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Associations between Depressive Symptoms, Rumination, Overgeneral Autobiographical Memory and Interpretation Bias within a Clinically Depressed Sample

Marien Lievaart, Colin van der Heiden and Elke Geraerts*

Institute of Psychology, Erasmus University Rotterdam, Rotterdam, The Netherlands

Abstract

There is ample research demonstrating that biases in cognitive processes, such as a negative interpretation bias, rumination, and overgeneral autobiographical memory, are potential vulnerability factors for depression. However, a key limitation is that most studies conducted so far have studied cognitive biases in depression in isolation. Therefore our goal was to explore whether or not interpretation bias, overgeneral autobiographical memory, and rumination are present and interrelated in depressive outpatients. In this explorative study we examined the relationship between negative interpretation bias, rumination, overgeneral autobiographical memory, and severity of depression in clinically depressed outpatients. According to our expectations a negative interpretation bias and rumination were associated with severity of depression. Moreover, overgeneral autobiographical memory was not associated with severity of depression, but seemed to be associated with diagnosis of depression. A negative interpretation bias, overgeneral autobiographical memory, and rumination were not significantly related with each other in this study. This finding suggests they are not strongly related and might be largely distinct vulnerability factors for depression. The study presents an important yet preliminary finding which warrants further replication with a larger sample size.

Keywords: Depression; Interpretation bias; Overgeneral autobiographical memory; Rumination; Avoidance; Combined cognitive bias hypothesis

Introduction

Depression is a highly prevalent and severe disorder, making it the most burdensome disease in the world of middle- and high-income countries [1]. Although previous research has led to the development of effective treatments for depression, such as medication and psychotherapy, there is still room for improvement. One of the main problems is the high recurrence rate after successful treatment. More than 50 percent of depressed people experience a recurrence within five years following recovery [2]. Furthermore, the rate of recurrence increases with each subsequent episode. This high recurrence rate in depression suggests the existence of specific vulnerability factors which are either not targeted directly by broad treatment approaches, or which disrupt the effect of the treatment [3]. For example, cognitive behavioral therapy (CBT) and interpersonal psychotherapy (IPT) both require a certain degree of conscious awareness and reflective thinking, while certain possible vulnerability factors, such as information-processing deficits, frequently act involuntarily and outside one's conscious awareness [4]. In order to enhance the effectiveness of treatments, more insight in specific vulnerability factors for depression is needed.

Supporters of the cognitive approach state that cognitions and cognitive processes are specific vulnerability factors playing a crucial role in the onset and maintenance of depression [5]. Indeed, numerous studies demonstrated that a negative interpretation bias [6], rumination [7], and overgeneral autobiographical memory [8], are potential vulnerability factors for the onset and/or maintenance of depression, as discussed in further detail below.

Overgeneral autobiographical memory (OGM) refers to the tendency to recall less specific or more overgeneral autobiographical memories when asked to come up with specific memories in response to a cue [9]. OGM is reliably associated with the diagnosis of depression [8]. Furthermore, OGM has been found to predict the course of depression [10] as well as the recurrence of depression [11]. Moreover, OGM has been found in individuals at risk for depression [11]. Finally, a cognitive bias modification study found that concreteness training resulted in greater decreases in depressive symptoms, and increases in concrete thinking in dysphoric individuals compared to individuals from a waiting list or bogus concreteness training [12]. However, although OGM is related to depression, there seems to be no correlation between OGM and the severity of depression [8]. In other words, although overgeneral memory is probably not associated with variations in depressive symptoms, it is typically found to distinguish depressed from non-depressed groups.

A negative interpretation bias can be defined as the tendency to interpret ambiguous situations in a negative way [13]. Ample research demonstrated that depressed individuals interpret ambiguous information in a negative way, specifically in the later stages of processing [14]. A negative interpretation bias has also been found in groups at risk for depression, for example individuals with remitted depression [15] or daughters of depressed mothers [16]. Moreover, longitudinal studies have shown that a negative interpretation bias can predict diagnosis of depression [17,18]. Finally, cognitive bias modification research has shown that targeting an interpretation bias via positive imagery led to decreases in depressive symptoms, as well as protection against a later negative mood induction [19-21].

A ruminative thinking style refers to the tendency to think

***Corresponding author:** Elke Geraerts, Institute of Psychology, Erasmus University Rotterdam, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands, Tel: +31-104089532; E-mail: geraerts@fsw.eur.nl

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recurrently about the causes, meaning and implications of depressive symptoms [22]. Ample research demonstrated that rumination predicts the course, onset and recurrence of major depression whereby greater rumination predicts greater depression [23-25]. Furthermore, rumination seems to partly account for greater levels of depression and anxiety in women compared to men [23]. Importantly, treating depressive rumination leads to improvement in depression [26,27].

To summarize, there is ample research demonstrating that biases in cognitive processes, such as negative interpretation bias, rumination, and overgeneral autobiographical memory, are potential vulnerability factors for depression. However, most studies in this research field were not conducted in clinically depressed patients receiving treatment for their problems. This leaves the question of whether such results can be generalized to clinical practice.

Our goal was therefore to replicate and further extend the results of earlier studies by investigating the presence of interpretation bias, rumination, and overgeneral autobiographical memory within clinically depressed outpatients. We expected rumination and a negative interpretation bias to be associated with severity of depression within our depressed sample. We further expected OGM not to be directly associated with the severity of depression [8].

The interrelations of cognitive biases

Another key limitation is that most studies conducted so far have studied cognitive biases in depression in isolation [28]. Because of this, we still have little insight into how cognitive biases are associated with each other or how they might collectively influence the etiology and maintenance of depression.

Everaert et al. [28] stress for an approach that considers the interplay between cognitive biases, by applying the combined cognitive bias hypothesis (CCBH) of Hirsch et al. [13] to depression. The combined cognitive bias hypothesis states that "cognitive biases do not operate in isolation, but rather can influence each other and/or can interact so that the impact of each on another variable is influenced by the other" [13]. In their review, Everaert et al. [28] mention three broad types of questions originating from the CCBH, specifically "association questions", "causal questions" and "predictive magnitude questions". "Associations questions" address whether information processing biases at the levels of attention, interpretation, and memory are interrelated, and these questions provide a first important step. "Causal questions" go into hypothesized causal relations among information processing biases which are tested by use of an experimental design. Finally, "predictive magnitude questions" involve the effects of information processing biases in isolation versus their effect in concert on the course of depression, which are mostly examined by using a prospective research design. Although Everaert et al. review a few interrelations between cognitive biases with regard to depression [28], for example between attention and memory, more studies investigating the interrelations of these cognitive biases are needed to gain a broader understanding. If, for example, these biases are present in depressed individuals and highly related to each other, interventions tackling one specific bias might influence the other biases as well, leading to less vulnerability in general. If, on the other hand, these biases are present but weakly related in depressed individuals, we most likely need to assess which biases are present and subsequently develop targeted treatments tackling these specific biases. Interestingly, Gotlib et al. found that only some biases (e.g. memory) may have a predictive effect on depressive symptoms when measured simultaneously, whereas others may not (e.g., attention biases) [29]. Moreover, investigating the interrelations helps us to see which hypothesis of cognitive models hold. Beck's model, for example, implies that cognitive biases occur simultaneously when stressful life events activate negative schemata [30].

In accordance with the "association questions" by Everaert et al. [28] which provide a first important step in exploring these exciting questions, our main goal was to explore whether or not interpretation bias, overgeneral autobiographical memory, and rumination are interrelated in depressive outpatients. One of these interrelations, specifically between rumination and OGM, has been often studied previously. A plausible explanation behind this association is that memory retrieval is hijacked by other material, that is self-relevant, triggering analytic, conceptually based processing (rumination), whereby the memory search is early aborted which leads to overgeneral memories [31]. In a recent review Sumner [32] concluded that there is indeed reliable support for an association between rumination and OGM. Moreover, different experimental studies found that increased concrete sensory-perceptual processing (distraction) resulted in more specific memories compared to rumination [33-35]. Finally, Raes et al. [36] found an association between rumination and OGM, and concluded that rumination mediated the relationship with depression. We therefore expect rumination to be associated with OGM in our study.

Since no studies to our knowledge exist in which the relationship between OGM and interpretation bias, or between interpretation bias and rumination have directly been tested, these relationships were explored in this study. It could be speculated that a negative interpretation of a situation would lead depressive individuals to ruminate more often about that particular situation or about similar previous negative situations. Alternatively, it could be that rumination leads to more negative interpretations since people are in a negative mood after ruminating. Therefore, we expect rumination to be associated with a negative interpretation bias. With regard to the relationship between overgeneral memory and interpretation bias one could speculate that depressed individuals are inclined to interpret ambiguous situations more negatively when they draw their conclusions on their negative overgeneral memories (e.g., "this situation will probably turn out bad, since I always experience bad situations"). Alternatively, the tendency to interpret situations negatively could lead to overgeneral negative memories since most ambiguous situations will be stored negatively in long term memory (e.g., "I always experience bad interpersonal relationships, since last three times my friends ignored me"). We have no specific expectations with regard to these hypotheses, and therefore these analyses are explorative.

Method

Participants

Participants were recruited through posters and referrals of practitioners at various locations of the mental health institution PsyQ in the Netherlands. Interested participants could subscribe themselves through email or via their therapists. A total of 67 potential participants were contacted by this means. Of these potential participants, 53 showed up at the initial screening and the second meeting. To participate in the study, participants had to meet the following criteria: (a) meeting criteria for a primary diagnosis of current major depressive disorder, as defined by the Diagnostic and Statistical Manual of Mental Disorders, 4th edition, Text Revision (DSM-IV-TR), and as established using the Dutch version of the Structured Clinical Interview for DSM-IV Disorders Axis I (SCID-1; [37]; Dutch translation: [38]) conducted by one independent trained interviewer, and (2) being

either free of or stable on psychoactive medication for at least six weeks. Exclusion criteria were kept to a minimum to enhance the clinical representativeness of the sample. Patients were only excluded if they (1) met the DSM-IV criteria for psychotic disorder, or bipolar disorder, (2) had insufficient understanding of the Dutch language, (3) had substance abuse requiring specialist treatment or (4) did not attend the second meeting. For the exclusion criteria concerning diagnosis and use of mediation, the medical records and DSM-IV diagnoses known by the mental health institution PsyQ were used.

In total, 36 participants attended both meetings and met the criteria of a depressive disorder as primary diagnosis. The final group consisted of thirteen men from 23 to 63 years (mean age: 41.08 years, *SD* = 14.44) and 23 women from 19 to 56 years (mean age: 42.30, *SD* = 9.33). The sample was diverse with regard to cultural and educational background. Of this group, 24 participants were soon about to start their outpatient treatment and 12 participants just started their Cognitive Behavioral Therapy. Importantly, there were no significant differences between participants who were about to start and participants already in treatment with regard to their scores on the important test variables mentioned below, all *t*s<1.29, all *p*s >0.05 (see table 1). Therefore, data were combined and all analyses were performed for the overall sample.

	About to start treatment			*Just started treatment*		
Measures*	***M***	***SD***	***N***	***M***	***SD***	***N***
Age	39.04	10.78	24	47.50	10.40	12
BDI-II	33.83	9.20	24	31.25	7.61	12
RSS	43.21	8.57	24	40.92	8.19	12
SCIT	-1.86	7.30	22	-0.45	4.72	11
AMT Total	4.45	2.29	22	4.10	2.33	10

**Note.* BDI-II=Beck Depression Inventory 2; RSS=Rumination on Sadness Scale; SCIT=Sentence Completion Task; AMT=Autobiographical Memory Task.

Table 1: Descriptive statistics for the depressed sample divided per group ("About to start treatment" versus "Just started treatment").

Material

Structured clinical interview for DSM-IV disorders axis I disorders (SCID-1): The sections for mood disorders of the Dutch version of SCID-I were used to assess current major depressive disorder [37,38].

Beck depression inventory-second edition (BDI-II): The Dutch version of BDI-II [39,40] was administered to provide a measure of the severity of depressive symptomatology. The BDI-II contains 21 items (scored 0-3; range 0-63). The total score of the BDI-II was used in this study. The BDI-II has proven excellent reliability and sufficient construct validity [41]. Internal consistency of the BDI-II in our sample was good[1], Cronbach's $\alpha = 0.87$.

The rumination on sadness scale (RSS): The RSS was used to measure rumination on sadness [42,43]. The RSS consists of 13 items (score 1-5; range 13-65). Previous research has shown good reliability and good convergent and discriminant validity [43]. Internal consistency of the RSS in our sample was good, Cronbach's $\alpha = 0.86$.

Autobiographical memory test (AMT): A Dutch translation of two interviewer administered versions of the AMT was used to measure specificity of autobiographical memory [9,44]. Each version contained 10 words, 5 positive and 5 negative[2]. The cues were orally and visually presented in a fixed order alternating between positive and negative words. Participants were asked to recall in response to each cue a different specific memory about a personally experienced event that happened at a particular time and place, and that lasted less than one day. Furthermore, they had to respond with a specific memory within one minute. If participants gave a non-specific answer before the time limit, they were prompted one more time with 'Could you be more specific?'. Only the first response was scored. Once the minute passed away without a response, the experimenter went on to the next cue. Participants' reactions were recorded and scored later. Participants first practiced with neutral practice words until they understood the task correctly.

Each response was coded as either a specific memory (i.e. referring to an event at a particular time and place, lasting less than a day), a non-specific memory (i.e. categoric memory, an event that was about repeated occasions; extended memory, an event lasted longer than a day; no memory, a statement not being a memory), or as an omission (i.e. no response). The total number of specific responses was the dependent variable in this study.

Sentence completion interpretation task (SCIT): The SCIT was developed and used to measure the extent to which a negative interpretation bias is present. Six scenarios were translated and taken over from the *ambiguous test scenarios* designed by Holmes et al. [20]. Fourteen scenarios were added by the authors. In a pilot study 21 undergraduate students completed the original SCIT containing 20 items. Psychometrically weaker items were deleted. In the final version 15 ambiguous situations were presented and participants were instructed to complete the sentences describing the ambiguous situations using as many words as needed. Examples given: "You bought a new outfit for a party. When arriving at the party, you notice everybody is looking at you, because you look…in your new clothes" or "Lesley's boyfriend took Lesley out to dinner. Suddenly, he tells her that he wants to tell her something very important. Lesly's friend wants to….." or "You arrive and you see your friends sitting at the table. All of a sudden they burst out laughing. They probably talk about….". Negative interpretations were scored as '-1', neutral interpretations were scored as '0' and positive interpretations as '1'. The sum of all scores makes the total score ranging from -14 to 14. Internal consistency of the final SCIT in our sample was acceptable, Cronbach's $\alpha = 0.79$.

State-trait anxiety inventory (STAI): Due to other research purposes these results are not described in this study.

Impact of event scale (IES): Due to other research purposes these results are not described in this study.

Procedure

The Medical Ethical Committee of the Erasmus Medical Center Rotterdam approved this study. Participants understood all procedures in the research and knowingly agreed to them. After participants signed the informed consent, the SCID and the STAI were administered by a trained interviewer in a screening session. In the second session within two weeks after the first session participants completed the BDI, IES,

[1]George and Mallery [45] provide the following rules of thumb for labeling Cronbach's Alpha: "_ > 0.9 – Excellent, _ > 0.8 – Good, _ > 0.7 – Acceptable, _ > 0.6 – Questionable, _ > 0.5 – Poor, and _ < 0.5 – Unacceptable".

[2]The AMT cue words in English (Dutch) were as follows: Version 1 – *sorry* (spijt), *happy* (gelukkig), *angry* (boos), *safe* (veilig), *clumsy* (onhandig), *interested* (geïnteresseerd), *hurt* (gekwetst), *successful* (succesvol), *lonely* (eenzaam) and *surprised* (verrast); Version 2 – *rejected* (afgewezen), *hopeful* (hoopvol), *helpless* (hulpeloos), *dedicated* (toegewijd), *guilt* (schuld), *calm* (kalm), *horrible* (afschuwelijk), *unconcerned* (zorgeloos), *sorrow* (verdriet) and *satisfied* (tevreden).

Measures*	*M*	*SD*	*N*
Age	41.86	11.25	36
BDI-II	32.97	8.86	36
RSS	42.44	8.39	36
SCIT	-1.39	6.51	33
AMT Total	4.34	2.27	32
Total Omissions	1.66	2.06	32
Total Categoric	1.69	1.23	32
Total Extended	1.31	1.40	32
Total Repeated	0.34	.60	32
Total Specific	4.34	2.27	32
Total Verbal Association	0.66	0.94	32

**Note.* BDI-II=Beck Depression Inventory 2; RSS=Rumination on Sadness Scale; SCIT=Sentence Completion Task; AMT=Autobiographical Memory Task.

Table 2: Descriptive statistics for the depressed sample in total.

RSS, SCT and AMT in fixed order.

Design and data analysis

A correlational design was used in this study with alpha set at 0.05. Hypothesized relationships were tested two-sided since this study was explorative.

Results

Table 2 shows the clinical characteristics of the depressed sample. The mean scores are high for the BDI, and RSS, indicating severe depressive symptomatology, as well as rumination on sadness. On average, the participants recalled about $M = 4.34$ specific memories on a scale of ten. This finding is worth mentioning, considering the fact that the participants showed lower specificity compared to the specificity at baseline of undergraduate students on the same AMT conducted in our laboratory ($M = 6.78$; [44]). Furthermore, the participants recalled more categoric memories ($M = 1.69$) compared to the baseline score of undergraduates ($M < 0.05$). In their study Geraerts et al. [44] found that more intrusions after suppression of their most negative autobiographical memory were associated with larger reductions in specific memories.

Associations between depressive symptomatology and potential cognitive vulnerability factors

Table 3 presents the correlations between depressive symptomatology and several potential vulnerability factors, including rumination, overgeneral autobiographical memory and negative interpretation bias[3]. As expected, results showed a strong positive correlation between self-reported depressive symptomatology (BDI-II) and rumination, $r = 0.52$, $p < 0.01$[4]. Moreover, depressive symptomatology correlated negatively with the degree of positive interpretations participants made, $r = -0.58$, $p < 0.01$. These results remained significant after applying Bonferroni correction by dividing the alpha level number of hypotheses being conducted (0.05/6 = 0.008). Finally, no significant association was found between depressive symptomatology and the number of specific memories, $r = -0.20$, $p > 0.05$[5].

Interrelationships between potential cognitive vulnerability factors

Table 3 also presents the interrelationships between the three potential cognitive vulnerability factors for depression (rumination, interpretation bias and OGM). The association between the degree of positive interpretations made and rumination was not significant, $r = -0.19$, $p > 0.05$. Additionally, the relationship between the degree of positive interpretations made with the number of specific memories was not significant, $r = 0.15$, $p > 0.05$. Finally, the relationship between rumination and the number of specific recalled memories was not significant, $r = -0.03$, $p > 0.05$. In sum, the vulnerability factors were not significantly associated with each other.

Discussion

The main goal of this study was to replicate and further extend the results of earlier studies by investigating the presence and associations of an interpretation bias, rumination, and overgeneral autobiographical memory within clinically depressed outpatients. In accordance to our expectations, rumination and a negative interpretation bias were highly correlated with severity of depression. Moreover, autobiographical memory was not significantly related to depressive symptomatology, although there were indications that OGM was associated with depression, since the depressed patients showed lower specificity compared to undergraduate students on the same AMT conducted in our laboratory [44]. This result is in accordance with Williams et al. [8] suggestion that overgeneral memory is not related to severity but seems to be present in depressed populations.

Although the results suggest rumination, OGM, and a negative interpretation bias to be vulnerability factors for depression, the cross-sectional correlational nature of this study prevents inferences about causality. An alternative explanation may be that rumination, OGM and interpretation bias are epiphenomena of co-occurring variations in depression. Another explanation would be that the results were solely due to the negative state our depressed persons were in, and therefore might not represent vulnerabilities for depression. However, the relations here presented are in line with the abundant research carried out so far, which shows that these biases are vulnerability factors for depression, as reviewed in the introduction.

The main goal of this study was to explore the interrelationships between the cognitive vulnerability factors within depressed outpatients in accordance with the "association questions" of the combined bias hypothesis. There were no significant associations between the cognitive vulnerability factors in this study, hinting that rumination, OGM, and interpretation are not strongly associated and may well be largely distinct vulnerability factors for depression. Unfortunately, our sample size was small and lacked power for interrelations of small to medium effect size. This seems to be evident for the non-significant

[3]A helpful reviewer noted that since anxiety and depression are co-morbid, the scores on the State-Trait Anxiety Inventory could influence the scores on the cognitive bias test administered. Indeed, for both rumination and a negative interpretation bias the correlations were reduced once controlling for co-morbid anxiety. The degree of positive interpretations made by the participants did remain significantly negatively associated with severity of depression ($r = -0.36$, $p < 0.05$), which means that a negative interpretation bias is associated with depression even when controlling for anxiety. Since rumination is associated with both depression and anxiety [46] and power was low in this study, rumination was no longer significantly associated with severity of depression when controlling for anxiety ($r = 0.30$, $p = 0.10$). However, the correlation between rumination and depression was of medium effect size and would probably turn out to be significantly associated with depression when controlling for anxiety in studies using bigger samples.

[4]Three patients forgot to fill in the SCIT (see table 1). Furthermore, four audiotapes of the AMT could not be listened, due to a recording problem.

[5]We found no meaningful correlations between the other measures of the AMT with the BDI, RSS, SCIT. For brevity these results are not reported in this paper.

Measures	BDI-II	RSS	SCIT	AMT
BDI-II	-			
RSS	.52**	-		
SCIT	-.58**	-.19	-	
AMT	-.20	-.03	.15	-

Note: * $p<0.05$; ** $p<0.01$; BDI-II=Beck Depression Inventory 2; RSS=Rumination on Sadness Scale; SCIT=Sentence Completion Task; AMT=Autobiographical Memory Task

Table 3: Correlations between depressive symptomatology and potential cognitive vulnerability factors, and its interrelationships, within the depressed sample

relationship between interpretation bias and rumination. A post hoc power analysis revealed that the power on the basis of the effect size observed in the present study for the relationship between interpretation bias and rumination (r = -0.19) was rather low, specifically 0.19. Thus it is possible that the relation found in this study would turn out to be significant in a study with a bigger sample size. Therefore, we cannot rule out that the tendency to ruminate might lead to negative interpretations of ambiguous situations or that the tendency to interpret a situation as negative leads to rumination about that situation. Hence, more studies with bigger sample sizes are needed to see if there indeed is no relationship between interpretation bias and rumination. If so, however, we know from this study that the relationship will probably be of weak to medium effect size.

Strangely, we found no relation between overgeneral autobiographical memory and rumination, contradicting an expected relationship based on previous research [32]. An explanation might be that we did not find an association because we used a self-report measure to tap rumination while the AMT is a behavioral measure. Moreover, so far it is not clear what process exactly underlies the relationship between rumination and OGM, and therefore other factors might underlie in their relationship, for example working memory or self-relevance [32]. More research is needed to explore the relationship between OGM and rumination and more specifically the exact process by which they are related.

The current study has limitations that are important to address. First, the cross-sectional design of the study limits us to examining the associations between these variables, and it is therefore impossible to make inferences about causality or about their interplay. However, establishing whether vulnerability factors are associated needs to be demonstrated as a first step. The current study is important in this regard. Second, the absence of a non-depressed comparison group further limits conclusions. One could question, for example, whether self-reported levels of processes, such as rumination, that are obtained while someone is in a depressed state as indicative of vulnerability. However, as our literature review shows, these processes seem to stay stable over time and seem to predict subsequent depression and therefore can be conceptualized as vulnerability factors. Finally, as a result of a small sample size, this study lacked statistical power for small and medium effect sizes. However, one could question the clinical relevance of small to medium effect sizes between biases, since this indicates that the vulnerabilities are largely distinct factors. A strong benefit of this study is that participants are clinically depressed outpatients who presented themselves for treatment; in other words: external validity is strong.

Within these limitations, our results provide some further support for overgeneral autobiographical memory, rumination and interpretation bias as largely distinct vulnerability factors for depression.

The above-mentioned results, in conjunction with the literature about cognitive biases, could have implications for treating depression. Interventions targeting rumination, OGM and interpretation bias, or their underlying factors, might lead to enhancements in treatment effectiveness for depression. Cognitive Bias Modification seems promising here [3]. Moreover, new interventions aimed at targeting rumination, such as metacognitive therapy, produced interesting first results in treating treatment-resistant depressed individuals [27].

We also suggest that depressed people might benefit from more customized treatments targeting the specific bias based on the assessment of the presence of certain information processing biases at individual levels, since OGM, rumination and a negative interpretation bias seem to be largely separate vulnerability factors for depression. Where one individual might suffer from rumination another individual might be suffering more from the negative interpretations he makes. Well conducted treatment outcome studies are off course needed to see if this claim holds. Mainly, we hope this study initiates more research into the combined hypothesis by examining the interrelations and interplay of cognitive biases in depression.

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References

1. World Health Organization (2008) Global burden of disease: 2004 update. Geneva,WHO Press.
2. Boland RJ, Keller MB (2009) Course and outcome of depression. In Gotlib IH, Hammen CL (Eds.), Handbook of depression. (2nd Edn.), Guilford Press, New York, 23-43.
3. Baert S, Koster EHW, De Raedt R (2011) Modification of information- processing biases in emotional disorders: Clinically relevant developments in experimental psychopathology. Int J Cogn Ther 4: 208-222.
4. Beevers CG (2005) Cognitive vulnerability to depression: a dual process model. Clin Psychol Rev 25: 975-1002.
5. Joormann J, Gotlib IH (2010) Emotion regulation in depression: Examining the role of cognitive processes. Cogn Emot 24: 281-298.
6. Mathews A, MacLeod C (2005) Cognitive vulnerability to emotional disorders. Annu Rev Clin Psychol 1: 167-195.
7. Nolen-Hoeksema S, Wisco B, Lyubomirsky S (2008) Rethinking Rumination. Psychological Science 3: 400-424.
8. Williams JM, Barnhofer T, Crane C, Herman D, Raes F, et al. (2007) Autobiographical memory specificity and emotional disorder. Psychol Bull 133: 122-148.
9. Williams JMG, Broadbent K (1986) Autobiographical memory in suicide attempters. J Abnorm Psychol 95: 144-149.
10. Sumner JA, Griffith JW, Mineka S (2010) Overgeneral autobiographical memory as a predictor of the course of depression: a meta-analysis. Behav Res Ther 48: 614-625.
11. Kleim B, Ehlers A (2008) Reduced autobiographical memory specificity predicts depression and posttraumatic stress disorder after recent trauma. J Consult Clin Psychol 76: 231-242.
12. Watkins ER, Baeyens CB, Read R (2009) Concreteness training reduces dysphoria: proof-of-principle for repeated cognitive bias modification in depression. J Abnorm Psychol 118: 55-64.
13. Hirsch CR, Clark DM, Mathews A (2006) Imagery and interpretations in social phobia: support for the combined cognitive biases hypothesis. Behav Ther 37: 223-236.
14. Wisco BE (2009) Depressive cognition: self-reference and depth of processing. Clin Psychol Rev 29: 382-392.

15. Gupta R, Kar BR (2008) Interpretative Bias: Indicators of Cognitive Vulnerability to Depression. German Journal of Psychiatry 11: 98-102.

16. Dearing KF, Gotlib IH (2009) Interpretation of ambiguous information in girls at risk for depression. J Abnorm Child Psychol 37: 79-91.

17. Rude SS, Valdez CR, Odom S, Ebrahimi A (2003) Negative Cognitive Biases Predict Subsequent Depression. Cognitive Therapy and Research 27: 415-429.

18. Rude SS, Durham-Fowler JA, Baum ES, Rooney SB, Maestas KL (2010) Self-report and Cognitive Processing, Measures of Depressive Thinking Predict Subsequent Major Depressive Disorder. Cognitive Therapy and Research 34: 107-115.

19. Blackwell SE, Holmes EA (2010) Modifying Interpretation and Imagination in Clinical Depression: A Single Case Series Using Cognitive Bias Modification. Applied Cognitive Psychology 24: 338-350.

20. Holmes EA, Lang TJ, Shah DM (2009) Developing interpretation bias modification as a "cognitive vaccine" for depressed mood: imagining positive events makes you feel better than thinking about them verbally. J Abnorm Psychol 118: 76-88.

21. Lang TJ, Blackwell SE, Harmer CJ, Davison P, Holmes EA (2012) Cognitive Bias Modification Using Mental Imagery for Depression: Developing a Novel Computerized Intervention to Change Negative Thinking Styles. Eur J Pers 26: 145-157.

22. Nolen-Hoeksema S (1991) Responses to depression and their effects on the duration of depressive episodes. J Abnorm Psychol 100: 569-582.

23. Nolen-Hoeksema S (2012) Emotion regulation and psychopathology: the role of gender. Annu Rev Clin Psychol 8: 161-187.

24. Smith JM, Alloy LB (2009) A roadmap to rumination: a review of the definition, assessment, and conceptualization of this multifaceted construct. Clin Psychol Rev 29: 116-128.

25. Watkins ER (2008) Constructive and unconstructive repetitive thought. Psychol Bull 134: 163-206.

26. Watkins E, Scott J, Wingrove J, Rimes K, Bathurst N, et al. (2007) Rumination-focused cognitive behaviour therapy for residual depression: a case series. Behav Res Ther 45: 2144-2154.

27. Wells A, Fisher P, Myers S, Wheatley J, Patel T, et al. (2012) Metacognitive therapy in treatment-resistant depression: a platform trial. Behav Res Ther 50: 367-373.

28. Everaert J, Koster EH, Derakshan N (2012) The combined cognitive bias hypothesis in depression. Clin Psychol Rev 32: 413-424.

29. Gotlib IH, Kasch KL, Traill S, Joormann J, Arnow BA, et al. (2004) Coherence and specificity of information-processing biases in depression and social phobia. J Abnorm Psychol 113: 386-398.

30. Beck AT (2008) The evolution of the cognitive model of depression and its neurobiological correlates. Am J Psychiatry 165: 969-977.

31. Hauer B (2008) Autobiographical memory retrieval. Overgeneral memory and intrusions. Maastricht University, Maastricht.

32. Sumner JA (2012) The mechanisms underlying overgeneral autobiographical memory: an evaluative review of evidence for the CaR-FA-X model. Clin Psychol Rev 32: 34-48.

33. Raes F, Watkins ER, Williams JM, Hermans D (2008) Non-ruminative processing reduces overgeneral autobiographical memory retrieval in students. Behav Res Ther 46: 748-756.

34. Watkins E, Teasdale JD (2001) Rumination and overgeneral memory in depression: Effects of self-focus and analytic thinking. J Abnorm Psychol 110: 353-357.

35. Watkins E, Teasdale JD (2004) Adaptive and maladaptive self-focus in depression. J Affect Disord 82: 1-8.

36. Raes F, Hermans D, Williams JM, Beyers W, Brunfaut E, et al. (2006) Reduced autobiographical memory specificity and rumination in predicting the course of depression. J Abnorm Psychol 115: 699-704.

37. First MB, Spitzer RL, Gibbon M, Williams JBW (1996) Structured Clinical Interview for DSM-IV Axis I Disorders, Clinician Version (SCID-CV). American Psychiatric Press, Inc, Washington, DC.

38. First MB, Spitzer RL, van Groenestijn MAC (1999) Gestructureerd klinisch interview voor de vaststelling van DSM-IV-As-I- stoornissen. Swets Test Publishers, Swets & Zeitlinger, Lisse.

39. Beck AT, Steer RA, Brown GK (1996) The Beck Depression Inventory (2nd Edn.), The Psychological Corporation, San Antonio, Texas.

40. Does AJWV (2002) BDI-II-NL, Handleiding De Nederlandse versie van de Beck Depression Inventory (2nd Edn.), Harcourt Test Publishers, Lisse.

41. Evers A, Vliet-Mulder JCV, Groot CJ (2005) Documentatie van tests en testresearch in Nederland, aanvulling 2005/01. Boom test uitgevers, Amsterdam.

42. Conway M, Csank PA, Holm SL, Blake CK (2000) On assessing individual differences in rumination on sadness. J Pers Assess 75: 404-425.

43. Raes F, Hermans D, Eelen P (2003) Kort instrumenteel De Nederlandstalige versie van de Ruminative Response Scale (RRS-NL) en de Rumination on Sadness Scale (RSS-NL). / The Dutch version of the Ruminative Response Scale (RRS-NL) and the Rumination on Sadness Scale (RSS-NL). Gedragstherapie 36: 97-104.

44. Geraerts E, Hauer BJA, Wessel I (2010) Effects of Suppressing Negative Memories on Intrusions and Autobiographical Memory Specificity. Applied Cognitive Psychology 24: 387-398.

45. George D, Mallery P (2003) SPSS for Windows step by step: A simple guide and reference. 11.0 update (4th Edn.), Allyn & Bacon, Boston.

46. Nolen-Hoeksema S (2000) The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. J Abnorm Psychol 109: 504-511.

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