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**Title:** Worry and rumination : underlying processes and transdiagnostic characteristics  
**Issue Date:** 2014-06-10
Chapter 7

General discussion
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The main aim of this thesis was to clarify some of the pending issues surrounding the transdiagnostic nature of worry and rumination as well as whether they share the same underlying processes and functions. In accordance with this aim several studies were designed covering two lines of research; i) epidemiological studies comparing worry and rumination in their relationship with each other and with emotional disorders; ii) experimental studies examining worry at a more functional/process level.

In this general discussion I will once more highlight the criteria for a transdiagnostic process as well as those for a shared underlying process with reference to the previous chapters in which these criteria were addressed. A brief summary of the main findings of each chapter will be provided and discussed with respect to their contribution to the ongoing worry-rumination debate. This is followed by a discussion of more general theoretical and clinical implications of the findings reported in this thesis including the advantages and disadvantages of adopting a transdiagnostic approach and suggestions for future directions of research. Finally, limitations of the present thesis will be addressed followed by an overall conclusion.

Criteria transdiagnostic process
As stated in the introduction a transdiagnostic process should meet several criteria:
1) to be present across multiple disorders but not due to comorbidity with one specific disorder (chapter 2 & 3);
2) exhibit similar process characteristics across these disorders (chapter 5); and
3) contribute to the onset, maintenance and/or recurrence of psychopathology across disorders (chapter 4).

Criteria shared underlying process
Even if worry and rumination are indeed established to be transdiagnostic processes this does not necessarily mean that they share the same underlying process. In case of a shared underlying process between worry and rumination, it is to be expected that they
1) are present in the same disorders (chapters 2 & 3);
2) have the same causal status regarding these (emotional) disorders (chapter 4);
3) share the same process characteristics (chapters 5 & 6); and
4) are highly interrelated (chapter 3).

Overview of results

Part A: Worry & rumination: relations with emotional disorders
In Chapters 2, 3 and 4 three studies are presented investigating the first main aim of this thesis (i.e., comparing worry and rumination in their relationship with each other and with emotional disorders). All three studies are conducted using epidemiological data from
the Netherlands Study of Depression and Anxiety (NESDA). This ongoing longitudinal cohort study includes 2981 participants who are followed for many years. The study has several important strengths among which a large sample size, prospective design and the inclusion of multiple waves.

Chapter 2 describes a study with a cross-sectional design examining the predictive utility of both worry and rumination. Specifically, it investigated whether worry and rumination have incremental validity in predicting the presence of a history or current occurrence of emotional disorders over and above more general personality traits while taking comorbidity into account. This was tested within the theoretical framework of the Integrative Hierarchical Model (Mineka, Watson, & Clark, 1998) which proposes that each of the emotional disorders contains general (common to all), specific (common to some) and unique components. To our knowledge, both worry and rumination have thus far not been tested as predictors in a hierarchical model. In the present study their role was investigated both in disordered patients (n = 1111) and in participants who were in remission (n = 834), hence exploring whether elevated scores on cognitive constructs merely reflect an epiphenomenon of current psychopathology or not. The sample consisted of participants taking part in the baseline assessment of NESDA. Disorders of interest were generalized anxiety disorder (GAD), panic disorder (PD), social anxiety disorder (SAD), major depressive disorder (MDD) and dysthymia (DYS) according to DSM-IV criteria as assessed with the CIDI. The study includes several cognitive measures: anxiety sensitivity, pathological worry and cognitive reactivity (including a subscale on rumination on sadness). In line with the aim of this thesis we will focus the discussion of the results on those concerning worry and rumination in particular.

Participants with a current disorder scored higher on worry and rumination than participants not currently meeting diagnostic criteria. Scores were elevated across all disorders. The same pattern of results was found when comparing participants in remission to a group with no history of psychopathology. Subsequently, hierarchical regression analyses were performed using a built in psychiatric control group. In the current disorder sample worry had additional predictive value over and above personality traits and the other cognitive constructs in predicting GAD. The same was true for rumination in predicting MDD. So, even though worry and rumination levels were elevated across emotional disorders worry had a more defining role in GAD and rumination in MDD. In the remission sample rumination had once again added predictive value for MDD. Worry on the other hand did not predict remitted GAD and was overruled by the influence of neuroticism. Results were replicated in analyses correcting for comorbidity.

These results suggest that worry and rumination are elevated across disorders (transdiagnostic criterion) both in the acute phase and once remitted. The data do not disclose whether elevated levels constitute a vulnerability factor or are for instance the result of scarring. Besides being present across disorders elevated scores are also present in the same disorders (precondition shared process). Results of the hierarchical regression analyses however, ascribe a more prominent role for worry in predicting GAD (acute
phase) and for rumination in predicting MDD (acute and remitted phase). Note that these predictive roles are relative and not absolute. Overall, our findings reveal that cognitive constructs have additional value in understanding anxiety and depressive disorders over and above personality traits. Moreover, they prove to be more than mere epiphenomena of current disorders.

Chapter 3 describes a study with a longitudinal design including three-waves and focusses on the stability of worry, rumination and psychopathology over time as well as the reciprocal relationships among these three phenomena. So far most studies have focused on cross-sectional or uni-directional relationships of worry and rumination with each other and with particular emotional disorders, and did not examine reciprocal effects nor the temporal character of the effects. The present study overcomes this gap in the literature and contributes directly to the ongoing debate regarding the question whether worry and rumination are conceptualizations of the same underlying process and whether they are transdiagnostic or not.

In this study we used the entire NESDA sample consisting of 2981 participants. Participants were tested over two year time-intervals with T2 including 87.1% and T3 80.6% of the original sample. Confirmatory factor analyses revealed that the latent structure and stability of emotional disorders was best represented by the distress (GAD, MDD, DYS) - fear (SOC, PD, AGO) model which is in line with recent measurement model studies of psychopathology (for an overview see Beesdo-Baum et al., 2009). This division allowed us to study the relationships between worry/rumination and emotional disorders while taking comorbidity into account.

Using structural equation modelling trait-state models were fitted for worry, rumination, distress disorders and fear disorders. Results showed that both worry and rumination contain stable underlying trait components. So far test-retest periods were usually quite short and this study is the first to reveal that stability is present over longer periods of time. Moreover, results also showed that the stable components of worry and rumination were highly correlated (.76) which supports the notion of a solid, shared, base and thus provides the preconditions for a shared process. Also in line with the proposition of a shared process was the finding that worry and rumination show similar relationships with both fear and distress disorders; in other words, they are present in the same disorders and relate to them in the same way. Besides being present in the same disorders they were also present across both fear and distress disorders, although associations with the distress disorders were slightly stronger than with the fear disorders. This was expected as GAD and depression - typically linked to worry and rumination respectively - were both placed in the distress disorder category. However, differences were modest and correlations between the trait components of worry/rumination and psychopathology were strong in all four trait-state models investigated. This underlines worry/rumination’s involvement across emotional disorders and is in line with criteria for a transdiagnostic process.

Another aspect examined in this study was whether worry/rumination and emotional disorders were mutually reinforcing each other over time resulting in a downward spiral.
Results did however not confirm this hypothesis. Changes in worry and rumination were not predictive of changes in fear or distress levels two years later. However, the opposite effects—change in psychopathology on change in repetitive negative thinking—were significant albeit small to medium in strength.

Overall, the findings from this study highlight the similarities between worry and rumination and support their conceptualization as transdiagnostic processes. The fact that state changes in psychopathology are not preceded by state changes in worry/rumination but vice versa suggests that fluctuations in worry/rumination may merely be epiphenomena of emotional disorders. From a clinical perspective it therefore seems more pertinent to modify the underlying trait component(s) of worry and rumination in order to obtain endurable therapeutic benefits.

Chapter 4 describes a study in which both cross-sectional data and longitudinal data (three-waves) are used to examine the role of worry and rumination in the occurrence of comorbidity among emotional disorders. A prerequisite for a cognitive process to be considered a transdiagnostic factor is its presence among multiple disorders. It is generally assumed that such transdiagnostic factors not only contribute to the occurrence of a specific disorder but are also (in part) responsible for comorbidity among these disorders. Worry and rumination (also referred to by the overarching term repetitive negative thinking (RNT)) are such candidate transdiagnostic factors. However, if RNT truly contributes to the high comorbidity rates among emotional disorders it should not only cross-sectionally relate to comorbidity but also mediate the relationship between anxiety and depressive disorders and vice versa. McLaughlin and Nolen-Hoeksema (2011) found support for the involvement of rumination in the co-occurrence of anxiety and depressive symptoms. However, this study only examined symptoms, not clinical diagnoses; and furthermore, it only examined rumination and did not include other types of RNT (such as worry). The aim of this study was to test whether RNT also accounts for the comorbidity among emotional disorders, both cross-sectionally and longitudinally. In other words, this study is a conceptual replication of McLaughlin and Nolen-Hoeksema (2011), focusing on clinical diagnoses instead of symptoms and examining two types of RNT—worry and rumination. We expected that both rumination and worry would account for the cross-sectional overlap of emotional disorders at baseline and would mediate the prospective cross-disorder relations among emotional disorders.

The same three wave samples were used as in the chapter 3 study including 2981 participants at baseline, 87.1% of the original sample at the 2 year follow-up, and 80.6% at the 4 year follow-up. The cross-sectional baseline data were used to perform separate ANOVA’s to compare worry/rumination levels between different groups with/without comorbidity. Structural equation modelling was used to fit the longitudinal mediation models. Like in chapter 3, the distress (GAD, MDD, DYS)-fear (SOC, PD, AGO) model was chosen to represents the latent structure and stability of emotional disorders as it had the best fit to the data. Two longitudinal mediation models were examined: one examining the role of rumination as a putative mediator of the longitudinal association of
distress with fear disorders (and vice versa) and one examining the role of worry in these longitudinal relations. In this way we could analyze whether baseline distress disorders predicted changes in rumination/worry and whether these changes predicted subsequent changes in fear disorders (and vice versa).

Our cross-sectional baseline findings showed that worry and rumination scores were elevated in both the fear and distress group when compared to participants with no current emotional disorder. Moreover, participants with distress disorders obtained higher scores than participants with fear disorders. Critically, worry and rumination levels were particularly high in those with comorbid fear and distress diagnoses. This finding is in line with results from the McEvoy et al. (2013) study and supports the transdiagnostic hypothesis, which assumes that higher levels of RNT are associated with higher levels of comorbidity.

Results of the longitudinal mediation models showed that worry and rumination both significantly mediated the longitudinal association between baseline fear disorders and later (4-year follow-up) distress disorders. These mediation results suggest that the increased risk of a future distress disorder when suffering from a fear disorder is partly attributable to worry and rumination. Partly attributable, as the mediation effects are small. The same applies for the longitudinal distress (baseline) \(\rightarrow\) fear (4-year follow-up) association with the exception that only rumination significantly mediated this association and worry did not.

Overall, the findings from the present study suggest that repetitive negative thinking in the form of rumination or worry constitutes an important transdiagnostic factor responsible for the co-occurrence of emotional disorders. In transdiagnostic treatment interventions for emotional disorders it seems warranted to include interventions specifically targeting this transdiagnostic factor.

**Part B: Mechanisms involved in worry: Avoidance**

In chapters 5 and 6 experimental studies are presented addressing the second main aim of this thesis (i.e., studying process and functional characteristics of worry). As the NESDA study is not designed to investigate worry at process level additional experimental studies were conducted to accommodate for this.

**Chapter 5** presents two experimental studies examining worry at process level, specifically, whether reduced concreteness is a pivotal component in explaining the cognitive avoidance function of worry and indeed leads to poorer problem solving as is often suggested. The prevailing theory concerning worry’s avoidance function is the Avoidance Theory of worry (Borkovec, Ray, & Stöber, 1998) which postulates that worry is a form of **cognitive avoidance** that operates via the reduction of aversive imagery with the purpose to avoid somatic anxiety reactions. However in doing so it is believed to undermine emotional processing and thereby contribute to the maintenance of worry. The two studies discussed in this chapter focussed on a caveat in the avoidance theory namely on **how worrying leads to reduced imagery**. The Reduced Concreteness theory
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of worry (Stöber, 1998; Stöber & Borkovec, 2002) posits that the mediator between worrying and reduced imagery is reduced concrete thinking (increased abstract thinking), which is presumed to be characteristic of worry. Concrete thinking is defined as “distinct, situationally specific, unequivocal, clear, singular” whereas abstract thinking is described as “indistinct, cross-situational, equivocal, unclear, aggregated” (Stöber & Borkovec, 2002, p. 92). The Reduced Concreteness theory hypothesizes that it is the relatively abstract style of thinking during worry which is responsible for reduced aversive visual imagery. So far the presence of reduced concreteness in worriers has been established to occur in the problem analyses phase (Stöber, 1996; Stöber, Tepperwien, & Staak, 2000; Stöber & Borkovec, 2002), however not yet during the problem solution generation phase. The latter had thus far only been investigated, and found, in participants with depression (Watkins & Baracaia, 2002; Watkins & Moulds, 2005).

Experiment 1 investigated whether high trait worriers (N = 40) adopt a more abstract thinking style compared to low trait worriers (N = 40) during the phase of problem solution generation and whether concreteness training improves social problem solving (SPS). SPS skills were assessed with the Worry Domain Means-Ends Problem Solving task (WD-MEPS). In this task participants were presented with a problem situation relevant to their personal circumstances and asked to find the ideal strategy for overcoming the problem situation and thereby reach a given ending (Marx, Williams, & Claridge, 1992). Problem solutions were rated for the number of steps (means) provided and on their effectiveness. Experiment 2 was a replication of the first study (high trait worriers N = 49, low trait worriers N = 48) extended to examine other aspects of SPS related to worry: problem orientation, problem solving style and problem solving confidence.

Results from both studies indicated that there were no baseline differences in thinking style (abstract/concrete) or problem solving skills (means/effectiveness) between high and low trait worriers. The claim that level of concreteness has a causal effect on problem solving was partly supported as results from the second experiment revealed that concreteness training had a positive effect on problem solving (number of means) relative to the abstract training. Effectiveness scores showed a similar pattern but this did not reach significance. Although high worrier’s problem solving skills were not found to be impaired, compared to low worriers they did report low problem solving confidence, a dysfunctional (negative) problem orientation and an overall avoidant problem solving style. Overall these results, combined with results from previous studies showing reduced concreteness in the problem analysis phase, suggest that high trait worriers’ SPS skills are intact and that impairments lie within the early stages of SPS. Although results differ from those found in depressive samples differences in study characteristics could possibly account for that, leaving the matter as to whether worry and rumination share this mechanism of reduced concreteness only partly answered.

Chapter 6 presents an experimental study focussing on the presence of behavioural avoidance in decision making and how this affects the maintenance of worry. Findings from a previous study by Mueller et al. (2010) suggest that worrying leads to improved
decision making on the Iowa Gambling Task (IGT) as evident through a steeper learning curve. In the IGT (Bechara et al., 1994), four decks of cards are simultaneously presented to the participant. Each selection of a card leads to either an addition or subtraction of points (money). The task is designed in such a way that repeated selection of card decks A and B leads to long term net loss and repeated play of decks C and D leads to long term net gain. Participants are instructed to maximize their winnings. The reinforcement schedule is too complicated for participants to figure it out but they typically develop an intuitive preference for decks C and D. The positive effect of worry on decision making reported by Mueller et al. (2010) could pose a reinforcement mechanism underlying pathological worrying. However, the standard IGT does not reflect decision making in a social context and critically, due to the forced nature of the task, it does not accommodate for anxiety disorder’s hallmark characteristic: avoidance. Pathological worriers tend to engage in mental procrastination and dwell on certain issues which may lead them to postpone or abandon decision making altogether. In order to examine the role of such avoidance behaviour or ‘inaction’ in decision making, the current study used both the standard IGT and a newly developed adaptation of the IGT that included a pass option (IGT-P). We expected high worriers to engage in avoidance behaviour (selection of the pass button) more often than low worriers and that this would mediate the relationship with their performance on the task i.e. whether they would select from the long term advantageous decks.

A total of 157 participants took part in the study of which 78 in the standard IGT and 79 in the adjusted IGT-P. Results were mixed. We did not replicate Mueller et al.'s (2010) findings on the standard IGT that high worriers outperform low worriers; no differences between groups were observed. On the IGT-P on the other hand we found –as expected- that high worriers performed worse than low worriers when given the option to avoid decision making. Also we found that pass usage led to poorer IGT performance. However, the relationship between worry and performance on the IGT was –to our surprise- not mediated by avoidance.

These results suggest that the mere option to avoid affects high worriers differently from low worriers. Explanations for this finding are speculative as the data do not provide a clear-cut answer. It is possible that the added complexity of the task by means of introducing a pass option increases uncertainty. With high worriers typically being intolerant of uncertainty (IU; Buhr & Dugas, 2006) it is possible that the impact was more pronounced in this group consequently fuelling worry related activity and exerting cognitive resources needed to unravel the task.

Overall, results from the present study do not support the notion of improved decision making in high worriers and therefore also do not provide evidence for the accompanying positive reinforcement hypothesis. On the contrary, when extending the IGT with an option to avoid decision making and thus to more closely resemble real-life, performance is even worse in high compared to low worriers. Whether the added complexity of the task affects ruminators in a similar way as worriers can not be determined from the present data and should be addressed in future studies.
Theoretical integration of findings

Worry and rumination have been proposed to be conceptualizations of the same shared underlying transdiagnostic process that in their definition only differ in their temporal orientation (worry-future; rumination-past). In order to qualify as being both transdiagnostic and as being reflections of the same underlying process several criteria (described at the start of this general discussion) should be met. In this section findings from the present thesis will be linked to these criteria and placed within a broader context. Overlapping criteria will be collapsed to avoid repetition.

Present across and in the same disorders
Thus far the assumption that worry and rumination are transdiagnostic processes was mainly based upon studies showing that both cognitive processes were present across multiple disorders (Harvey et al., 2004; Ehring & Watkins, 2008). However these studies did often not consider the option that comorbidity of disorders may be responsible for the observed elevated levels. The results from the present thesis show that levels are elevated during both the acute phase and the remitted phase of emotional disorders (chapter 2) and that even when taking comorbidity into account worry and rumination are both involved across fear and distress disorders (chapter 3). From a hierarchical point of view worry has a more defining role in GAD and rumination in MDD (chapter 2). This does not contradict the transdiagnostic nature of both concepts, it only means that they are more prominently present in some disorders than others. This may partly be due to the specific wording of the questionnaire items and repeating the analyses with a more generic RNT measure is advisable. In sum, the data presented in this thesis supports the first criterion of a transdiagnostic process as well as that of a shared underlying process.

Besides worry and rumination there are other candidate transdiagnostic thought processes that are likely to play an important role in all or some of the emotional disorders. In recent years, literature has for instance seen a real boost of articles proposing perfectionism (for an overview see Egan, Wade, & Shafran, 2011) and intolerance of uncertainty (e.g. Mahoney & McEvoy, 2012; Carleton, 2012) as transdiagnostic concepts. In addition to thought processes, there are also memory processes (e.g. explicit selective memory), reasoning processes (e.g. emotional reasoning), and behavioural processes (e.g. avoidance/safety behaviour) which are likely to meet transdiagnostic criteria (Harvey et al., 2004, p.270). Even with processes common to multiple (emotional) disorders, the way psychological disorders present themselves can vary greatly. Mansell et al. (2008) have proposed three possible explanations for this: (1) variations in idiosyncratic current concerns; (2) variations in the degree of shared processes and (3) distinct processes for specific disorders or groups of disorders (Mansell, Harvey, Watkins, & Shafran, 2008). Further examination of these propositions is necessary to get a better understanding of how transdiagnostic processes can be placed within existing frameworks and in order to more clearly define their role in understanding and treating psychological disorders.
Shared process characteristics across and in the same disorders

Worry and rumination have many similarities; they are both repetitive forms of thinking, negative in valence (e.g. Ehring & Watkins, 2008) and characterized by cognitive inflexibility and difficulty in switching attention from negative stimuli (Davis & Nolen-Hoeksema, 2000; Hazlett-Stevens, 2001). Another proposed central element of both worry and rumination is reduced concreteness. Previous studies have shown that reduced concreteness plays a pivotal role in dysphoric individuals and that increasing concreteness improves social problem solving (solution generation phase) (Watkins & Moulds, 2005) and reduces depressive symptomatology (Watkins, Baeyens, & Read, 2009; Watkins & Moberly, 2009; Watkins et al., 2012). In worry/GAD the presence of reduced concreteness has been found in the problem analyses phase (Stöber, Tepperwien, & Staak, 2000; Stöber & Borkovec, 2002) but not in the problem solution generation phase (chapter 5). These contrasting findings highlight a potential difference between worry and rumination, namely that there is a nuance to be made regarding the aspects they influence and consequently the moments in time during which their influence is most pronounced. This difference is not in line with the criterion that worry and rumination share the same process characteristics even though the mechanism itself (reduced concreteness) is essentially the same. More differences between worry and rumination have been articulated over the years (see Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008 for an overview), of which the most well-known is that of the direction of processing. Whereas worry is considered to be future oriented focussing on anticipated threats, rumination on the other hand is considered to be past-oriented focussing on issues of self-worth, meaning and themes of loss (Nolen-Hoeksema et al., 2008). Other differences concern the conscious and non-conscious motives underlying both cognitive processes. Whereas the conscious motive to worry is to prepare and anticipate for threat (Borkovec, Hazlett-Stevens, & Diaz, 1999), that of rumination is to gain insight, solve problems and to understand the deep meanings of events (Lyubomirsky & Nolen-Hoeksema, 1993; Papageorgiou & Wells, 2001; Watkins & Baracaia, 2002). The non-conscious motives of worry and rumination are both concerned with avoidance. In line with the Avoidance Theory of worry (Borkovec, Ray, & Stöber, 1998) the non-conscious motive of worry is thought to be the avoidance of somatic anxiety reactions and negative affect whereas that of rumination is the avoidance of aversive situations and the responsibility to take action (Nolen-Hoeksema et al., 2008). Although different, at a higher level both types of avoidance can be referred to by the overarching concept Experiential Avoidance. Experiential avoidance has been defined as the phenomenon that occurs when a person is unwilling to remain in contact with particular private experiences (e.g. bodily sensations, emotions, thoughts, memories, behavioral dispositions) and takes steps to alter the form or frequency of these events and the contexts that occasion them (Hayes, Wilson, Gifford, Folette & Strosahl, 1996). The term avoidance refers to both cognitive avoidance (chapter 5) and behavioural avoidance (chapter 6). Elevated levels of EA have indeed been reported in GAD and MDD (Cribb, Moulds, & Carter, 2006; Salters, Raffa, & Orsillo, 2005) and suggest a general inability to accept things as they are, and to just let things be. Interestingly, interventions such
as ‘Mindfullness based therapy’ (Segal, Williams, & Teasdale, 2002) and ‘Acceptance and Commitment therapy’ (Hayes, 2004; Hayes, Luoma, Bond, Masuda & Lillis, 2006) focus on skills to address these deficiencies. Overall, it seems that at a higher level worry and rumination seem very similar, even identical, but that once these aspects are dissected, differences emerge. Therapeutic interventions aimed at higher level processes may well be effective. However, it is likely that to really optimize clinical effects fine-tuning of interventions is needed to address the lower level differences.

Co-occurrence of worry and rumination, and their contributions to onset, maintenance and/or recurrence of psychopathology

Co-occurrence of anxiety and depressive disorders is very common (e.g. chapter 2, 3 and 4) and is associated with higher levels of worry and rumination than in the instance of a single diagnosis (McEvoy, Watson, Watkins, & Nathan, 2013; chapter 4). This link between heightened levels and comorbidity supports the hypothesis that worry and rumination are transdiagnostic concepts; however, it does not exclude the option that they are merely epiphenomena reflecting—in the instance of comorbidity—more severe psychopathology.

Findings reported in the present thesis confirmed the presence of heightened levels of worry and rumination during both the acute and remitted phase of emotional disorders, even when controlling for residual symptoms (chapter 2). Hence, these results do indicate that there is more to worry and rumination than just being epiphenomena. This conclusion is in line with longitudinal prospective studies that showed that rumination predicts the occurrence of both anxiety and depressive symptoms over time, including new onset of depressive disorders (Nolen-Hoeksema, 2000). Likewise, worry has been found to be a vulnerability factor predicting increments of anxiety and depressive symptoms over time (Hong, 2007). Furthermore, an extensive review of the literature on repetitive (negative) thinking (RNT) also revealed that RNT is a vulnerability factor for both anxiety and depressive disorders (Watkins, 2008). The present thesis adds to these longitudinal findings by showing that both worry and rumination mediate the relationship between the presence of fear disorders at baseline and the occurrence of distress disorders 4 years later. Moreover, the association between baseline distress disorders and changes in fear disorders is mediated by changes in rumination, although changes in worry as a mediator did not reach significance in this prospective analysis (chapter 4). Overall, it appears that the accumulating evidence on the causal status of worry and rumination reveals a very similar overall pattern for both cognitive constructs, hence in line with requirements for a shared underlying process. Nonetheless, it is an area which is still very much in progress and there is plenty of ground left to uncover.

High interrelatedness of worry and rumination

The assumption that worry and rumination share the same process is largely based on studies showing significant correlations between the two constructs (e.g. Segerstrom et al., 2000, $r = .32$ to $r = .46$; Muris et al., 2004, $r = .55$; Watkins, 2004, $r = .51$; Hong, 2007, $r = .42$). It is surprising how easily and frequently worry and rumination are referred to as
being one and the same considering that these correlations are –although significant– not as high as would be expected of processes that are hypothesized to be so similar. The reason for these relatively low correlations is not clear. Results from this thesis provide however a possible explanation. When disentangling trait and state components of worry and rumination it becomes clear that trait components are highly related (chapter 3, $r = .76$) whereas state level fluctuations are only moderately related (chapter 3, $r$'s varying between .39 and .45). The observed score correlations mentioned before, are lower than the trait correlations. However, the observed scores also include a state component which represents the effects of external circumstances and measurement error. This is likely an important contributing factor to the lower observed score correlation. However at trait level worry and rumination are highly interrelated and thus meet preconditions for a shared process.

**Advantages and disadvantages of the transdiagnostic approach**

The disorder specific approach has been really successful in elucidating the onset and maintenance of various psychiatric disorders and has resulted in the development of many (cognitive-behavioural) therapies that have proven to be very effective (e.g. Beck, Rush, Shaw, & Emery, 1979 [depression]; Clark & Ehlers, 2004 [posttraumatic-stress disorder]; Salkovskis, 1989 [obsessive-compulsive disorder]; Clark, 1988 [panic disorder]). However, the progress made within this perspective seems to be levelling off and there is still a large group of patients left that do not respond (sufficiently) to existing therapies. Furthermore, over time it has become evident that comorbidity among disorders is very common, while disorder specific therapies do not adequately address comorbidity among disorders. In cases where there is comorbidity the clinician has several options: 1) Treat one disorder with the idea that this will impact upon the comorbid disorder: this is indeed the case, however effects on the comorbid disorder are limited and there is propensity to relapse in the comorbid disorder; 2) Apply evidence based treatments sequentially: the downside to this approach is mainly the higher costs involved; 3) Combine evidence based treatments: this option is however at risk of diluting efficacy and has been reported to be less effective than applying one single disorder specific treatment; and 4) Apply a transdiagnostic approach addressing the shared maintaining mechanisms: this latter option has recently sparked a lot of interest and appears to be the most promising. For a more extensive overview and discussion of these four options in treating comorbid disorders we refer to McManus et al. (2010).

The recent interest in a transdiagnostic approach to psychiatric disorders has resulted in an ever increasing number of papers on candidate transdiagnostic processes (e.g. Harvey, Watkins, Mansell, & Shafran, 2004; Nolen-Hoeksema & Watkins, 2011) as well as on transdiagnostic therapies (e.g. McManus et al., 2010; Clark, 2009; Mansell et al., 2009; Clark & Taylor, 2009) in which some clear advantages, but also disadvantages are outlined. The most important ones are discussed below.
Transdiagnostic processes

Advantages
Firstly, many processes (e.g. worry, thought suppression, experiential avoidance) that were initially proposed to be specific to a certain disorder have turned out to be present across multiple disorders. Thus investigating transdiagnostic processes seems to fit better with the nature of psychopathology and therefore provides a better use of limited research resources. Secondly, the transdiagnostic approach holds promise in understanding and explaining the high comorbidity rates among disorders as well as why certain disorders in particular seem to group together. From a transdiagnostic point of view processes common to multiple disorders are the ones that may be (partly) responsible for the co-occurrence of disorders. A view supported by findings presented in the present thesis (chapter 4). Thirdly, insight into the different transdiagnostic processes as well as into how they are all interrelated provides new angles for therapeutic interventions. For a more extensive overview and discussion of these advantages of investigating transdiagnostic factors we refer to Nolen-Hoeksema and Watkins (2011).

Disadvantages
Firstly, and most importantly, although transdiagnostic processes may be very useful in explaining comorbidity among disorders, research has fallen behind in explaining how people characterized by the presence of the same process can suffer from different disorders. Harvey et al. (2004) suggested that the factor defining which disorder one develops is the topic of current concern. More recently however Nolen-Hoeksema and Watkins (2011) proposed a heuristic for developing transdiagnostic models of psychopathology, in which topic of current concern is only one factor in an elaborate model in which biological factors also have an important role. Their model includes different levels of transdiagnostic risk factors, mechanisms and mediators which all interact and contribute to the development of a certain disorder. This attempt to provide a framework in which to place transdiagnostic factors is promising but in need of further study. It is for instance not clear how the different levels of transdiagnostic (risk) factors are exactly related. A second disadvantage of the transdiagnostic approach is that it has thus far not succeeded in explaining how the presence of the same transdiagnostic factor can lead to the development of different disorders at different times in someone’s life (Nolen-Hoeksema & Watkins, 2011). Especially between childhood/adolescence and adulthood there appears to be a shift in the presented symptoms. McLaughlin and Nolen-Hoeksema (2011) observed this in the instance of the transdiagnostic risk factor rumination and attributed the difference to the fact that internalized psychopathology in youths is less differentiated than in adults. However, what mechanisms or factors are responsible for this differentiation is not yet clear.

Research into candidate transdiagnostic processes, their causal role and the development of models explaining their interrelatedness is of fundamental importance for the development of new transdiagnostic therapies. In recent years research on transdiagnostic
processes has indeed received more attention. This is not only reflected in the large number of articles published in this area but for instance also by an announcement of NIMH in 2013 stating a new research framework that abandons the symptom focused categories of DSM-5 and alternatively focuses on domains containing functions that transcend disorder categories. As mentioned before one of the questions that remains is which processes should be included as targets for therapeutic interventions. A process that is very likely to make the cut is repetitive negative thinking (worry/rumination), a choice which is supported by the findings in this thesis.

Transdiagnostic therapies

Advantages

Firstly, as mentioned above, a transdiagnostic approach may prove to be a good way to deal with comorbidity among disorders. Addressing the processes that are shared by the comorbid disorders might elicit positive changes across the board (e.g. Mansell et al., 2009; McManus, Shafran, & Cooper, 2010; Nolen-Hoeksema & Watkins, 2011). A second advantage concerns the costs involved. A transdiagnostic approach lends itself better for group therapy as it can be applied in heterogeneous groups. Considering group therapy is cheaper and with the pressure on mental health care to reduce its costs, this constitutes an important benefit (Clark, 2009). Thirdly, therapists will need to learn fewer techniques/protocols, which increases the chances of dissemination of the therapy and ultimately a higher rate of patients that receive evidence based treatments (e.g. McManus et al., 2010; Clark & Taylor, 2009). Fourthly, transdiagnostic treatments could be beneficial for patients who do not respond to disorder specific treatment and for those who suffer from disorders ‘not otherwise specified’ for which there is currently no clear specific treatment (Mansell et al., 2009). In addition transdiagnostic treatments may be useful in treating residual symptoms or in preventing people who are at risk of developing mental health problems (Clark, 2009; McManus et al., 2010).

Disadvantages

The main disadvantage of embracing the transdiagnostic perspective is the risk of losing the progress that has been made with the disorder specific approach. It should not be forgotten that the existing disorder specific therapies do yield positive effects for many; a result which is still questionable for the transdiagnostic approach (McManus et al., 2010; Clark & Taylor, 2009). Furthermore, the disorder specific therapies already include components that target transdiagnostic mechanisms (e.g. avoidance in anxiety disorders), thus the differences between the two perspectives is really one of degree (Clark & Taylor, 2009). Therefore the question remains whether a transdiagnostic approach will really add enough additional value to existing and well-established therapies. The second disadvantage is inherent to the early stage the transdiagnostic approach is currently in. Its (theoretical) concept and practical consequences are still rather vague and seem to include many different components. It is at risk of becoming too complex and failing to connect sufficiently to clinical practise (cp.
Nolen-Hoeksema & Watkins, 2011). Although clinical practise is erratic and relatively simple explanatory models do not always suffice, they do provide a working model that can be disseminated to clinical practise at large. With time, hopefully a clearer working model of the transdiagnostic perspective will be developed, overcoming these obstacles. Thirdly, therapies focussing on altering transdiagnostic processes may not appeal to patients consequently resulting in higher dropout rates and less motivation for therapy. After all, compared to interventions tackling general processes a disorder specific approach more closely resembles the patients’ thoughts and experiences thus providing a feeling of being understood and implying expertise of the therapist. So even when using a transdiagnostic approach it may be important to add disorder specific and/or idiosyncratic elements.

Some efforts to develop new transdiagnostic therapies have already been made. Fairburn, Cooper and Shafran (2003) for instance proposed a general therapy for eating disorders (Fairburn et al., 2009), Barlow, Allen and Choate (2004) developed a unified treatment for emotional disorders and then there are treatments that target disorders in general such as mindfulness (Segal, Williams, & Teasdale, 2002) and acceptance and commitment therapy (ACT: Hayes, 2004; Hayes et al., 2006). Results of these interventions are somewhat mixed and reflect the early stages of transdiagnostic treatments as well as the bulk of work still needing to be done. So the question remains where in the therapeutic landscape the transdiagnostic treatment should be located? Should it replace disorder specific therapies? Is it best suited as a pre-therapy preceding the ‘real’ disorder focussed therapy? Or should it be regarded as the main therapy followed by a few sessions targeting disorder specific elements? These questions are not answered as yet but the overall consensus seems to be that it should be complementary as it is very unlikely to outperform disorder specific, tailored, interventions (Clark, 2009; Clark & Taylor, 2009).

Overall it can be concluded that the transdiagnostic approach is still in its infancy and a lot of work is still needed to be done. The importance of the advantages and the clear potential that this approach has warrants further research into this area.

**Strengths and limitations**

The studies described in this thesis all have certain strengths and limitations which are described in detail in the respective chapters. The most important ones will be repeated and elaborated upon here.

**Strengths**

Some of the main strengths of this thesis come from using data from the Netherlands Study of Depression and Anxiety (NESDA) (chapters 2, 3 and 4). The NESDA study provided us with the unique opportunity to examine worry and rumination in a large
population (power) coming from different health care settings (generalizability) within a longitudinal design including multiple waves. Thus far rumination and especially worry have mainly been studied using a cross-sectional design or prospectively with relatively short follow-up periods, limiting the interpretation of the findings. NESDA's longitudinal design allowed us to examine the stability, fluctuations, and interactions between worry and rumination as well as with emotional disorders over a four year period. Our studies further benefited from the inclusion of numerous disorders in NESDA, allowing us to add to the existing literature by examining the incremental validity of worry and rumination in predicting various emotional disorders as well as by investigating the transdiagnostic nature of both cognitive constructs while taking comorbidity into account.

Another strength concerns the tasks used in the experimental studies (chapters 5 and 6). Existing well established experimental paradigms were modified to tailor for worry specific characteristics subsequently allowing us to study worry at process level. The problem solving task MEPS-P used in chapter 5 was especially designed to meet an important prerequisite of worry, namely that topics need to have personal relevance (Stöber et al., 2000). Also, in the same study, the focus of the abstract/concreteness manipulation was altered to fit themes characteristic of anxiety disorders, i.e. fear-future. Another worry related modification was the added avoidance option in the decision making task (IGT) in chapter 6. Previous studies using the standard decision making task in a high worry population failed to feature this hallmark of anxiety disorders in their design. Our modified version provides a novel and crucial twist to the existing paradigm allowing for more accurate assessment of decision making in high trait worriers. A final strength of the experimental studies reported in this thesis is that we successfully included students with worry scores resembling those found in clinical GAD samples.

Limitations
The studies in this thesis have several general limitations. First of all our findings are limited to the repetitive negative thinking processes of worry and rumination. There are other forms of repetitive negative thinking (RNT) such as post event processing (Rachman, Gruter-Andrew, & Shafran, 2000; McEvoy, Mahoney, & Moulds, 2010). Whether our results can be generalized to these other processes has to be examined in future studies. In line with this is the absence of a generic measure of RNT that transcends specific content such as the Repetitive Thinking Questionnaire (RTQ; McEvoy, Mahoney, & Moulds, 2010) and the Perseverative Thinking Questionnaire (PTQ; Ehring et al., 2011). Inclusion of such a generic RNT measure could provide a more accurate picture of RNT's role in emotional disorders as current assessment of worry and rumination is coloured by the wording of questions and by the disorder it was based upon when originally designed. However available generic measures are also not entirely objective. The RTQ for instance, was developed from a pool of questions drawn from the Penn State Worry Questionnaire (PSWQ; Meyer et al, 1990), the Response Styles Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991) and the Post-Event Processing Questionnaire-Revised (PEPQ-R; McEvoy & Kingsep, 2006); thus possibly restricting its scope to these three processes. This may be
an accurate resemblance of RNT if it turns out that RNT is only made up by these three processes. Because research of different type of processes involving RNT is still ongoing this decision to restrict the scope of RNT may be premature.

Another limitation concerns the assessment of worry and rumination. For rumination we used the subscale ‘rumination on sadness’ from the Leiden Index of Depression Sensitivity - Revised (LEIDS-R; Van der Does, 2002; Williams, et al., 2008); a questionnaire measuring cognitive reactivity to sad mood. Worry was determined by the PSWQ. Thus, both cognitive processes were assessed by a singular instrument. This was the result of a trade-off in order to obtain data from a large population by the NESDA study. There are however also other measures of rumination and worry and it cannot be excluded that these would yield slightly different results. It is for instance, with the current assessment of rumination on sadness, not possible to make the distinction between brooding and reflection.

A related and general limitation concerns the self-report measures used in the studies reported. One could question whether people are able to accurately indicate and reflect upon their psychological state of mind, cognitive processes they are engaging in, the vividness of their thoughts, etcetera. Also, self-report is more liable to be affected by social desirability bias as may have been the case in experiment 1 of chapter 5 where self-report VAS measuring the success of the manipulation did not match ratings by independent raters. In this particular situation we were able to overcome this by using the latter scores. Even though self-report measures have obvious downsides most of the instruments reported upon in this thesis are well established and accepted in research.

The use of data from the NESDA study has besides the aforementioned multiple major strengths, also a few limitations. Findings are for instance limited to the disorders assessed in the standard diagnostic procedures and consequently, some diagnostic categories such as PTSD and OCD in which RNT is believed to play a crucial role, are missing. Also, over the multiple waves, attrition was not entirely random. The response rate was 87.1% at wave 2 and 80.6% at wave 3, and non-response was significantly higher among those with younger age, lower education, higher levels of psychopathology, higher levels of worry, and among those with a history of abuse and neglect: i.e. the more severe group. Consequently generalizability of our study results is somewhat restricted.

Another limitation related to the longitudinal studies in this thesis concerns causality. Even though with a longitudinal design it is possible to get a better understanding of relations between certain factors and clinical disorders over time when compared to cross-sectional studies, it still does not give a conclusive answer regarding causality. In order to investigate causal relationships experimental studies are indispensable.

A final limitation that should be mentioned concerns the non-clinical samples used in the experimental studies. Although all experiments included participants scoring within the clinical range this is not the same as meeting diagnostic GAD criteria of which worry is only one aspect. It can therefore not be excluded that the same experiments would yield slightly different results when conducted in a clinical sample.
Future directions

In general, and in line with the limitations mentioned above, future studies should include: other candidate RNT processes such as post-event processing; other disorders in which RNT is expected to play an important role like PTSD and OCD; general RNT measures that are content independent like the RTQ and PTQ.

Regarding the criteria for a transdiagnostic process and those for a shared underlying process, there’s still work to be done with regard to the causal status of worry and rumination i.e. do they contribute to the onset, maintenance and/or recurrence of psychopathology across disorders. The present thesis includes findings supporting worry and rumination as mediators for the prospective cross-disorder relations among emotional disorders (chapter 4). Although these findings are encouraging there are – as mentioned above – more aspects of causality in need of attention before firm conclusions on worry and ruminations causal status can be drawn. Overall, studies with longer follow-up periods consisting of multiple waves to obtain a better notion of worry and rumination’s role in the onset, maintenance and recurrence of emotional disorders are warranted. The inclusion of multiple waves would also provide the opportunity to examine the presence of for instance scarring. Importantly, in order to get conclusive answers regarding causality, merely a longitudinal design does not suffice; the field is in need of more experimental studies investigating worry and rumination’s causal status.

Another possible venture for future studies concerns the biological underpinning of RNT. The present thesis includes a series of experiments investigating worry at process level by focussing on how worry operates and establishes its negative effects from a cognitive perspective. An alternative angle from which to study similarities between worry and rumination and their transdiagnostic nature would be to tackle it at different levels focussing on for instance genetic influences or brain functioning. Given the complexity and intertwined nature of the biological underpinning of emotional disorders it seems likely that these do not correspond with the diagnostic boundaries of DSM-5 (APA, 2013) and that they will display many similarities across disorders and across processes. Studies have already shown for instance that rumination is linked to an imbalance in activity between different areas of the brain (Hamilton et al., 2011; Marchetti, 2012; Zhu et al., 2012) and that this imbalance may posit an underlying mechanism of rumination, impaired attentional control and cognitive reactivity (Marchetti et al., 2012). This example illustrates that worry and rumination may constitute endophenotypes for emotional disorders and that paying attention to their biological underpinning may provide us with a better understanding of the disorders which could help to develop alternative therapeutic interventions.

In Chapter 5 a study was presented where, in contrast with hypotheses, no differences were found between high and low worriers regarding their social problem solving skills. Considering that there is no defect needing fixing, it seems only logical to move on to those problem solving related aspects that are suboptimal. High worriers have low problem solving confidence, dysfunctional (negative) problem orientation and possess an overall avoidant problem solving style characterized by passivity and inaction (e.g. Dugas, Freeston,
& Ladouceur, 1997; Dugas, Letarte, Rheaume, Freeston, & Ladouceur, 1995; Davey, 1994; Ladouceur, Blais, Freeston, & Dugas, 1998; chapter 5). When aiming at improved social problem solving these aspects should be targeted in therapeutic interventions in order to yield clinically significant effects.

Finally, the Iowa Gambling Task with pass option (IGT-P) constitutes a novel twist of an existing and established decision making paradigm. Its novelty also implies that replication is needed, preferably also including replication in clinical populations. Also, it is still unclear how the option to avoid establishes its negative effect and why its influence is different in high worriers compared to low worriers. Several suggestions have been put forward in chapter 6, such as differential influences of distraction, intolerance of uncertainty, or increased exertion of cognitive resources; however additional studies will be needed to test their accuracy. In general the contrasting findings between using the traditional IGT and our modified IGT-P version (chapter 6) illustrate the importance of tailoring a paradigm according to the group of interest. Thus far this is not common practise in IGT research. Nonetheless studies conducted in MDD with the traditional IGT generally show impaired decision making in clinical MDD groups (e.g. Cella, Dymond, & Cooper, 2010; Han et al, 2012). Although MDD is more past than future oriented and therefore not in line with the goal of the pass option to avoid, it may still meet a characteristic process; rumination. As speculated in chapter 6 the pass button may also have a retrospective component. In instances of high loss it may trigger rumination due to the fact that loss could have been averted if only the pass option had been used. It would therefore be interesting to see whether the pass option would indeed negatively affect performance in people suffering from MDD.

Clinical implications

Overall, the studies presented in this thesis support worry and rumination as transdiagnostic processes. However, as the foregoing discussion on advantages and disadvantages surrounding the transdiagnostic approach has already laid out, the fact that worry and rumination can be considered transdiagnostic does not necessarily mean that transdiagnostic therapeutic interventions are clinically the most effective. Results from chapter 2 illustrate that processes like worry and rumination may be transdiagnostic but play a more defining role in one or a few specific disorders. Therefore, it seems only logical that these primary, for the specific disorder characteristic, processes deserve priority in clinical interventions. The awareness of the existence of these transdiagnostic processes is however helpful in making educated guesses as to the effects certain interventions will have on comorbid disorders sharing the same transdiagnostic process(es) while treating the primary disorder.

Clinical implications can also be taken from our studies regarding the similarities between worry and rumination. Both processes are very similar and more and more often they are regarded as the same as reflected in the increased use of the overarching term RNT and the introduction of new RNT measures like the PTQ and RTQ. This fusion may in
many instances be harmless or even favourable, however it is important to stay aware of the differences that are thereby ignored and how this affects clinical practise. For instance, the experiments conducted on abstract-concreteness in worriers revealed that reduced concreteness is not directly affecting the generation of problem solutions (chapter 5) but the preceding problem analyses phase (Stöber, Tepperwien, & Staak, 2000; Stöber & Borkovec, 2002). Rumination on the other hand does affect the solution generation phase and the therapeutic intervention ‘Concreteness Training’ has yielded positive effects in dysphoric participants (Watkins & Moberly, 2009; Watkins, Baeyens, & Read, 2009; Watkins et al., 2012). Tailoring Concreteness Training to tackle the affected problem solving phase in worry/GAD (i.e. problem analyses phase) may be necessary in order to establish any clinically significant changes. Finally, it has to be noted that Concreteness Training has not been directly compared to other therapeutic interventions such as mindfulness, traditional cognitive therapy, or competitive memory training and thus still needs to prove its added value for clinical practise; not only for GAD but also for MDD.

Another clinical implication that has spun from the findings in this thesis concerns the focus of CBT. Our state-trait model approach described in chapter 3 revealed that state level changes in worry/rumination are not responsible for state level changes in emotional disorders 2 years later but that levels rather seem to covary. Trait level components were on the other hand substantial and highly related. These results are in line with studies showing that change in cognitive content does not predict change in depressive symptoms (Jarrett, Vittengl, Doyle, & Clark, 2007) nor are a cause of improvement in anxiety symptoms (Smits, Julian, Rosenfield, & Powers, 2012). Translated to clinical practise our findings suggest that changes in state cognitions (such as negative automatic thoughts) may be primarily a reflection of changes at symptom level and that in order to establish long lasting changes in psychopathology it may well be necessary to alter underlying cognitive vulnerabilities (i.e., cognitive structures and schema’s) which when activated are presumed to give rise to more momentary cognitive content c.q. negative automatic thoughts.

Overall conclusion

The main aim of the present thesis was to contribute to the worry-rumination debate by investigating whether worry and rumination are transdiagnostic processes and whether they represent a shared underlying process. Overall the studies presented in this thesis yielded support for both accounts: worry and rumination are highly related, are present across emotional disorders and show both similarities and differences at process level. Especially at a general, abstract, level similarities between worry and rumination seem to predominate. However, at a more concrete and specific level both similarities and differences are observed. Such differences can be relevant for research as well as therapeutic interventions. Depending on the questions in a certain research or clinical context emphasis on a more general-abstract or concrete-specific perspective on worry and rumination seems warranted.
References


