Running Head: RUMINATION, MOOD AND DYSFUNCTIONAL ATTITUDES

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How Ruminative Thinking Styles Lead to Dysfunctional Cognitions:

Evidence From a Mediation Model

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Abstract

Background and Objectives: Dysfunctional attitudes and a ruminative thinking style are of utmost clinical importance because they are found to be crucially implicated in depression vulnerability. In this study, based on the Diathesis-Stress model (Beck, 1967) and the Differential Activation Hypothesis (Teasdale, 1988), we investigated whether inter-individual differences in a ruminative thinking style would be related to the development of depressive symptoms, leading to the activation of dysfunctional attitudes under stress.

Methods: Seventy-six never depressed undergraduate students completed internet questionnaires measuring rumination, depressive symptoms and dysfunctional attitudes at 4 fixed moments in time (T1, T2, T3, T4): T1 was performed six weeks before their exams (considered as a low stress period); T2, T3 and T4 were performed during three consecutive weeks in their final exams (considered as life stress event).

Results: As expected, results revealed that the relationship between rumination, measured both out of (T1) and in (T2) a stressful period, and dysfunctional attitudes (measured at T4) was mediated by increased depressive symptoms (measured at T3).

Limitations: Because the questionnaire for rumination was developed in the context of understanding responses to depressive symptoms, there might be a construct overlap between the predictor and the mediator of the models that were tested. Moreover, because only healthy undergraduates were included, our results demonstrate a decreased generalizability.

Conclusions: These findings indicate that rumination can be conceived as a stable and underlying mechanism leading to depressed mood and dysfunctional attitudes under stress. Moreover, our findings highlight that clinical interventions should not only target dysfunctional schemas and attitudes, but might also benefit from the use of procedures aimed at changing processes such as a ruminative thinking style.

Keywords: Rumination, stress, dysfunctional attitudes, depressive symptoms, cognitive reactivity

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1. Introduction

The Diathesis-Stress model (Beck, 1967), the most prominent cognitive framework for depression vulnerability, purports that negative cognitions remain latent until activated by stressful events. These negative cognitions or schemata embody a constellation of dysfunctional attitudes such as negative representations of self-referent information and rigid, unrealistic pessimistic perspectives (Beck, 1967). This activation process of dysfunctional attitudes following a stressful event is referred to as “cognitive reactivity” and has been related to the onset, relapse and recurrence of depression (Beck, Rush, Shaw, & Emery, 1979). Current interventions such as cognitive behaviour therapy focus mainly on the content of these dysfunctional cognitions. Although these cognitive/behavioural treatment options for depression reveal to be successful in the short term (Hollon & Dimidjian, 2009), relapse or recurrence rate after remission or recovery remains very high (Segal, Pearson, & Thase, 2003). This indicates that current treatment options might be insufficiently successful in identifying and diminishing underlying vulnerability mechanisms that set depressive symptoms and dysfunctional attitudes in motion. Interestingly, the mere presence of a stressful event seems not to be enough to activate dysphoric mood and dysfunctional attitudes and conjures questions regarding individual differences in this cognitive reactivity. For example, what are the underlying mechanisms that allow stressors to trigger depressive symptoms and dysfunctional attitudes? To answer this question, it is important to study healthy people with no prior history of depression because their stress reactivity cannot be influenced by former depressive episodes, which are a good predictor of increased cognitive reactivity (for a review, see Scher, Ingram, & Segal, 2005).

Until recently, dysfunctional attitudes were considered a cognitive vulnerability factor that moderates the relation between stressors and increased psychological distress (e.g., negative mood, frustration, anxiety, ...). From this perspective, dysfunctional attitudes are considered latent cognitions that, when activated by a stressor, lead to a product of psychological distress (Beck et al., 1979). However, an important question is why stress would lead to the activation of dysfunctional attitudes in some individuals, whereas other individuals cope in a more healthy way. To account for these inter-individual differences, the Differential Activation Hypothesis of Teasdale (1988) proposes that, during stressful periods, negative mood leads to the activation of negative cognitive schemas (such as dysfunctional attitudes) because during prior depressogenic experiences, the association between negative mood and depressogenic schemas has been strengthened. In line with the Differential Activation Hypothesis, research has shown that dysfunctional attitudes only become manifest when activated by a depressed mood (e.g., Segal, Gemar & Williams, 1999). However, these studies yielded also mixed results (for a review, see Scher et al., 2005), implying that there might be other underlying processes explaining the onset of dysfunctional attitudes. Recently, a ruminative thinking style has been proposed as an important mechanism in relation to the onset of dysfunctional attitudes, based on its association with a negative attentional biases, sustained negative mood states, increased vulnerability for depression, and being stable beyond the depressive episode (for a review, see Smith and Alloy, 2009). A ruminative thinking style (rumination) is considered a stable trait-like tendency to respond to stressful life events with repetitive and automatic self-focused thoughts about the origin, the causes and consequences of these depressogenic circumstances (Nolen-Hoeksema, 1991).

Although previous studies have emphasised the relationship between the stressor and the activation of dysfunctional attitudes (e.g., Hankin, Abramson, Miller, & Haefl, 2004), and the relationship between cognitive reactivity and rumination (Moulds, Kandris, Williams,

Lang, Yap, & Hoffmeister, 2007), recent studies are starting to investigate the active role of rumination in the activation of dysfunctional attitudes and psychological distress. For example, Morrison & O'Connor (2008) found that rumination in response to life stressors predict psychological distress (operationalized as dysphoria, hopelessness and suicidal thinking). However, in these studies the relationship between dyphoric mood and negative thoughts is not investigated separately.

Based on these research findings and the Differential Activation Hypothesis (Teasdale, 1988), we could hypothesise that, during stressful periods, rumination might lead to dysphoria, which in turn, would activate dysfunctional attitudes. This implies that rumination is not conceived as a mere product of distress but as a fundamental mechanism leading to dysfunctional attitudes. Depressive symptoms would then mediate the relation between a ruminative thinking style and the activation of dysfunctional attitudes. This specific model fits with the observation that rumination is a stable vulnerability factor that prospectively predicts depression (Nolen-Hoeksema, 2000; Spasojevic & Alloy, 2001). Dysfunctional attitudes refer to negative representations and dysfunctional cognitions of self-referent information and rigid, unrealistic pessimistic perspectives (Beck, 1967). Testing of this model requires the use of a prospective design with a temporal order between multiple data points to investigate the influence of rumination on the development of depressive symptoms and dysfunctional attitudes under stress. This mediation model can be tested using the statistical model proposed by Baron & Kenny (1986), based on a set of regression analyses, combined with bootstrapping (see Preaches & Hayes, 2004). To the author's best knowledge, this mediation model has never been investigated in prior research.

Hence, we set up a large study with a group of healthy students with no prior history of depression, and tested them at four moments in time (T1, T2, T3, T4). The first test moment was out of a stressful period (T1); and the last three test moments fell on three

consecutive weeks during a stressful period (T2, T3, T4). Importantly, these latter three consecutive weeks fell during their final examination, which is a naturally occurring stressor, and testing was fixed on the same day of each week. All participants reported their rumination tendency, depressive symptoms and dysfunctional attitudes on each test moment. Considering that rumination is a stable vulnerability factor, we tested a model containing the tendency to ruminate during a period of low stress (T1), but also a model with an indication of rumination during a stressful period (T2). We were interested in a measure of depressive symptoms on T3 and dysfunctional attitudes on T4, both administered during the stressful examination period. Because of this specific temporal order of these latter variables, we were able to test whether the relationship between rumination and dysfunctional attitudes was mediated by depressive symptoms.

2. Methods

2.1. Participants

A total of seventy-six students of Ghent University (60F/16M) with a mean age of 20.49 years ($SD = 1.82$) participated in this study. The absence of a history of a major depressive episode or current depression was confirmed using the structured Mini International Neuropsychiatric Interview (MINI - Sheehan et al., 1998; Dutch version of Van Vliet, Leroy, & Van Megen, 2000). After receiving a complete verbal description of the study, they all provided written informed consent (protocol approved by the local ethics committee of Ghent University). Participants received a financial reward for participation. This study is part of a larger project, also investigating the influence of attentional bias on stress related rumination.

2.2. Materials

2.2.1. Rumination. The *Ruminative Response Scale (RRS)* (Nolen-Hoeksema & Morrow, 1991; Dutch translation by Raes & Hermans, 2007) was administered to measure

ruminative thinking styles. The RRS consists of items that describe responses to a depressed mood, related to focussing on the self, on symptoms, and on the origin and consequences of the distress. This self report questionnaire consists of 26 questions to which participants respond on a 4-point Likert scale how often they engage in these responses (i.e. 1 = almost never, 2 = sometimes, 3 = often, 4 = most of the times). Instructions of the RRS we administered six weeks before the start of the exams were related to “how they responded in general”, whereas instructions of the RRS we administered during the exams were related to “how they responded over the last week”.

2.2.2. Depressive symptoms. The *Beck Depression Inventory II* (BDI-II; Beck, Steer, & Brown, 1996; Dutch translation by Van der Does, 2002a) was administered to screen for depressive symptoms and dysphoria over the last week. The BDI consists of 21 multiple choice format items and measures the presence and severity of cognitive, motivational, affective and somatic symptoms of depression.

2.2.3. Dysfunctional attitudes. The *Dysfunctional Attitudes Scale (DAS-A)* (Weissman, 1979; Dutch translation by Van den Broeck, 2002) was used to measure dysfunctional attitudes, measuring concerns about approval from others, prerequisites for happiness and perfectionist standards (e.g., “If I do not do as well as other people, it means I am a weak person”). The DAS-A has 40 statements to which participants respond on a 7-point Likert scale (i.e., 1 = totally agree, 2 = agree very much, 3 = agree slightly, 4 = neutral, 5 = disagree slightly, 6 = disagree very much, 7 = totally disagree) with how they felt during the last week.

Past reports showed good psychometric qualities of all questionnaires.

2.3. Procedure

Six weeks before the examinations, participants were included in the study. At that moment, they provided written informed consent and filled in the RRS. Subsequently, when

participants were preparing for and performing final examinations, they were contacted via email. Every week, on Wednesday, all questionnaires (RRS, BDI-II and DAS) were sent out through the internet and participants' responses were automatically emailed to a lab email address after they filled in the online questionnaires. Responses were only considered as valid when received the same or the next day. For statistical analysis, we were interested in RRS on T1 and T2, depressive BDI-II on T3 and DAS on T4.

2.4. Statistical analyses

Mediation analyses were performed to investigate the extent to which dysphoria (BDI-II: mediator) carries the effect of rumination (RRS: predictor) to the endorsement of dysfunctional attitudes (DAS: outcome variable) (see Figure 1a). Because we measured the predictor at least one week before the mediator, and the mediator one week before the dependent variable, the present data meet all the criteria for testing mediation. Two models with different predictors were tested: one model with rumination measured out of a stressful period and a second model with rumination measures in a stressful period. Mediation analyses were conducted using multiple regression analyses (ordinary least squares: Baron & Kenny, 1986). A bootstrapping analysis (with 1000 bootstrap resamples) was used to check the indirect effect (the amount of the mediation) of rumination to dysfunctional attitudes via the mediator (BDI-II) (Preaches & Hayes, 2004). For the above analyses the significance level was set at an alpha level of .05.

3. Results

3.1. Descriptives

For the RRS and BDI-II, higher scores are indicative of respectively, higher rumination, and depressive symptoms. For the DAS-A, lower scores are indicative of more dysfunctional attitudes. A total of 7 participants did not return their questionnaires on one test moment, all of which were listed as missing data. The mean of scores of questionnaires were:

RRS (T1): $M = 52.72$ ($SD = 14.03$; range = 29 - 87); RRS (T2): $M = 52.71$ ($SD = 17.20$; range = 26 - 90); BDI (T3): $M = 10.25$ ($SD = 7.81$; range = 0 - 39); DAS (T4): $M = 187.18$ ($SD = 34.43$; range = 106 - 267). For a full correlation matrix, we refer to table 1.

3.2. Mediation modelling¹

3.2.1. Rumination measured out of a stressful period. For an illustration of the mediation model (with path a-c'), we refer to Figure 1b. The first regression equation (estimate path c) tested the total effect of RRS (being the predictor) on DAS (outcome variable) and yielded a significant effect, $\beta = -.29$, $t = -2.52$, $p = .01$, that may be mediated. The second regression equation (estimate path a) demonstrated that the predictor (RRS) had an effect on the proposed mediator (BDI-II), $\beta = .45$, $t = 4.11$, $p < .001$. The third regression equation (estimate path b) demonstrated an effect of the proposed mediator (BDI-II) on reports of dysfunctional attitudes (DAS, outcome variable), when controlling for the predictor (RRS), $\beta = -.42$, $t = -3.52$, $p = .001$. Finally, in a fourth step to estimate path c', the direct effect of RRS on DAS, controlling for the proposed mediator was not significant, which suggests a complete mediation effect of the BDI-II, $\beta = -.09$, $t = -.79$, $p = .45$. This was confirmed by bootstrapping the indirect effect and significance (1000 bootstrap resamples) using normal distribution with a 95 % confidence interval (two-tailed), value = $-.46$, $S.E. = .18$, 95% CIs $[-.81, -.11]$, $z = -2.59$, $p < .01$.

3.2.2. Rumination measured at the start of a stressful period. For an illustration of the mediation model (with path a-c'), we refer to figure 1c. The first regression equation (estimate path c) tested the total effect of RRS (being the predictor) on DAS (outcome variable) and yielded a significant effect, $\beta = -.48$, $t = -4.54$, $p < .001$, that may be mediated. The second regression equation (estimate path a) demonstrated that the predictor (RRS) had an effect on the proposed mediator (BDI-II), $\beta = .61$, $t = 6.31$, $p < .001$. The third regression

¹ Of note, it is important to mention that analyses using depressive brooding or reflective pondering, two subscales of the RRS questionnaire, also yielded significant results that are similar to the results using the total RRS score, both when measured during times of life stress and no stress.

equation (estimate path b) demonstrated an effect of the proposed mediator (BDI-II) on reports of dysfunctional attitudes (DAS, outcome variable), when controlling for the predictor (RRS), $\beta = -.30$, $t = -2.22$, $p = .03$. Finally, in a fourth step to estimate path c', the direct effect of RRS on DAS, controlling for the proposed mediator was nearly significant which might suggest a partial mediation effect of the BDI-II, $\beta = .27$, $t = -1.98$, $p = .052$. However, bootstrapping the indirect effect demonstrated a significant effect (1000 bootstrap resamples) using normal distribution with a 95 % confidence interval (two-tailed), value = $-.37$, $S.E. = .18$, 95% CIs $[-.71, -.02]$, $z = -2.07$, $p = .04$, which is indicative of complete mediation.

[Insert Figure 1 about here]

4. Discussion

The Diatheses-Stress framework holds that a stressor can lead to dysfunctional attitudes and the Differential Activation Hypothesis proposes that this “cognitive reactivity” is contingent on dysphoric mood. Within the dynamics of dysfunctional attitudes, accumulating research reports an important role of trait rumination. However, to date, only limited research has investigated the particular influence of a ruminative thinking style on the activation of dysfunctional attitudes, especially when investigating the mediating role of depressive symptoms. Because all the variables were measured in a specific temporal order, we were able to test a unique mediation model.

As expected, findings of the current study reveal that rumination predicts the activation of dysfunctional attitudes and that this relation is fully mediated by the experience of depressive symptoms. The statistical model was significant with rumination out of a stressful period (T1, 6 weeks before the start of the exams) and with rumination measured during a period full of stressful events (T2). These findings indicate that a ruminative

thinking style can be considered as a valid and stable predictor of the activation of dysfunctional attitudes.

According to the differential activation hypothesis (Teasdale, 1988), during stressful periods dysphoric mood leads to the activation of dysfunctional attitudes. The current research findings extend on this model by pointing at a crucial role of rumination in this cognitive reactivity dynamic. It is important to note that, although some researchers already found a correlation between rumination and the increase of negative cognitions (Nolen-Hoeksema, 2000), the current results suggest that dysfunctional attitudes are activated by ruminative thinking only when depressive symptoms are increased after rumination. In line with our results, a recent questionnaire study of Moulds et al. (2008) found evidence for a partial correlation between cognitive reactivity and a ruminative thinking style, even after controlling for current depressive symptoms. In the latter research, cognitive reactivity was indexed by the LEIDS-R questionnaire (Van der Does, 2002b), which measures the association between sad mood and dysfunctional attitudes. Our results go beyond the study of Moulds and co-workers (2008), providing further fine grained evidence for the dynamics of cognitive vulnerability factors, especially because variables were tested using a specific temporal order.

Although other studies have already tested whether dysfunctional attitudes in the past, predict depressive episodes, our study is the first that investigates the specific underlying mechanism that could explain the activation of dysfunctional attitudes during stressful periods of life in never depressed individuals. For example, prospective studies have demonstrated that dysfunctional attitudes interact with rumination to predict prospective depressive episodes (e.g. Hankin et al., 2004). Robinson & Alloy (2003) found that non depressed freshmen, who exhibited both dysfunctional attitudes and a tendency to ruminate about negative implications following stressful events, were more likely to develop

depressive episodes than individuals with only one or none of these two risk factors. These results are important for our current findings because the relationship between rumination and dysfunctional attitudes might provide an indication of vulnerability to develop a depressive episode over time. Because our participants never experienced a depressive episode in the past, the current results point out that a ruminative thinking style might be considered as a stable and enduring cognitive vulnerability factor, playing a role in the onset of depression.

Our study findings have important clinical implications because they suggest that clinical interventions should not only target the content of dysfunctional cognitions but should also focus on ruminative thinking styles which seem to be related to the development of dysfunctional attitudes. Reducing ruminative processes (e.g., rumination-focused cognitive therapy: Watkins et al., 2007) may be a potential mechanism of action in cognitive behavioural interventions for treating depression, or as a prevention strategy in people who are vulnerable to develop depression.

A first drawback of the present study is that rumination on sadness (using RRS) and depressed mood (using BDI) are related. In fact, the RRS was developed in the context of understanding responses to depressive symptoms (Nolen-Hoeksema, 1991). This might imply a confound between the initial variable (RRS) and the mediator (BDI) within the mediation models that were tested in the current study. It is however important to mention that a significant mediation would be impossible when the two constructs would show a main overlap. Indeed, although the BDI and RRS are related, the RRS measures thinking styles whereas the BDI measures DSM IV symptoms. A second limitation is the decreased generalizability of our results. This is because only healthy, never depressed undergraduates were included. Future studies are encouraged to perform a study with a similar design using a larger and more representative sample to replicate and specify these results with regard to depression (vulnerability).

To summarize, our findings, based on a large group of healthy never depressed students, posit a crucial role for rumination on the activation of dysfunctional attitudes. The relationship between rumination (measured both in and out of a stressful period) and dysfunctional attitudes was mediated by increased depressive symptoms, which means that rumination can be conceived as a stable and underlying mechanism leading to depressed mood and dysfunctional attitudes under stress. These findings provide crucial information for researchers investigating underlying working mechanisms of psychological distress and vulnerability to depression using the diathesis-stress account as a touchstone. Moreover, our findings highlight that clinical interventions should not only target dysfunctional schemas and attitudes, but might also benefit from the use of procedures aimed at reducing processes such as rumination.

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Table 1. Full correlation matrix (listing the Pearson's r) of the key variables at the various time points

	RRS (no stress)	BDI-II (no stress)	RRS (week 1 stress)	BDI-II (week 2 stress)	DAS (week 3 stress)
RRS (no stress)	1.00	.46**	.70**	.45**	-.29**
BDI-II (no stress)		1.00	.58**	.77**	-.42**
RRS (week 1 stress)			1.00	.61**	-.48**
BDI-II (week 2 stress)				1.00	-.47**

** $p < .01$

Figure captions

Figure 1: Mediation analyses were performed to investigate the extent to which the mediator (M: BDI-II) carries the effect of predictor (X: RRS) to the endorsement of the outcome variable (Y:DAS).

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