight $a \times b$) of the IV on the DV through a proposed mediator (*M*). Weight *a* represents the effects of the IV on the *M*, whereas weight *b* is the effect of the *M* on the DV, partialling out the effect of the IV. More specifically, an indirect effect is the multiplication of the unstandardized regression weight of the IV on the *M* and the weight of the *M* on the DV. In the case of multiple mediators, it is possible to estimate total indirect effects (i.e., sum of all $a \times b$ weights) as well as specific indirect effects (e.g., effects for each individual mediator).

The current study employed a bootstrapping method (with $n = 5000$ bootstrap resamples) to assess the indirect effects (see Preacher & Hayes, 2008). Bootstrapping is a nonparametric resampling procedure that generates an empirical approximation of the sampling distribution of a statistic from the available data. More specifically, the bootstrapping sampling distributions of the indirect effects are empirically generated by taking a sample (with replacement) of size *n* from the full data set and calculating the indirect effects in the resamples. This way, point estimates and 95% confidence intervals are estimated for the indirect effects. Three types of confidence intervals were computed (i.e., percentile confidence interval, bias-corrected confidence interval and bias-corrected and accelerated confidence interval). As a stringent test of our hypotheses, we considered point estimates of indirect effects significant in the case zero is not contained in all confidence intervals. Further, as we examined multiple indices of repetitive thinking specific indirect effects are reported, which allow for a direct comparison. The analysis was repeated with symptoms of anxiety instead of symptoms of depression as the dependent variable. Fig. 1 presents a graphic representation of the mediation model.

Results

General findings

Before addressing the main results, four general remarks are in order. First, descriptive statistics of the self-report measures for the

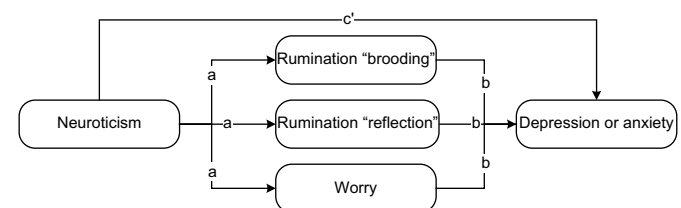


Fig. 1. Graphic representation of the mediation model. Note. The total effects (weight *c*) is composed of a direct effect (weight *c'*) and the indirect effect (sum of all $a \times b$ weights).

Table 1
Descriptive statistics and internal consistency ratings of the self-report measures ($N = 198$)

| | Total sample | | | Females | | Males | | <i>t</i> | <i>p</i> |
|----------------------------|--------------|------|----------------------|---------|------|-------|------|----------|----------|
| | Mean | SD | Internal consistency | Mean | SD | Mean | SD | | |
| 1. Neuroticism (EPQ-N) | 9.3 | 2.3 | 0.72 | 9.5 | 2.3 | 9.2 | 2.4 | 1.11 | 0.27 |
| 2. Depression (IDS) | 38.1 | 12.4 | 0.84 | 39.4 | 12.9 | 36.3 | 11.7 | 1.69 | 0.09 |
| 3. Anxiety (SCL-90) | 23.1 | 8.0 | 0.87 | 24.3 | 9.1 | 21.5 | 5.8 | 2.47 | 0.01 |
| 4. Rumination (RRS) | 50.4 | 11.5 | 0.90 | 51.5 | 12.1 | 48.9 | 10.8 | 1.52 | 0.13 |
| 5. Rumination (reflection) | 9.7 | 2.6 | 0.56 | 9.2 | 2.4 | 10.0 | 2.7 | 2.05 | 0.04 |
| 6. Rumination (brooding) | 12.2 | 3.2 | 0.71 | 12.6 | 3.3 | 11.8 | 3.0 | 1.71 | 0.09 |
| 7. Worrying (PSWQ) | 58.2 | 11.6 | 0.80 | 58.8 | 11.8 | 57.3 | 11.0 | 0.91 | 0.36 |

Note: for the EPQ-N, which consists of dichotomous items, the Kuder–Richardson (KR-20) formula was used to assess internal consistency.

total sample as well as for females and males separately are presented in Table 1. All variables were approximately normally distributed (skewness range: -0.86 to 0.59 ; kurtosis range: -0.52 to 0.39). Independent samples *t*-tests did not reveal significant gender differences on the self-report measures (see Table 1), except for the anxiety scale of the SCL-90-R and the reflection factor, with females having higher scores on these two measures than men. Further, there were no gender differences with respect to duration of depression or number of previous episodes. Second, all self-report measures showed adequate to good internal consistency except for the reflection scale (see Table 1), which may be due to the relatively low number of items included in the scale. Further, all self-report measures were substantially and significantly inter-correlated (see Table 2). Third, the specificity of rumination to depression and worry to anxiety was tested by means of *z*-tests, which revealed no differences between the magnitude of the correlations between rumination and depression and between rumination and anxiety ($z = 0.81$, $p = 0.42$), and between the magnitude of the correlations between worry and anxiety and between worry and depression ($z = 0.74$, $p = 0.46$). Finally, the correlation coefficients between worry and the two rumination scales were considered low enough to justify the simultaneous inclusion of these variables in a regression equation assessing mediation ($rs < 0.64$).

Mediating effects of rumination and worry in the relation between neuroticism and symptoms of depression and anxiety

The results of the mediation analyses are presented in Tables 3 and 4. Neuroticism was positively and significantly associated with depression and anxiety (*c* weights) and also to rumination (including the reflection and brooding factors) and worry (*a* weights). With respect to the effects of the mediators on depression and anxiety (*b* weights), separate analyses showed that rumination and worry were positively and significantly related to both variables. In subsequent analyses, rumination and worry mediated the relation between neuroticism and symptoms of depression and anxiety. When rumination and worry were analyzed simultaneously, only rumination appeared as a significant and positive mediator for these symptoms. Dividing rumination

into a brooding and reflection factor showed that reflection and brooding were significant and positive mediators with regard to depressive symptoms. For anxiety symptoms, only brooding emerged as a significant and positive mediator. Worry did not contribute as mediator in analyses in which brooding and reflection were included as mediators in the relation between neuroticism and symptoms of depression and anxiety (see Tables 3 and 4). Noteworthy, on the basis of the partial correlations, it was estimated that the mediators accounted for 55%–74% of the variance symptoms of depression or anxiety explained by neuroticism across the various analyses, suggesting partial mediation of rumination and worry in the relation between neuroticism and symptoms of depression and anxiety.

We re-ran all analyses controlling for depressive symptoms with anxiety as dependent variable and controlling for anxiety symptoms in the case depressive symptoms was the dependent variable (data not shown). The same pattern of results was found except for (a) worry being no longer a significant mediator in the relation between neuroticism and symptoms of depression (step 2), and (b) brooding being no longer a significant mediator in the relation between neuroticism and depression when controlling for reflection and worry (step 5). Further, one may argue that multicollinearity between rumination and worry or between brooding, reflection, and worry might have affected the results of the analyses. Therefore, we ran a series of linear regression analyses with depression and anxiety scores as the dependent variables and rumination, worry, and the brooding and reflection factors in subsequent analyses as the independent variables. Variance inflation factors (VIF) ranged between 1.35 and 1.98 indicating that multicollinearity did not influence the results.

Discussion

The current study sought to investigate the mediational effects of rumination and worry in the relation between neuroticism and symptoms of depression and anxiety. Results can be summarized as follows. In line with our expectation, substantial and significant associations were found between neuroticism, rumination (i.e., total score, brooding, reflection), worry, and symptoms of depression and anxiety. With respect to the mediational analyses, when analyzed separately, rumination and worry mediated the relation between neuroticism and symptoms of depression and anxiety. In examining the relative contributions of rumination and worry in the mediational process, only rumination emerged as a significant mediator. Finally, when the rumination factors 'brooding' and 'reflection' were analyzed (cf. Treynor et al., 2003) as possible mediators, both brooding and reflection emerged as significant mediators in relation to depressive symptoms. For anxiety symptoms, only brooding emerged as significant mediator. In examining the relative contributions of worry, reflection and brooding, worry did not emerge as a significant mediator. When controlling for anxiety symptoms, brooding did not significantly mediate this

Table 2
Pearson correlation coefficients between the self-report measures ($N = 198$)

| | 1 | 2 | 3 | 4 | 5 | 6 |
|----------------------------|-------|-------|-------|-------|-------|-------|
| 1. Neuroticism (EPQ-N) | – | | | | | |
| 2. Depression (IDS) | 0.43* | – | | | | |
| 3. Anxiety (SCL-90) | 0.46* | 0.64* | – | | | |
| 4. Rumination (RRS) | 0.43* | 0.55* | 0.51* | – | | |
| 5. Rumination (reflection) | 0.33* | 0.42* | 0.36* | 0.83* | – | |
| 6. Rumination (brooding) | 0.41* | 0.49* | 0.48* | 0.88* | 0.64* | – |
| 7. Worrying (PSWQ) | 0.53* | 0.39* | 0.43* | 0.46* | 0.35* | 0.51* |

Note: * $p < 0.001$.

Table 3

Summary of mediation results for depression (5000 bootstrap samples)

| | Independent variable (IV) | Mediating variable (M) | Dependent variable (DV) | Effect of IV on M (a) | Effect of M on DV (b) | Direct effects (c') | Indirect effect (a × b) | Total effects (c) |
|----|---------------------------|------------------------|-------------------------|-----------------------|-----------------------|---------------------|-------------------------|-------------------|
| 1. | Neuroticism | Rumination | Depression | 0.43 | 0.44 | 0.24 | 0.19 ^a | 0.43 |
| 2. | Neuroticism | Worrying | Depression | 0.53 | 0.22 | 0.31 | 0.12 ^a | 0.43 |
| 3. | Neuroticism | Rumination | Depression | 0.43 | 0.41 | 0.20 | 0.18 ^a | 0.43 |
| | | Worrying | | 0.53 | 0.08 | – | 0.05 | – |
| 4. | Neuroticism | Reflection | Depression | 0.33 | 0.16 | 0.26 | 0.06 ^a | 0.43 |
| | | Brooding | | 0.41 | 0.27 | – | 0.11 ^a | – |
| 5. | Neuroticism | Reflection | Depression | 0.33 | 0.16 | 0.23 | 0.06 ^a | 0.43 |
| | | Brooding | | 0.41 | 0.24 | – | 0.10 ^a | – |
| | | Worrying | | 0.53 | 0.08 | – | 0.04 | – |

^a Significant point estimate ($p < 0.05$).

relation, indicating that brooding might not be consistently related to depressive symptoms. Noteworthy, neuroticism still explained a significant portion of the variance in depression and anxiety scores when the mediators were taken into account, suggesting that the significant mediators partially mediated the relation between neuroticism and symptoms of depression and anxiety.

The results from the mediational analyses are largely consistent with and refine the findings from previous research (Kuyken et al., 2006; Muris et al., in press; Muris et al., 2005; Roelofs et al., 2008). Only Muris et al. (2005) examined the contribution of worrying as a potential mediator. However, in their study it was not possible to disentangle the relative contribution of rumination and worry to the mediational process. The results from the current study suggest that in clinically depressed individuals, the effects of worrying as a possible mediator were canceled out when rumination was controlled for. Thus, ruminative responses to depressed mood contribute significantly in the mediational process and may also capture the variance that is originally explained by worry. Furthermore, when controlling for symptoms of anxiety, worry (only included as the sole mediator) did not mediate the relation between neuroticism and depressive symptoms, indicating that worry might be more specifically related to anxiety symptoms compared to depressive symptoms in the mediational process. The findings with respect to the associations between reflection and symptoms of depression and anxiety are in line with the Interacting Cognitive Subsystems Theory (Teasdale & Barnard, 1993; Teasdale et al., 1995) and suggest that reflection has unconstructive consequences (e.g. Watkins, 2008). The findings from this study contrast the results obtained by Roelofs et al. (2008), who found that a negative association of rumination on the causes of sadness (which closely parallels the 'reflection' factor) emerged in the mediation analyses only when controlling for symptom-based rumination (which closely reflects 'brooding') and rumination on

sadness (which was not included in the current study) (see also Roelofs, Muris, Huibers, Peeters, & Arntz, 2006). Treynor et al. (2003) found that reflection was associated with less depression over time in longitudinal analyses, although it was correlated with more depression concurrently. These findings have led Treynor et al. (2003) to suggest that reflection might be instigated by negative affect or leads to negative affect in the short term. The contrary findings with respect to the effects of reflection have also been reported in relation to suicidal ideation. That is, some studies have also reported beneficial effects of reflection with respect to suicidal ideation (e.g., Crane, Barnhofer, & Williams, 2007), whereas other studies have found negative effects of reflection (and brooding) on suicidal ideation (Miranda & Nolen-Hoeksema, 2007; O'Connor & Noyce, 2008). Thus, the findings with respect to reflection are inconclusive and seem to depend on the (negative) valence of the thought content, a (negative) intrapersonal context, and an abstract level of construal (see Watkins, 2008), and may further depend on whether the effects of reflection are examined in the short or long run, the inclusion of different components of rumination, sample characteristics (e.g., undergraduates, adult community sample, clinically depressed individuals), and the use of different depression outcome measures. Clearly, more research is needed to further elucidate the precise role of reflection in depressive symptomatology.

The results from the current study may have clinical implications. For example, the treatment of depression may focus on strategies specifically designed to modify the 'brooding' tendency. These strategies can be incorporated in standard cognitive behavior therapy for depression in which brooding-related thoughts can be challenged. Other strategies may include 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). Watkins et al. (2007) have developed

Table 4

Summary of mediation results for anxiety (5000 bootstrap samples)

| | Independent variable (IV) | Mediating variable (M) | Dependent variable (DV) | Effect of IV on M (a) | Effect of M on DV (b) | Direct effects (c') | Indirect effect (a × b) | Total effects (c) |
|----|---------------------------|------------------------|-------------------------|-----------------------|-----------------------|---------------------|-------------------------|-------------------|
| 1. | Neuroticism | Rumination | Anxiety | 0.43 | 0.37 | 0.30 | 0.16 ^a | 0.47 |
| 2. | Neuroticism | Worrying | Anxiety | 0.53 | 0.26 | 0.33 | 0.14 ^a | 0.47 |
| 3. | Neuroticism | Rumination | Anxiety | 0.43 | 0.33 | 0.24 | 0.14 ^a | 0.47 |
| | | Worrying | | 0.53 | 0.15 | – | 0.08 | – |
| 4. | Neuroticism | Reflection | Anxiety | 0.32 | 0.07 | 0.32 | 0.02 | 0.47 |
| | | Brooding | | 0.41 | 0.30 | – | 0.13 ^a | – |
| 5. | Neuroticism | Reflection | Anxiety | 0.32 | 0.07 | 0.27 | 0.02 | 0.47 |
| | | Brooding | | 0.41 | 0.25 | – | 0.11 ^a | – |
| | | Worrying | | 0.53 | 0.14 | – | 0.07 | – |

^a Significant point estimate ($p < 0.05$).

a rumination-focused cognitive therapy for residual depression and found in an open case series that this treatment produced significant improvements in depressive symptoms, rumination, and comorbid disorders. Papageorgiou and Wells (2004) have argued to also focus on metacognitive beliefs about rumination that are involved in the onset and maintenance of rumination. Attention-training treatment can be used to obtain increased metacognitive control (Wells, 2000) and has been found to lead to a long-term reduction of rumination, metacognitions, and depressive symptoms in patients with recurrent major depressive disorder (Papageorgiou & Wells, 2000). Another recent treatment development that is likely to be of relevance to change rumination is mindfulness-based cognitive therapy for depression (Segal, Williams, & Teasdale, 2002). There is indeed evidence to suggest that mindfulness therapy in which recovered depressed patients learn to engage in mindful emotional processing, and in turn reduce emerging dysphoria, is effective in preventing relapse (e.g., Ma & Teasdale, 2004; Ramel, Goldin, Carmona, & McQuaid, 2004; Segal et al., 2002).

Admittedly, the current study has some limitations that need to be addressed. To begin with, the findings of the current study should be interpreted with some caution due to criteria contamination between the different measures. That is, items tapping rumination ask individuals to report the tendency to ruminate when sad, down or depressed and include items that refer to 'depression' or 'symptoms of depression'. The items that represent worry tend to mention degree, frequency, and duration of worry without an emotional context. Therefore, it is possible that neuroticism, which is a construct, operationalized in terms of exaggerated emotional response and increased sadness and anxiety may show more overlap with rumination than with worry. Thus, a stronger mediation effect of rumination might alternatively be explained by the language and semantics of the items used to assess the various constructs. Further, the study was cross-sectional in nature making it impossible to draw conclusions on cause-effect relations. Therefore, studies that apply prospective intervals are warranted. Second, with respect to the issue of generalisability, it is noteworthy to mention that our sample was predominantly white European, which may limit the generalisability of our results to other cultures. Despite these limitations, the results of the current study seem to indicate that brooding partially mediated the relation between neuroticism and symptoms of anxiety and depression, while reflection partially mediated the relation between neuroticism and symptoms of depression. Worry did not act as a mediator when controlling for rumination, brooding, and reflection. It would be interesting to examine the model in patients with anxiety disorders, in particular generalized anxiety disorder for which worry is a characteristic feature. The finding of partial mediation suggests that other (cognitive) variables might also be involved in the mediational process as well. Future research should be aimed at identifying alternative pathways by which neuroticism might lead to symptoms of depression and anxiety and test the relative contribution of the hypothesized mediating variables in the mediational analysis. This research should apply prospective intervals and include hormonal, genetic, other psychological variables in addition to a ruminative response style. The role of negative life stressor might be particularly interesting in order to understand the various pathways to depression and anxiety within a diathesis-stress framework.

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