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Rumination is Associated with the Phenomenal Characteristics of Autobiographical Memories and Future Scenarios

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Abstract

In the present studies it was investigated whether rumination was associated with the phenomenal characteristics of autobiographical memories and future scenarios. In three studies student participants completed questionnaires on rumination and recalled and rated a positive and a negative memory. In Studies 2 and 3 participants also generated and rated a positive and a negative future scenario. Memories were rated on reliving and emotional valence; future scenarios were rated on reliving, emotional valence and how probable the scenario was. Generally, the results showed that a higher degree of rumination was related to more reliving of negative memories and future scenarios as well as more negative expectations for the future scenarios. These processes may help explain why rumination predicts depression and other types of negative affect.

KEYWORDS: AUTOBIOGRAPHICAL MEMORY, FUTURE SCENARIOS, RUMINATION

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Introduction

Several theorists argue for a strong interplay between autobiographical memories and the self or identity (Conway, 2005; McAdams, 1993; Singer & Salovey, 1993). This relationship has been supported in studies finding associations between individual differences, such as traits and dominant motives, and the thematic content of autobiographical memories (e.g. McAdams et al., 2004; Woike, 1995). However, the association between individual differences and memories may not only reveal itself in memory content but may also be evident in phenomenal characteristics of memories (e.g. Rasmussen & Berntsen, in press; Rubin & Siegler, 2004).

In the present studies it was investigated whether the phenomenal characteristics of memories are associated with rumination and if this association is a function of valence. Rumination has been defined in a variety of different ways, but generally rumination involves repetitive self-focused negative thoughts about the past, like stressors, goal discrepancies and traumas and a focus on negative emotions (Janoff-Bulman & Berg, 1998; Martin & Tesser, 1996; Nolen-Hoeksema, 1991; Tait & Silver, 1989; Tedeschi & Calhoun, 2004; Thomsen, 2006; Watkins, 2008). Rumination may be a particularly relevant individual difference variable, because it involves repetitive negative thoughts about the self, e.g. rehearsal of memories (Nolen-Hoeksema, Wisco & Lyubomirsky, 2008; Trapnell & Campbell, 1999). Finding associations between rumination and the phenomenal characteristics of autobiographical memories could contribute to understanding the process of rumination and why rumination is associated with increased negative affect (see Thomsen, 2006; Watkins, 2008 for reviews).

There are at least two reasons why one would expect associations between rumination and the phenomenal characteristics of memories. First, if autobiographical memory is conceptualised as a part of the self, then negative focusing on the self through rumination would

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also include a negative focus on one's autobiographical memories, which may influence the phenomenal characteristics of memories. Second, increased recall of negative autobiographical memories has been suggested to be one of the mechanisms linking rumination and negative affect (Lyubomirsky, Caldwell & Nolen-Hoeksema, 1998). Because rumination focuses selectively on negative material one would expect rumination to be associated with the phenomenal characteristics of negative memories and not with phenomenal characteristics of positive memories.

It has been suggested that the autobiographical memory system underpins projections of the self into the future (Schachter, Addis & Buckner, 2007; Tulving, 2002). Thus, individual differences in phenomenal characteristics of memories may also extend to similar individual differences in the phenomenal characteristics of such future projections (Quoidbach, Hansenne & Mottet, 2008). Rumination focuses primarily on past negative experiences (e.g. Wood, Saltzberg, Neale, Stone & Rachmiel, 1990). However, when ruminating individuals are asked to generate future scenarios, the phenomenal characteristics of especially their negative future scenarios may also be associated with rumination, because such future projections are supported by the same processes involved in recalling memories (Schacter et al., 2007). Also, studies showing that rumination is related to anxiety and worry, which focus on the future (Fresco, Frankel, Mennin, Turk & Heimberg, 2002; Segerstrom, Tsao, Alden & Craske, 2000; Watkins, 2008), support the notion that rumination may also be related to negative future scenarios.

Thus, there are several reasons to believe that rumination would be associated with the phenomenal characteristics of negative memories and future scenarios. Hence, this was examined in three studies, where rumination was related to reliving and emotional valence of both negative and positive memories and future scenarios.

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Rumination and Autobiographical Memory

In order to derive more specific predictions for the association between rumination, memories and future scenarios, different conceptualizations of rumination are briefly introduced. The literature on rumination is extensive and understandings of rumination vary according to areas of study (see Watkins, 2008 for a review). Below stressor-related rumination (e.g. Tait & Silver, 1989) and depressive rumination (e.g. Nolen-Hoeksema, 1991) are distinguished.

Here, the term stressor-related rumination is used as an umbrella term for rumination focused on negative events, like stressors, goal discrepancies and traumas (Janoff-Bulman & Berg, 1998; Martin & Tesser, 1996; Tait & Silver, 1989; Tedeschi & Calhoun, 2004). It is important to emphasize that stressor-related rumination is a process experienced by everyone when stressors are encountered, although some individuals ruminate more than others and more severe stressors elicit more rumination. According to this view, rumination is the processing of negative events that are discrepant from mental structures, like goal-hierarchies, schemata and basic assumptions about the world and self. As such, rumination necessarily includes rehearsal of the negative events as well as thoughts about the meaning and implications of the events (e.g. Michael, Halligan, Clark & Ehlers, 2007). For some individuals this processing of negative events becomes extended and associated with negative affect.

Following the above, rumination should be related to increased reliving of negative memories because rumination includes rehearsal of negative memories and rehearsal has been associated with higher degrees of reliving (e.g. Bohn & Berntsen, 2007). This prediction would also agree with studies showing that event-specific rumination predicts Post Traumatic Stress Disorder (e.g. Ehlers, Mayou & Bryant, 1998; Michael et al., 2007), which is characterized by

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re-experiencing the trauma memory, although such studies do not directly address phenomenal characteristics of the trauma memory.

Depressive rumination, on the other hand, is conceptualized as an abstract and analytical thinking style focused on mood and symptoms of distress, for example “when I feel depressed I think about the reasons for and consequences of my sadness” (e.g. Nolen-Hoeksema, 1991). Most research on rumination and autobiographical memory, has adopted this conceptualization of rumination and several studies have investigated associations between depressive rumination and over-general categoric memory, i.e. the recall of memories summarized across several situation versus recall of specific situations. The studies generally find that increased rumination is associated with recalling more categoric memories, both in clinical (e.g. Park, Goodyer & Teasdale, 2004; Watkins & Teasdale, 2001) and student samples (e.g. Raes, Watkins, Williams & Hermans, 2008). In addition, the relationship between rumination and categoric memory has been found with both experimental (e.g. Watkins & Teasdale, 2001, 2004) and correlation designs (e.g. Raes, Hermans, Williams & Eelen, 2007; Raes et. al., 2006). Over-general recall is assumed to reflect functional avoidance of the emotional experiences associated with recalling specific memories (Williams et al., 2007). Because specific memories consists of brief slices of sensory-perceptual-affective information from the original situation (episodic memory or ESK; Conway, 2005; Conway & Pleydell-Pearce, 2000), whereas over-general categoric memories are abstracted from experience, over-general categoric memories are assumed to be associated with lower degrees of reliving. Since rumination is associated with over-general recall, rumination thus contributes to cognitive avoidance (Williams et al., 2007, see also Borkovec, Ray & Stöber, 1998 for a related idea concerning worry).

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The studies on rumination and over-general memory do not directly examine phenomenal characteristics. However, because rumination is associated with over-general memory, which is assumed to be characterized by a lower degree of emotional reliving (see Mansell & Lam, 2004 for support), it is possible that rumination would be associated with lower reliving of negative memories in the present study. This is because highly ruminating individual access sensory-perceptual-affective information to a lesser extent when recalling negative memories. Following this line of reasoning, one might expect rumination to be associated with less reliving of negative memories.

However, in the present studies we followed the predictions from the stressor-related understanding of rumination. Thus, we predicted that rumination would be associated with increased reliving of negative memories and future scenarios. There are several reasons for this. First, a recent study found that rumination was associated with a higher degree of emotional reaction to intrusive memories (Williams & Moulds, 2010). Second, we used measures of stressor-related rumination in the present studies. Assuming that such stressor-related rumination occurs in response to many negative memories such rumination may function as rehearsal which increases reliving of negative memories. Third, a recent series of studies have indicated that over-general memory in depression may be due to reduced executive resources (Dalgleish et al., 2007). Likewise, rumination may hinder recall of specific memories and the associated reliving because it drains executive resources (Teasdale et al, 1995). In the present studies (2 and 3), recall was not time limited and thus the effect of rumination on executive resources may be less pronounced, allowing the recall of specific memories associated with high reliving.

In addition to increased reliving of negative memories, rumination may be associated with a more negative emotional valence of memories and future scenarios. This may be 1)

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because highly ruminating individuals actually experience more negative events, 2) because they interpret events more negatively or 3) because the repetitive focus on negative events increases the associated affect (Martin & Tesser, 1996). Previous studies have also supported the relationship between rumination and more negative valence for memories (Lyubomirsky et al., 1998; Teasdale & Green, 2004).

To sum up, the present studies investigated associations between 1) rumination and 2) phenomenal characteristics of autobiographical memory and future scenarios, measured as higher reliving and negative valence for negative memories and future scenarios.

Study 1

Method

Participants

The participants were 82 psychology students (72 women, 9 men and one blank) with an average age of 24.99 years ($SD = 4.40$), who completed the questionnaires as a part of a research methods course.

Materials and Procedure

The participants completed a packet of questionnaires. To measure rumination, the Emotional Control Questionnaire-Rumination subscale (ECQ-R, Roger & Najarian, 1989) was used. This subscale includes 14 items rated on five-point Likert scales. The items focus on stressor-related rumination, referring to problems, accidents and interpersonal conflicts. Higher scores indicate higher degrees of rumination. Internal reliability was satisfactory (Cronbach's $\alpha = 0.77$).

The participants were given one minute to recall a very negative and shocking memory and one minute to recall a very positive memory. We chose to focus on a shocking memory for

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reasons not relevant to the present study. The order was counterbalanced (see Berntsen, 2002 for the procedure). Examples were given for both types of memories.

Participants had five minutes to write down keywords of as many details as they could remember from the negative and shocking/positive event. Examples of negative memories included deaths, interpersonal conflicts and low exam grades. Examples of positive events included being in love, finishing high school, being accepted at university and pregnancy/births.

They were then asked to rate the memory on questions 1-5 in Table 1 and estimate the age of the memory. Questions 1-3 addressed reliving qualities and questions 4-5 addressed emotional qualities of memories. These questions are standard measures within autobiographical memory research. The questionnaire also included other questions not relevant to the present study.

For ethical reasons and because participants were placed close to each other, they were allowed to select a less negative and shocking/positive memory. This option was given through a standard instruction given in the questionnaire. Thirteen and 9 participants respectively chose this option as indicated by responding “yes” to the questions about whether they had selected a less negative and shocking/positive memory. Arguably participants may opt to respond with a less intense memory, even if not explicitly allowed to and this procedure made possible assessment of how frequently this was the case. All memories were included in the analysis, but the pattern of results was similar when these individuals were excluded from analysis.

Results and Discussion

A series of independent t-tests showed no systematic effects of counterbalancing and thus the data were collapsed for the two groups in the following analysis.

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In agreement with predictions, a series of Pearson's correlations showed that rumination was associated with a higher degree of reliving of negative memories (see Table 2). However, in disagreement with previous studies (Lyubomirsky et al., 1998; Teasdale & Green, 2004), rumination was not associated with recalling more negative memories, perhaps because negative memories in the present study focused on shocking memories. Highly ruminating individuals did not recall more recent memories, suggesting that age of memory was not a confounder.

Study 2

In Study 2, it was attempted to replicate these results with positive and negative life story memories and extend the results to future scenarios. A life story memory is a specific memory which the individual perceives as central to her/his life story and which symbolizes key themes and concerns (McAdams, 1993). Study 2 included life story memories and future scenarios because such memories and scenarios are central to identity and self-understanding (McAdams, 1993) and thus may be especially likely to be associated with other aspects of personality, like rumination.

It has been suggested that recalling the past and imagining the future relies on the same underlying system (Schacter et al., 2007; Tulving, 2002). This has been supported by studies finding similarities between phenomenal characteristics of memories and future scenarios (e.g. Berntsen & Jacobsen, 2008; D'Argembeau & van der Linden, 2004) and the time distributions of memories and future scenarios (e.g. Berntsen & Jacobsen, 2008; Spreng & Levine, 2006). Suicidal inpatients also generate over-general categoric future scenarios, parallel to their over-general categoric memory recall (Williams, Ellis, Tyers & Healy, 1996), although a more recent

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study has demonstrated that suicidal patients also have vivid future images of suicide attempts (Holmes, Crane, Fennell & Williams, 2007).

One interesting avenue for further research in this area is whether individual differences are associated with memories and future scenarios in similar ways. This has been investigated in one recent study (Quoidbach et al., 2008) where it was found that only Neuroticism showed consistent associations with the valence of both past and future events, whereas other personality traits showed few and inconsistent associations with past and future events. However, as argued above, rumination may be an individual difference variable of particular relevance for the phenomenal characteristics of autobiographical memory and future scenarios. Therefore in the present study rumination was expected to be associated with higher reliving and more negative emotional valence for negative future scenarios parallel to the associations between rumination and negative memories.

In addition, the relationship between rumination and future expectations was investigated. Studies have shown that rumination is associated with pessimism (Nolen-Hoeksema, Parker & Larson, 1994) and rumination is associated with more negative expectations for the future (Lyubomirsky & Nolen-Hoeksema, 1995). Thus, it was predicted that highly ruminating individuals would judge the probability of negative future scenarios as more likely and the probability of positive future scenarios as less likely.

Method

Participants

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The participants were 132 psychology students (106 women, 25 men and one blank) with an average age of 26.06 ($SD = 5.65$), who were required to complete the questionnaires as a part of a research methods course.

Materials and Procedure

Participants completed the Rumination-Reflection Questionnaire (RRQ, Trapnell & Campbell, 1999). The rumination subscale of the RRQ contains 12 items rated on 5-point Likert scales with higher scores indicating higher degree of rumination. A different rumination scale was utilized in order to investigate if the findings from Study 1 would replicate with another measure of rumination. However, like the ECQ-R this scale focuses on stressor-related rumination, with items referring to negative episodes and situations. The scale showed good internal reliability (Cronbach's $\alpha = 0.91$).

Participants were then asked to recall and describe specific memories of 1) a high point and 2) a low point (adapted from McAdams, www.sesp.northwestern.edu/foley/instruments/). A high point/low point was described as an experience associated with very positive/very negative emotions lasting no more than one day. If a longer period of time came to mind the participants were asked to select the experience in the sequence most clearly associated with these emotions. Examples of low point memories included deaths, accidents, interpersonal conflicts and low exam grades. Examples of high point memories included being in love, being accepted at university and pregnancy/births. After each description the memory was rated on questions 1-5 in Table 1 and participants estimated the age of the memory. The questionnaire also included other questions not relevant to the present study.

Participants were then asked to imagine and describe their most positive and their most negative future scenario. A positive future scenario was described as a future that included

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dreams and goals, whereas a negative future scenario was described as a future that was unwanted and feared. Participants were asked to try to be realistic. Examples of positive future scenarios included having an exciting career and being happily married with children. Examples of negative future scenarios included having no/a poor job, divorces/living alone and being handicapped or psychologically disturbed. The future scenarios were then rated on questions 6-8 in Table 1.

For ethical reasons and because participants were placed close to each other, they were allowed to select a less intense alternative to each element; 27, 14, 12 and 9 participants chose this for the high point memory, the low point memory, the positive and the negative future scenario respectively. All memories and scenarios were included in the analysis, but the pattern of results was similar when these individuals were excluded from analysis.

Results and Discussion

A series of Pearson's correlations showed a general pattern, where rumination was associated with increased reliving for only the low point memory, thus replicating the results of Study 1 (see Table 3). Rumination was also associated with having more negative low point memories. This is different from the Study 1 results, but in agreement with previous studies in the area (Lyubomirsky et al., 1998; Teasdale & Green, 2004). Highly ruminating individuals did not recall more recent memories, suggesting that age of memory was not a confounder.

In order to examine the relationship between rumination and the positive and negative future scenarios, a series of Pearson's correlations were calculated (see Table 4). Generally the results indicate that rumination was associated with stronger reliving for negative future scenarios. This is consistent with the memory results from Studies 1 and 2. Highly ruminating individuals were also more likely to believe that negative future scenarios would be fulfilled and

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less likely to believe that positive future scenarios would be fulfilled. But contrary to expectations, rumination was not associated with generating more negative future scenarios.

Study 3

In Study 3 it was attempted to replicate the results from Study 2, while addressing two methodological concerns of Studies 1 and 2. First, in Studies 1 and 2 participants were tested in a group setting, which may interfere with the recall, description and rating of highly personal memories. Hence, in Study 3, participants were emailed questionnaires, allowing them to complete questions under more private circumstances. Second, both Studies 1 and 2 sampled mostly female psychology students, limiting the generalizability of results. Hence in Study 3, the sample consisted of both male and female students from various study programmes.

Participants and Recruitment

The participants were 583 freshmen from different faculties at the University of Aarhus (408 women) with an average age of 22.00 years ($SD = 5.02$), who completed the questionnaires as a part of a larger packet (see Thomsen, Tønnesvang, Schnieber & Olesen, under review for further details). They were recruited through the Registry at the University of Aarhus, which sends emails to all freshmen as a part of the enrolment procedure. Participants were provided with links to electronic versions of the questionnaires.

Materials and Procedure

Participants completed the RRQ (Trapnell & Campbell, 1999). As in Study 2, the scale showed good internal reliability (Cronbach's $\alpha = 0.90$).

Participants were then asked to recall and describe specific memories of 1) a high point and 2) a low point (adapted from McAdams, www.sesp.northwestern.edu/foley/instruments/). A high point/low point was described as an experience associated with very positive/very negative

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emotions lasting no more than one day. After each description the age of the memory was estimated and the memory was rated on questions 2 and 5 in Table 1. Only two questions were included, because the study items were a part of a larger packet, and questions 2 and 5 were most central to predictions.

Participants were then asked to imagine and describe their most positive and their most negative future scenario. A positive future scenario was described as a future that included dreams and goals, whereas a negative future scenario was described as a future that was unwanted and feared. Participants were asked to try to be realistic. Participants then rated the future scenarios on questions 6-8 in Table 1.

Results and Discussion

It was first tested if the correlations between rumination and the other central variables were significantly different between women and men (Fisher's Z test). Since this was generally not the case ($Z < 1.96$, except for the correlation between rumination and reliving of the negative future scenario, where the correlation was higher for men, but significant and positive for both men and women), data were collapsed across gender in the following analyses.

Pearson's correlations showed that rumination was associated with increased reliving for only the low point memory, thus replicating the results of Studies 1 and 2 (see Table 3). Rumination was also associated with recalling more negative low point memories (note that because of the direction of the scale, this correlation is positive). This is in agreement with Study 2 and previous studies in the area (Lyubomirsky et al., 1998; Teasdale & Green, 2004). Highly ruminating individuals did not recall more recent memories, suggesting that age of memory was not a confounder.

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In order to examine the relationship between rumination and the positive and negative future scenarios, a series of Pearson's correlations were calculated (see Table 4). Generally, the pattern of results is similar to Study 2. Rumination was associated with stronger reliving for negative future scenarios and believing that negative future scenarios were more likely and positive future scenarios were less likely. In agreement with Study 2 there were no associations with the emotional valence of future scenarios. Surprisingly, rumination was also associated with increased reliving for the positive future scenario.

General Discussion

Although the correlations were small, the results of the three studies generally confirmed that highly ruminating individuals experience more reliving when thinking about negative events in both the past and the future. In agreement with previous studies (e.g. Lyubomirsky & Nolen-Hoeksema, 1995), a high degree of rumination was also associated with estimating a negative future as more likely than a positive future. The expected relationship between rumination and more negative valence was found for low point memories in Studies 2 and 3, but not for negative memories in Study 1 or negative future scenarios.

Rumination and Reliving of Negative Memories and Future Scenarios

That highly ruminating individuals experienced more reliving when thinking about negative past and future events is in agreement with viewing rumination as encompassing rehearsal of negative memories (e.g. Michael et al., 2007; Nolen-Hoeksema et al., 2008), which is then associated with higher reliving at recall. The results are also consistent with previous studies showing that rumination is related to a higher degree of emotional reaction to negative autobiographical memories (Williams & Moulds, 2010).

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Alternatively, since the procedure in the studies did not include timing of memory recall, highly ruminating individuals may have dwelled selectively longer on their negative memories and future scenarios than less ruminating individuals. This dwelling may have increased the reliving and negative emotional valence experienced in response to the negative memories and future scenarios. This would be in agreement with the suggestion that prolonged focus polarizes emotional responses (Martin & Tesser, 1996).

The finding that rumination was also related to increased reliving of negative future scenarios extend previous studies (e.g. Berntsen & Jacobsen, 2008; D'Argembeau & van der Linden, 2004; Quoidbach et al., 2008) by showing that individual differences in rumination display similar associations with memories and future scenarios. However, there were also differences in that rumination was associated with more negative emotional valence (Studies 2 and 3) for memories but not future scenarios. One possibility is that the association between valence for negative memories and rumination is due to ruminating individuals actually experiencing more negative events in their past. That is, the associations between rumination and valence of negative memories are not due to interpretative processes but rather reflect real differences in the events experienced. If this is the case, then the association between rumination and valence may not extend into the future. Generally, the results suggest that relationships between memory and aspects of personality can fruitfully be extended to include future scenarios.

The results may appear to disagree with studies showing that rumination is associated with over-general memory (see Williams et al., 2007 for a review). However, memory specificity was not assessed in the present study, which focused on phenomenal characteristics and future studies clearly need to assess both specificity and phenomenal characteristics to further

illuminate the relationship between rumination and autobiographical memory and future scenarios. Still, the present results are relevant to the literature on rumination and over-general memory because they indicate that rumination cannot generally be viewed as cognitive avoidance with respect to recall-processes, but may also have properties that serve to magnify emotional reactions to negative memories. Thus, rumination may influence recall processes in two ways: 1) cognitive avoidance (e.g. over-general memory) and 2) cognitive magnification (increased reliving of negative memories and future scenarios). Below, we discuss how rumination may be associated with both vivid negative memories and over-general memory.

First, in the present studies, participants recalled emotional memories and were allowed relatively long retrieval times compared to earlier studies. Thus, rumination may drain executive resources (Brewin, Reynolds & Tata, 1999; Teasdale et al., 1995), interfering with the hierarchical retrieval process and result in over-general memories in experiments with brief retrieval times (Christensen, 2007). However, when longer retrieval times are allowed, highly ruminating and worrying individuals may recall memories of negative events associated with strong reliving qualities.

Second, over-general memory may co-exist with vivid memories (Schönfeld & Ehlers, 2006). Studies have shown that although depressed individuals have over-general memory, depression is also related to vivid negative memories (Williams & Moulds, 2007) and vivid negative future images (Holmes et al., 2007; Holmes, Lang, Moulds & Steele, 2008). Retrieval-induced forgetting may be one process that could explain the co-existence of over-general memory and vivid negative memories (and future scenarios) in rumination and depression (Wessel & Hauer, 2006). Thus, if individuals ruminate over (i.e. rehearse) certain specific memories, these memories may maintain their vividness over time, while at the same time

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inhibiting the recall of other specific memories. This could result in over-general memories when these individuals are tested on the autobiographical memory test, which samples memories more broadly (AMT, Williams & Broadbent, 1986). This is also supported by studies showing that recall of general memories on the AMT is related to avoidance and intrusions of specific trauma memories (Brewin et al., 1999; Kuyken & Brewin, 1995; Schönfeld & Ehlers, 2006).

In addition, the participants in the present studies were healthy students. It is possible that the nature and effects of rumination change when the individual experience prolonged negative affect, e.g. rumination may become more abstract thus serve functions of cognitive avoidance. This is consistent with previous studies finding associations between rumination and over-general memory only among sad participants (e.g. Park et al., 2004; Sutherland & Bryant, 2007) and with experiments showing that rumination does not increase sad mood in neutral participants (e.g. Lyubomirsky & Nolen-Hoeksema, 1993; 1995). However, the effect of depression was not examined in the present studies and thus the potential interactions between rumination and depression in relation to the phenomenal characteristics of memories and future scenarios needs further studies. Also, the present studies operationalized rumination as stressor-related rumination. It is possible that questionnaires measuring depressive rumination (e.g. the Ruminative Responses Scale, Nolen-Hoeksema & Morrow, 1991), which is a more abstract and analytical process may show different results. Still, different measures of rumination tend to show similar associations with for example depression (Thomsen, 2006; Watkins, 2008). This indicates that although different modes of rumination may exist (e.g. stressor-related and depressive rumination), these modes of rumination may show similar associations with other variables (at least when measured as individual difference variables, Thomsen, 2006).

Limitations

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The designs were correlational and the central findings need to be replicated within experimental paradigms, inducing participants to ruminate, recall/generate memories and future scenarios and rate reliving, emotional valence and expectations. Also, because multiple correlations were calculated, there may be a danger of type 2 errors. However, the pattern of findings was consistent across three studies, which would be unlikely if the specific correlations were due to type 2 errors.

The correlations were generally low and were not entirely consistent across the three studies. However, this is often the case when investigating associations between individual differences and memories (e.g. McAdams et al., 2004; Rubin & Siegler, 2004; Woike, 1995) and may reflect that type of event and recall context also explain variations in memory content and phenomenal characteristics of memories. In addition the use of single questions may also have attenuated correlations and future studies should sample more memories and use scales rather than single questions. Still, finding similar correlations across three different studies testifies to the validity of the results.

The samples consisted mainly of healthy students and hence the present associations between rumination and phenomenal characteristics of memories and future scenarios may not generalise to clinical samples.

Conclusion and Perspectives

Ruminating individuals experience more reliving of their negative memories and future scenarios. In addition, they had more negative memories and more negative expectations for the future. These processes may help explain why rumination predicts depression and other types of negative affect. Thus, when negative events from the past or future enter consciousness, they

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evoke stronger emotional responses, perhaps intensifying negative moods and instigating more rumination.

The present results are also of relevance to the understanding of autobiographical memory, since they indicate that individual difference in the tendency to rehearse memories may help explain reliving and emotional qualities of memories. Considering rumination as one type of rehearsal, also highlights that rehearsal is not a passive repetition process but is selective, motivated and play a role in changing interpretations and emotional reactions to memories.

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Table 1

Questions on Memory Characteristics. Variable Names Shown in Italics.

Q1: How *vivid* is the memory? With 1 = *not at all* and 7 = *very vivid*

Q2: Do you *relive emotions* from the event, when you think back upon it now? With 1 = *not at all* and 7 = *very much*. In Study 3 with 1 = *not at all* and 5 = *very much*.

Q3: Do you *relive* bodily feelings and *physical* reactions from the events, when you think back upon it now? With 1 = *not at all* and 7 = *very much*.

Q4: How emotionally *intense* was the event? With 1 = *not at all* and 7 = *very intense*.

Q5: How did you experience the event emotionally? With 1 = *very negative*, 4 = *neutral* and 7 = *very positive*. (*valence*) In Study 3 with 1 = *moderately positive/negative*, 2 = *very positive/negative* and 3 = *extremely positive/negative*.

Q6: Do you experience emotions as you think about the positive/negative future scenario now? With 1 = *not at all* and 7 = *very much*. (*reliving*). In Study 3 with 1 = *not at all* and 5 = *very much*.

Q7: What is the nature of these emotions? With 1 = *very negative*, 4 = *neutral* and 7 = *very positive*. (*valence*). In Study 3 with 4 = *neutral and mixed*.

Q8: How much do you believe that the positive/negative future scenario will be full-filled? with 1 = *not at all* and 7 = *very much*. (*probability*)

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Table 2

Correlations Between Rumination and Memory Characteristics in Study 1.

	Rumination	
	Negative memory <i>N</i> = 78-80	Positive memory <i>N</i> = 74-79
Age of memory	-0.11	-0.11
<u>Reliving questions</u>		
Vivid	0.13	0.00
Relive emotions	0.20(*)	0.04
Relive physical	0.23*	0.09
<u>Emotional quality questions</u>		
Intense	-0.06	-0.13
Valence	0.05	0.00

* $p < 0.05$, (*) $p < 0.10$

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Table 3

Correlations Between Rumination and Memory Characteristics in Studies 2 and 3.

	Study 2		Study 3	
	Rumination		Rumination	
	N=127-31		N= 583	
	Low point	High point	Low point	High point
Age of memory	-0.04	-0.11	-0.06	-0.05
<u>Reliving questions</u>				
Vivid	0.17(*)	-0.06	-	-
Relive emotions	0.21*	-0.05	0.14*	-0.01
Relive physical	0.14	0.08		
<u>Emotional quality questions</u>				
Intense	0.11	-0.05	-	-
Valence	-0.27*	-0.07	0.13*	-0.02

* $p < 0.05$, (*) $p < 0.10$

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Table 4

Associations Between Rumination and Characteristics of the Future Scenarios in Studies 2 and 3.

	Reliving		Valence		Probability	
	Positive	Negative	Positive	Negative	Positive	Negative
Study 2						
Rumination	0.05	0.18*	-0.08	-0.10	-0.27*	0.27*
Study 3						
Rumination	0.17*	0.22*	-0.04	0.01	-0.11*	0.14*

* $p < 0.05$, (*) $p < 0.10$