Accepted Manuscript

Repetitive negative thinking as a predictor of depression and anxiety:
A longitudinal cohort study

Philip Spinhoven , Albert M. van Hemert , Brenda W. Penninx

Please cite this article as: Philip Spinhoven , Albert M. van Hemert , Brenda W. Penninx , Repetitive
negative thinking as a predictor of depression and anxiety: A longitudinal cohort study, *Journal of
Affective Disorders* (2018), doi: https://doi.org/10.1016/j.jad.2018.08.037

Highlights

- Repetitive negative thinking (RNT) underlies rumination and worry.

- RNT is a risk factor for severity, persistence and relapse of depression and anxiety.

- RNT as a pathological trait deserves more attention in clinical diagnosis and treatment.

Repetitive negative thinking as a predictor of depression and anxiety:

A longitudinal cohort study

Philip Spinhoven, PhD [1,2], Albert M. van Hemert, MD, PhD [2],

& Brenda W. Penninx, MD, PhD [2,3]

Affiliations: [1] Leiden University, Institute of Psychology, Leiden, The Netherlands

[2] Leiden University Medical Center, Department of Psychiatry, Leiden,

The Netherlands

[3] VU University Medical Center, Department of Psychiatry Amsterdam,

The Netherlands

Corresponding author: Philip Spinhoven, PhD,

Leiden University, Institute of Psychology,

Wassenaarseweg 52, 2333 AK Leiden, The Netherlands.

Tel: +31 (0)71 5273377; Fax: +31 (0)71 5274678;

E-mail: Spinhoven@FSW.LeidenUniv.NL

Abstract

Background. Repetitive Negative Thinking (RNT) is assumed to be a transdiagnostic proximal risk factor in depression and anxiety. We examined the prospective relations of disorder-dependent as well as disorder-independent measures of RNT with depression and anxiety outcomes.

Methods. In a prospective cohort study, 1972 adults completed a 3-year follow-up period (attrition=12.6%). DSM-IV diagnoses were assessed with the CIDI, symptom severity with the IDS and BAI, and RNT with measures for perseverative thinking (PTQ), rumination (LEIDS-R) and worry (PWQ).

Results. The common dimension of our RNT measurements (according to Confirmatory Factor Analysis) was significantly associated with comorbidity among depressive and among anxiety disorders, severity of depressive and anxiety symptoms, as well as persistence and relapse of depressive and anxiety disorders. Additionally, a specific factor for rumination predicted comorbidity of depressive disorders, comorbidity of anxiety disorders and relapse of depressive disorder, while a specific factor for worry predicted comorbidity of anxiety disorders and relapse of anxiety disorders, although to a lesser extent than general RNT.

Limitations. The present study relied solely on self-report measures of RNT and controlling for baseline demographic and clinical variables greatly attenuated the predictive value of RNT.

Discussion. Disorder-independent RNT may be a similar underlying process present across depressive and anxiety disorders. It seems more important than the representation of this process in disorder-specific cognitive content such as rumination in depression and worry in anxiety. RNT as a pathological trait deserves more attention in clinical diagnosis and the transdiagnostic treatment of comorbid depression and anxiety in particular.

Key words: repetitive negative thinking; rumination; worry; depression; anxiety

Introduction

Repetitive, prolonged, and recurrent thought (such as worry, rumination, reflection, and problem solving) is part of the human condition and can have both unconstructive and constructive consequences (see Watkins (2008) for an extensive overview). Unconstructive repetitive negative thinking as related to emotional problems has been defined as a style of thinking about one's problems or negative experiences that is repetitive, intrusive, and difficult to disengage from (Ehring and Watkins, 2008; Watkins, 2008). Although RNT may be heightened during episodes of psychiatric disorder, RNT is considered to constitute a stable trait-like feature. As such RNT has been conceptualized as a transdiagnostic risk factor implicated in the onset and maintenance of various depressive and anxiety disorders (Harvey et al., 2004; McEvoy et al., 2013). Current measures of RNT are mostly focused on a specific content (such as ruminating about depression or worrying about future threats) and are therefore disorder-specific. For example, depressive rumination has been characterized as "repetitively focusing on the fact that one is depressed; on one's symptoms of depression; and on the causes, meanings, and consequences of depressive symptoms" (Nolen-Hoeksema, 1991)(p. 569). In most studies depressive rumination is measured with the Ruminative Responses Scale developed to assess rumination that is related to depression (Treynor et al., 2003). Worry has been characterized as "a chain of thoughts and images, negatively affect-laden, and relatively uncontrollable" (Borkovec et al., 1983)(p.10). The Penn State Worry Questionnaire (PSWQ) is the most frequently used scale to capture the generality, excessiveness, and uncontrollability dimensions of pathological worry (Meyer et al., 1990).

Consistent with a transdiagnostic perspective, rumination and worry are present across a number of different psychiatric disorders, although rumination may be relatively more pronounced in depression and worry in generalized anxiety disorder (GAD) (Olatunji et al., 2010; Olatunji et al., 2013). There are more similarities than differences across the processes of worry and rumination, including the fact that they are repetitive, difficult to control, negative in content, predominantly verbal, and relatively abstract (Watkins, 2008). The only replicated diagnosis-specific differences concern the thought content and temporal orientation, with depressive rumination more likely to be past-oriented and worry more likely to be future-oriented (Ehring and Watkins, 2008).

The study of RNT is complicated by the fact that practically all measures relate either to rumination or worry, the assessment of which include content-specific or disorder-specific items (McEvoy et al., 2013). To examine the relations between disorder-independent RNT and psychopathology, two generic RNT measures have been developed and validated: the Repetitive Thinking Questionnaire (RTQ; Mahoney et al., 2012; McEvoy et al., 2010; McEvoy et al., 2014) and the Perseverative Thinking Questionnaire (PTQ; Ehring et al., 2012; Ehring et al., 2011). This latter measure is used in the present study and comprises items based on core characteristics of RNT (such as repetitiveness, intrusiveness and difficulty to disengage from) to capture RNT as a trait.

Cross-sectional studies with the RTQ and PTQ in non-clinical (Ehring et al., 2012; Ehring et al., 2011; McEvoy et al., 2010) and clinical (Ehring et al., 2011; Mahoney et al., 2012) samples showed that these disorder-independent measures of RNT are strongly associated with severity of depression, anxiety and general distress. In addition, it has been found that PTQ scores prospectively predict severity of depressive symptoms in a non-clinical sample (Topper et al., 2014), also after controlling for baseline severity (Raes, 2012). Given the high overlap among different measures for RNT, a few studies have tried to identify common variance across measures of RNT using structural equation modelling (Arditte et al., 2016; Hur et al., 2017; McEvoy and Brans, 2012; Segerstrom et al., 2000; Spinhoven et al., 2015). Overall, these studies show that the shared variance of perseverative

thinking, worry and rumination scales is very large and that an underlying factor for RNT is associated with severity of depressive and anxiety symptoms (Arditte et al., 2016; Hur et al., 2017; McEvoy and Brans, 2012; Segerstrom et al., 2000; Spinhoven et al., 2015) as well as with individual depressive and anxiety disorders and comorbidity among depressive and among anxiety disorders (Spinhoven et al., 2015). However, over and above a general factor accounting for the commonality shared by the RNT measures, rumination and worry measures still show a differential and unique although smaller effect on measures for symptom severity. In these studies the unique variance in rumination or brooding proved to be related with depression (McEvoy and Brans, 2012; Segerstrom et al., 2000; Spinhoven et al., 2015) and the unique variance in worry with anxiety outcomes (Hur et al., 2017; Spinhoven et al., 2015) (but see Topper et al. (2014) for an exception). Besides some prospective studies of RNT for the course of anxiety and depression symptoms in non-clinical student samples (Raes, 2012; Topper et al., 2014), there are no clinical studies examining the degree to which RNT or shared versus unique aspects of RNT are prospectively associated with depression and anxiety outcomes.

Aims of the study

To fil this gap, we examined to what extent common versus unique aspects of RNT are predictive of comorbidity among depressive and anxiety disorders, severity of depressive and anxiety disorders, as well as persistence and relapse of depressive and anxiety disorders. We hypothesized that a general factor of RNT would be associated with each of these outcomes and that in addition specific factors for rumination and worry would be differentially related to depression and anxiety outcomes, respectively.

Methods

Design and procedure

The NESDA study is an ongoing cohort study designed to investigate determinants, course and consequences of depressive and anxiety disorders. A sample of 2981 persons aged 18 to 65 years was included, consisting of healthy controls, persons with a prior history of depressive and/or anxiety disorders, and persons with a current depressive and/or anxiety disorder. Respondents were recruited in the general population, through a screening procedure in general practice, or when newly enrolled in specialized health care in order to represent different health care settings and different developmental stages of psychopathology. General exclusion criteria were a primary diagnosis of severe psychiatric disorders such as psychotic, obsessive compulsive, bipolar or severe addiction disorder, and not being fluent in Dutch. A detailed description of the NESDA design and sampling procedures has been given elsewhere (Penninx et al., 2008). The research protocol was approved by the Ethical Committees of the participating universities and all respondents provided written informed consent.

The baseline assessment included demographic and personal characteristics, a standardized diagnostic psychiatric interview and a medical assessment including blood sampling. After two (T2), four (T4), six years (T6), and nine years (T9) a face-to-face follow-up assessment was conducted with a response of 87.1% (n=2596) at T2, of 80.6 % (n=2402) at T4, of 75.7 % (n = 2256) at T6, and of 66.1% (n=1972) at T9.

The Perseverative Thinking Questionnaire (see below) was administered at T6 for the first time. For the purpose of the present study we selected all participants at T6 with complete T9 data (n = 1972; attrition rate=12.6%). From this sample we selected two groups with a current disorder at T6 (i.e. with a depressive disorder or with an anxiety disorders) and two groups with a remitted disorder at T6 (i.e., a history of depressive or a history of anxiety

disorders). Because of comorbidity of (past) depressive and anxiety disorders, these four groups are partly overlapping. More specifically, the sample included the following four subgroups: (a) persons with a 6-month recency depressive disorder at T6, that could or could not persist during the follow-up period from T6 to T9 (n = 334; depressed group); (b) persons with a history of previous depressive disorders but no 6-month recency depressive disorder at T6, who could have or not have a relapse during the follow-up period (n = 790; previously depressed group); (c) persons with a 6-month recency anxiety disorder at T6, that could or could not persist during the follow-up period (n = 382; anxious group); (d) persons with a history of previous anxiety disorders but no 6-month recency anxiety disorder at T6, who could have a relapse during the follow-up period (n = 576; previously anxious group). As among the persons with no history of previous anxiety or depressive disorders and no 6-month recency anxiety or depressive disorder at T6 (n = 442), only 10 persons had an onset of depression and only 9 an onset of anxiety disorder, prediction of onset was not further analyzed.

Measures

Psychiatric diagnosis. DSM-IV depressive [Major Depressive Disorder (MDD), Dysthymia (DYS)] or anxiety [Panic Disorder with or without Agoraphobia (PD), Social Anxiety Disorder (SAD), Generalized Anxiety Disorder (GAD), Agoraphobia without panic (AGO)] disorders at T6, T9 and between T6 and T9 were established using the Composite Interview Diagnostic Instrument (CIDI, version 2.1). The CIDI is a worldwide used fully standardized instrument, which classifies diagnoses according to DSM-IV criteria (APA, 1994). It has shown high interrater reliability, high test-retest reliability and high validity for depressive and anxiety disorders. More specifically, Kappa values for interrater reliability for the diagnoses included in NESDA are good (MDD=.62-.66; PD=.84; SAD=.64; GAD=.69; AGO=.68) except for DYS (Kappa=.52) (Wittchen, 1994).

Symptom severity. Severity of depressive symptoms was measured using the 30-item Inventory of Depressive Symptomatology (IDS; Rush et al., 1986), assessing depression symptoms on a 4-point scale. The IDS has shown high correlations with observer-rated scales such as the Hamilton Depression Scale (Rush et al., 1996). Internal consistency of the IDS in the present study was .91. Severity of anxiety symptoms was measured using the 21-item Beck Anxiety Inventory (BAI; Beck et al., 1988), assessing anxiety symptoms on a 4-point scale. The BAI is a frequently used self-report measure of anxiety and its reliability and validity are well established (Osman et al., 2002). Internal consistency of the BAI in the present study was .94.

Perseverative thinking. Perseverative thinking was measured with the Perseverative Thinking Questionnaire (PTQ; Ehring et al., 2012; Ehring et al., 2011). The PTQ is a disorder-independent measure of trait repetitive negative thinking and consists of 15 items. Participants are asked to rate on a scale from '0' (never) to '4' (almost always) how often each of the items applies to their process of thinking. The item pool comprises three items for each of the assumed process characteristics of repetitive negative thinking: (1) repetitiveness, (2) intrusiveness, (3) difficulty to disengage from, as well as (4) unproductiveness, and (5) capturing mental capacity. The internal consistency of the measure in the present study was high: .97.

Worry. Pathological worry was measured with the Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990). This questionnaire consists of 16 items rated on a 5-point Likert scale ranging from '1 = not at all typical of me' to '5 = very typical of me'. In the NESDA study only the 'General worry' subscale of 11 items was used (Van Rijsoort et al., 1999). The PSWQ has been proven to be a psychometrically valid measure of trait worry unaffected by

the content of the worry (Davey, 1993; Meyer et al., 1990). Internal consistency of the General worry scale in the present study was high: .96.

Rumination. Depressive rumination was assessed using the subscale Rumination on Sadness of the revised version of the Leiden Index of Depression Sensitivity (LEIDS-R; Van der Does, 2002; Williams et al., 2008). The subscale Rumination on Sadness (RUM) consists of 6 items. Participants are asked to indicate whether and how their thinking patterns change when they experience mild dysphoria by scoring each item on a 5-point Likert-scale ranging from 0 'not at all' to 4 'very strongly' applicable to me. LEIDS-R rumination scores show a moderately strong association with scores for rumination on the Ruminative Response Scale (RRS): .62 (Moulds, 2014) and .51 after controlling for current depressive symptoms *(*Moulds et al., 2008*)*. In the present sample the internal consistency of the RUM-scale was .82.

Statistical analyses

As we expected PTQ, LEIDS-R and PSWQ scores to be highly inter-correlated, we first evaluated their dimensionality in four steps. We used Confirmatory Factor Analyses (CFA) to estimate the following four measurement models: (a) a unidimensional model specifying that all PTQ, LEIDS-R and PSWQ items are indicators of a single factor; (b) a three-factor model assuming that PTQ, LEIDS-R and PSWQ items measure three separate factors; (c) a second-order model in which the three first-order factors load on a second-order Repetitive Negative Thinking (RNT) factor; and (d) a bi-factor model with a single general factor for RNT and three separate factors for perseverative thinking, rumination and worry. More specifically, a bi-factor model tests whether: (a) there is a general factor that accounts for the commonality shared by the facets (i.e., negative perseverative thinking, rumination, and worry) and (b) there are multiple specific factors, each of which accounts for the unique influence of the specific facet over and above the general factor.

Moreover, in an attempt to address the high comorbidity among depressive and anxiety disorders, we also examined the fit of a one-factor model (i.e., MDD, DYS, GAD, SAD, PD and AGO loading on one underlying general psychopathology factor) versus the DSM-IV model (i.e., MDD and DYS loading on an underlying factor for depressive disorders versus GAD, SAD, PD and AGO loading on an underlying factor for anxiety disorders) with Confirmatory Factor Analyses (CFA) for repeated assessments, while constraining the regressions coefficients for each disorder to be the same at both time points.

The RNT measurement models were estimated with robust maximum likelihood (MLR) as the assumption that the observed indicators follow a continuous and multivariate normal distribution was slightly violated. The psychopathology measurement models were estimated with diagonally weighted least squares (WLSMV) as estimator as WLSMV provides the best option for modelling categorical data such as psychiatric diagnoses. Goodness of fit of the models was assessed based on the following model fit indices: comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residuals (SRMR). For the TLI and CFI, values between 0.90 and 0.95 are considered acceptable, and $\geq$ 0.95 as good. For the RMSEA and SRMR, acceptable models have values of < 0.08, and good models of < 0.05. The χ^2-significance test is reported although it was not included in determining goodness of fit given the relatively large sample size. Model comparison was performed for nested models using the Satorra-Bentler scaled χ^2-difference test for the RNT measurement models and DIFTEST for the psychopathology measurement models.

Next, we proceeded with fitting structural equation models (SEM) in order to examine the predictive utility of separate factor scores for rumination and worry as well as general bi-factor scores for RNT at T6 for factor scores for comorbidity among depressive and

comorbidity among anxiety disorders at T9 controlling for corresponding T6 values. We did not further examine the predictive utility of separate factor scores for negative perseverative thinking in these prediction models as we were specifically interested in the unique influence of disorder-dependent measurements of RNT over and above the scores for the general disorder-independent factor. The relation of RNT with symptom severity was analysed in a similar way with T9 IDS and BAI scores as outcomes controlling for corresponding T6 scores.

As we also examined the predictive value of RNT for persistence and relapse of depressive and anxiety disorders, logistic regression analyses were conducted separately in the previously depressed group, the depressed group, the previously anxious group and the anxious group. In these models, we used separate factor scores for rumination and worry as well as bi-factor scores for RNT as predictor of respectively relapse of depressive disorder, persistence of depressive disorder, relapse of anxiety disorder or persistence of anxiety disorder as binary outcome variable.

Finally, in order to examine the prospective value of RNT measurements independent of and on top of demographic and clinical variables, all predictive analyses were repeated controlling for demographic (gender, age, years of education) and clinical variables (severity of depressive and anxiety symptoms and presence of (comorbid) depressive and/or anxiety disorders at baseline).

Descriptive statistics and preliminary analyses were run using SPSS version 23 (IBM Corp., 2013) and CFA and SEM models were run using MPlus v. 7.1 (Muthén and Muthén, 1998-2012). A significance level of $p < .05$ was used for all analyses.

Results

Sample characteristics

Of the 2256 participants at T6, 1972 completed the T9 measurements. Study dropouts (n = 284; 12.6%) between T6 and T9 did not differ from study completers regarding age, gender and presence of anxiety disorder at T6. However, in comparison to completers dropouts were significantly less educated (d=.34) and showed higher levels of depressive (d=.21) and anxiety symptoms (d=21), perseverative thinking (d=.13), rumination (d=.16) and worry (d=.13), as well as a higher proportion of persons with depressive disorders at T9 (φ=.08). So, the effect sizes for most differences between both groups were negligible (Cohens'd < .2 or Cramer's φ < .10) or small (d <.5). Table 1 shows sociodemographic, clinical and psychological characteristics of our total group and the four subgroups at T6. All correlations among measures for RNT and symptom severity at T6 were large (> .5; p < .001). This was also the case for the autocorrelations of measures for RNT and symptom severity between T6 and T9 (see Supplementary Material for the Tables with (auto)correlations).

Relations among measures of repetitive negative thinking

The single-factor, three-factor and hierarchical CFA models had a poorer fit to the data than the bi-factor model with three specific factors, $\chi^2(432)=3150.50$, p<.001; CFI=.95; TLI=.95; RMSEA=.05. A χ^2 difference test for nested models using the Satorra-Bentler scaled χ^2 -difference test showed that the fit of the bi-factor model was better than that of the three-factor and hierarchical model ($\chi^2(29)=970.25$, p< .001). A table with the fit indices of the four CFA models for the PTQ, LEIDS-R and PSWQ scores can be found in the Supplementary Material. The item loadings in the bi-factor model on the general factor were statistically significant and substantial, with an average k of 0.75 (range: 0.34 to 0.87). Most of the items loaded substantially only on the general factor, and only 2 of the 32 items had a

lower loading on the general than the specific factor. Of note is that 13 of the 15 PTQ items and none of the LEIDS-R and PSWQ items had a loading of >.80 on the general factor (see figure 1 of the confirmatory bi-factor model). The general factor accounted for 79.7% of the common variance, while the specific factor for perseverative thinking only accounted for 3.3%, the specific factor for rumination for 6.3%, and the specific factor for worry for 10.6% of the common variance. The ω estimates for the general, perseverative thinking, rumination, and worry factors were: 0.98, 0.97, 0.85, and 0.96, respectively. The ω_h revealed the following values for the same factors above: 0.92, 0.02, 0.36, and 0.29, indicating a low capacity of the scales –in particular of the PTQ- to reliably measure the variance due to the specific factors by themselves, beyond reliability provided by the general factor (Brunner et al., 2012).

Latent structure of depressive and anxiety disorders

In examining the fit of a one-factor model and the DSM-IV model (MDD/DYS versus GAD/SAD/PD/AGO), the DSM-IV model showed a better fit to the data: One-factor model: $\chi^2(58)=286.18$, p<.001; CFI=.93; TLI=.93; RMSEA=.04; DSM-IV model: $\chi^2(52)=201.80$, p<.001; CFI=.96; TLI=.95; RMSEA=.04. Moreover, the DIFFTEST indicated that constraining the parameters of the nested one-factor model significantly worsened the fit of the two-factor model ($\chi^2(6)=86.88$, p<.001). The latent factors for depressive and anxiety disorder comorbidity proved to be highly associated at T6 (0.90, p < .001) and T9 (0.91, p < .001).

Prediction of comorbidity and severity of depression and anxiety in the total sample

Structural equation modeling showed that factor scores for perseverative thinking (PTQ), rumination (LEIDS-R) and worry (PSWQ) each predicted factor scores for comorbidity among depressive disorder (MDD/DYS) and comorbidity among anxiety disorders (GAD/SAD/PD/AGO), as well as depression and anxiety severity scores at T9, controlling for corresponding T6 values in separate analyses. Standardized estimates were all small varying from 0.13 to 0.21 (see Table 2). A subsequent analysis with bi-factor scores revealed that only the general RNT factor consistently predicted each of the outcomes, while the specific factor for rumination additionally predicted comorbidity among depressive disorders and depression severity, and the specific factor for worry, depression and anxiety severity. However, the standardized coefficients for the specific factors were all small. Results of the prediction of comorbidity and symptom severity by the bi-factor scores are depicted in Figure 2, respectively Figure 3.

Repeating the analyses above controlling for demographic and clinical variables, showed that in the prediction of comorbidity among depressive and comorbidity among anxiety disorders only the specific factor for rumination remained a significant predictor, while the prediction of severity of depressive and anxiety symptoms was not critically affected (see Table 3).

Prediction of persistence and relapse of depression and anxiety in the subgroups

Univariable logistic regression analyses showed that factor scores for perseverative thinking (PTQ), rumination (LEIDS-R) and worry (PSWQ) each predicted persistence and relapse of depressive and anxiety disorders, while only PTQ scores for perseverative thinking predicted persistence of anxiety disorder (see Table 2) with odds ratio's varying from 1.42 (p < 0.001) to 2.95 (p < 0.001).

A subsequent analysis with bi-factor scores revealed that only the general RNT factor consistently predicted each of the outcomes with odds ratio's varying from 1.27 (p < 0.05) to 1.62 (p < .0.001), while the specific factor for rumination additionally predicted relapse of

depressive disorder (OR = 1.57; p < 0.001)) and the specific factor for worry relapse of anxiety disorder (OR = 1.27; p < 0.05).

After repeating the analyses above controlling for demographic and clinical variables, factor scores for rumination remained predictive of relapse of depressive and relapse of anxiety disorders, factor scores for worry remained predictive of relapse of anxiety disorders, the general RNT factor remained predictive of relapse of anxiety disorders and the specific rumination factor remained predictive of relapse of depressive disorders (see Table 3).

Discussion

Key findings

The present study is the first longitudinal cohort study assessing the predictive value of disorder-independent as well as disorder-dependent measures of repetitive negative thinking (i.e., rumination and worry) for comorbidity among depressive and among anxiety disorders, persistence and relapse of depressive and anxiety disorders, as well as severity of depressive and anxiety symptoms. We found that the structural relations between disorder-independent thinking, rumination and worry are best presented by a bi-factor model. In this model a general factor labelled repetitive negative thinking (RNT) captured most of the common variance, while the specific factors for rumination and worry only accounted for a small portion of the common variance. In particular the general factor of RNT showed consistent and significant prospective relations with each of our depression and anxiety outcomes (i.e., comorbidity among depressive and among anxiety disorders, persistence and relapse of depressive and anxiety disorders, as well as severity of depressive and anxiety symptoms).

Strengths and limitations

Strengths of this study include (a) the use of a large and representative sample of participants with common depressive and / or anxiety disorder from different recruitment settings, (b) the use of a structured diagnostic interview to assess presence and comorbidity of depressive and anxiety disorders and of additional self-report questionnaires to assess severity of depression and anxiety, (c) the administration of three separate measures of RNT allowing to model the importance of common versus unique variance across measures of RNT for depressive and anxiety disorders; and (d) a longitudinal design allowing a better interpretation of the possible direction of causality than cross-sectional designs.

However, the results of this study also need to be considered in the light of several limitations: (a) Study results may not be generalizable to all depressive and anxiety disorders as for example persons with bipolar disorder, obsessive-compulsive-disorder or post-traumatic stress-disorder were not included; (b) Rumination was assessed using the subscale 'Rumination on Sadness' of the LEIDS-R. Although this scale shows a moderately strong association with the most widely used scale for rumination, the Ruminative Response Scale (RRS; Nolen-Hoeksema and Morrow, 1991), this scale does not allow to examine different aspects of rumination, such as brooding and reflection. Moreover, the PSWQ as our measure of worry does not differentiate between the tendency to worry constructively or unconstructively (McNeill and Dunlop, 2016); (c) The present study relied solely on self-report measures of RNT and symptom severity and replication of the present findings using multi-modal assessments are needed (e.g., using experimental tasks to measure deficits in the inhibition of irrelevant emotional stimuli in working memory (Joormann et al., 2006) or negative thought intrusions during a baseline period of focused breathing (Ruscio et al., 2011)); (d) The BAI has been disputed for its focus on cognitive and psychophysiological symptoms linked to panic and it could be argued that this focus may have confounded

associations with RNT measures. However, a previous study of 1601 primary care patients participating in the NESDA study (Muntingh et al., 2011) showed that the BAI may be used as a severity indicator of anxiety in primary care patients with different anxiety disorders.

Discussion of research findings
These results concur with those of previous studies (Arditte et al., 2016; Hur et al., 2017; McEvoy and Brans, 2012; Topper et al., 2014) and our own cross-sectional study of the same participants at T6 showing that the common dimension of RNT was significantly associated with each of the depressive and anxiety disorders, comorbidity among depressive and among anxiety disorders, as well as the common core of depressive, anxiety and avoidance symptoms (Spinhoven et al., 2015). However, in contrast to the rather large cross-sectional relations in our previous study (>.50), the prospective relations in the present study had a small effect size (<.30). These relations are also lower than those found in two previous prospective studies of the predictive value of RNT for depression and anxiety severity among psychology students with a follow-up of 1 to 6 months with moderately strong prospective relations (Raes, 2012; Topper et al., 2014). Our relatively smaller effect sizes may be due to study differences in sample (students versus a mixed community/clinical sample) and length of the follow-up period (1 to 6 months versus 3 years). The present study extends previous findings by showing that RNT also predicts diagnostic outcomes after 3 years in a clinical longitudinal cohort study. Our results strengthen the presupposition that rumination and worry share a common process that is characterized by negative perseverative thought and that this hallmark feature of depressive and anxiety disorders can be seen as a transdiagnostic risk factor implicated in the course of these disorders (Ehring and Watkins, 2008; McEvoy et al., 2013; Ruscio et al., 2011; Watkins, 2008). As probably relatively few causal mechanisms intervene between these processes and the course of depression and anxiety, RNT can be seen as a proximal risk factor and potential treatment target (Nolen-Hoeksema and Watkins, 2011).

Our bi-factor conceptualization of RNT measures showed that disorder-independent perseverative thinking as measured with the PTQ did not represent a specific factor over and above the general latent factor for RNT. Moreover, a bi-factor model enabled simultaneous tests of the association of depression and anxiety outcomes with the general latent factor for RNT and the unique contributions of content-related specific factors for rumination (as measured with the LEIDS-R) and worry (as measured with the PSWQ), that are distinct from the general construct. On top of RNT, a specific factor for rumination predicted comorbidity among depressive disorders, depression severity and relapse of depressive disorder, while a specific factor for worry predicted depression and anxiety severity and relapse of anxiety disorders. The size of these relations was relatively small. These results are in accordance with most previous cross-sectional studies using a 'distinctive' approach showing that rumination is most strongly associated with MDD and worry with GAD, although elevated across disorders (Olatunji et al., 2010; Olatunji et al., 2013). Critically, previous cross-sectional studies examining both common and unique aspects of RNT also found an association of unique variance in rumination or brooding with depression (McEvoy and Brans, 2012; Segerstrom et al., 2000; Spinhoven et al., 2015) and unique variance in worry with anxiety outcomes (Hur et al., 2017; Spinhoven et al., 2015) (but see Topper (Topper et al., 2014) for an exception). However, the prospective associations of the unique aspects of RNT may be confounded by content-or disorder-specific depression and anxiety items included in our measures of rumination and worry inflating relations with specific disorders (McEvoy et al., 2013). Disorder-independent RNT as a similar underlying process across depressive and anxiety disorders may be of primary importance and the representation of this

process in disorder-specific cognitive content may be of secondary importance (Ehring and Watkins, 2008).

Of note is that most prospective relations of our RNT measurements with depression and anxiety outcomes were greatly attenuated or even became non-significant after controlling for symptom severity. These results can be interpreted in different ways. A statistical reason for the 'shrinking' predictive value of disorder-independent RNT could be that this characteristic is so intrinsically associated with severity of depressive and anxiety symptoms that by statistically controlling for these variables, which almost define the presence of depressive and anxiety disorders, the statistical power of disorder-independent RNT to uniquely predict these disorder is greatly reduced if not eliminated. Another possibility is that high levels of disorder-independent RNT have to be seen as a proxy risk factor, i.e. as a small part or indicator of the causally more important global risk factor of symptom severity. However, it should be stressed that proxy risk factors are also risk factors. Substituting, combining or splitting proxy risk factors in constituting elements may indicate profitable directions for the search for important causal factors (Kraemer et al., 2001). As symptom severity is such a broad and complex concept, disaggregation of this global risk factor in constituting elements may enhance our understanding of the causal processes involved. Several symptoms tapped by measures for symptom severity may not only index symptom severity, but also play a causal role in the onset and maintenance of disorders (Borsboom and Cramer, 2013). For example, from a cognitive perspective an IDS item such as 'View of myself: I think almost constantly about major and minor defects in myself' would be conceptualized as a form of dysfunctional thinking implicated in the onset and maintenance of depression and not only as a depression symptom (Beck and Haigh, 2014). Further studies into the dynamic interplay of RNT with other putative causal risk factors targeted by symptom severity measurements (such as dysfunctional thinking or behavioral avoidance) seem warranted, preferably using multi-modal assessments to prevent common method biases as in our present study both RNT and symptom severity were measured by self-report.

Our findings may bear relevance for clinical diagnosis and treatment. In relation to clinical diagnosis, the underlying dimension of RNT shows similarity with diagnostic constructs from the DSM-5 Section III model of pathological personality traits, in particular the trait of Anxiousness (including frequent worry) and Depressivity (including pessimism about the future) (Association, 2013; Krueger et al., 2012). Also in the Hierarchical Taxonomy of Psychopathology (HiTOP) (Kotov et al., 2017) RNT could be introduced as a maladaptive trait underlying the internalizing spectrum composed of distress and fear disorders. Future studies of the diagnostic value of RNT as a dimensional construct in conjunction with other dimensional traits for various psychiatric disorders and dimensional assessments of psychopathology are needed.

Regards psychological treatment, generic interventions to reduce RNT are currently being tested, such as rumination-focused CBT, mindfulness-based CBT, meta-cognitive therapy, and cognitive bias modification (Watkins, 2015). A recent systematic review of treatments to reduce rumination and worry (Querstret and Cropley, 2013) showed that mindfulness-based and cognitive-behavioral interventions may be effective in the reduction of both rumination and worry. Moreover, rumination and worry have been identified as mechanisms of change in mindfulness-based therapies across various psychological outcomes (Gu et al., 2015). Transdiagnostic treatments in which participants are encouraged to change their thinking style, or to disengage from emotional responses to rumination and/or worry may be especially helpful for persons with comorbid emotional disorders in which RNT in the form of worry and rumination is present. Although the current results are consistent with these positive effects of treatments targeting RNT in order to reduce symptoms of anxiety

and depression, the correlational nature of our prospective cohort study does not allow for causal conclusions to be drawn.

To conclude, the results of this study show that RNT as a process underlying worry and rumination predicts various depression and anxiety outcomes to a larger extent then unique aspects of worry and rumination. These results concur with a transdiagnostic perspective and suggest that RNT as a pathological trait deserves more attention in clinical diagnosis and the treatment of comorbid depression and anxiety in particular.

Declaration of interest: None

Contributors:

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the concept, design, analysis, writing, or revision of the manuscript. Furthermore, each author certifies that this material or similar material has not been and will not be submitted to or published in any other publication before its appearance in the Journal of Affective Disorders.

Role of the Funding source:

References

Arditte, K.A., Shaw, A.M., Timpano, K.R., 2016. Repetitive negative thinking: A transdiagnostic correlate of affective disorders. J. Soc. Clin. Psychol. 35, 181-201.

American Psychiatric Association, 1994. Diagnostic and Statistical Manual of Mental Disorders (fourth ed.). Author, Washington DC.

American Psychiatric Association, 2013. Diagnostic and Statistical Manual of Mental Disorders (5th ed.). Author, Washington, DC.

Beck, A.T., Brown, G., Epstein, N., Steer, R.A., 1988. An inventory for measuring clinical anxiety: Psychometric Properties. J. Consult. Clin. Psych. 56, 893-897.

Beck, A.T., Haigh, E.A., 2014. Advances in cognitive theory and therapy: The generic cognitive model. Annu. Rev. Clin. Psychol. 10, 1-24.

Borkovec, T.D., Robinson, E., Pruzinsky, T., DePree, J.A., 1983. Preliminary exploration of worry: Some characteristics and processes. Behav. Res. Ther. 21, 9-16.

Borsboom, D., Cramer, A.O.J., 2013. Network analysis: An integrative approach to the structure of psychopathology. Annu. Rev. Clin. Psychol. 9, 91-121.

Brunner, M., Nagy, G., Wilhelm, O., 2012. A tutorial on hierarchically structured constructs. J. Pers. 80, 796-846.

IBM Corp., 2013. SPSS Statistics for Windows, Version 23.0. IBM Corp., Armonk, NY.

Davey, G.C., 1993. A comparison of three worry questionnaires. Behav. Res. Ther. 31, 51-56.

Ehring, T., Raes, F., Weidacker, K., Emmelkamp, P.M.G., 2012. Validation of the Dutch version of the Perseverative Thinking Questionnaire (PTQ-NL). Eur. J. Psychol. Assess. 28, 102-108.

Ehring, T., Watkins, E.R., 2008. Repetitive negative thinking as a transdiagnostic process. Int. J. Cogn. Ther. 1, 192-205.

Ehring, T., Zetsche, U., Weidacker, K., Wahl, K., Schonfeld, S., Ehlers, A., 2011. The Perseverative Thinking Questionnaire (PTQ): Validation of a content-independent measure of repetitive negative thinking. J. Behav. Ther. Exp. Psychiatry 42, 225-232.

Gu, J., Strauss, C., Bond, R., Cavanagh, K., 2015. How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. Clin. Psychol. Rev. 37, 1-12.

Harvey, A.G., Watkins, E., Mansell, W., Shafran, R., 2004. Cognitive behavioural processes across psychological disorders. Oxford University Press, Oxford.

Hur, J., Heller, W., Kern, J.L., Berenbaum, H., 2017. A bi-factor approach to modeling the structure of worry and rumination. J. Exp. Psychopathol. in press.

Joormann, J., Dkane, M., Gotlib, I.H., 2006. Adaptive and maladaptive components of rumination? Diagnostic specificity and relation to depressive biases. Behav. Ther. 37, 269-280.

Kotov, R., Krueger, R.F., Watson, D., Achenbach, T.M., Althoff, R.R., Bagby, R.M., Brown, T.A., Carpenter, W.T., Caspi, A., Clark, L.A., Eaton, N.R., Forbes, M.K., Forbush, K.T., Goldberg, D., Hasin, D., Hyman, S.E., Ivanova, M.Y., Lynam, D.R., Markon, K., Miller, J.D., Moffitt, T.E., Morey, L.C., Mullins-Sweatt, S.N., Ormel, J., Patrick, C.J., Regier, D.A., Rescorla, L., Ruggero, C.J., Samuel, D.B., Sellbom, M., Simms,

L.J., Skodol, A.E., Slade, T., South, S.C., Tackett, J.L., Waldman, I.D., Waszczuk, M.A., Widiger, T.A., Wright, A.G.C., Zimmerman, M., 2017. The Hierarchical Taxonomy of Psychopathology (HiTOP): A dimensional alternative to traditional nosologies. J. Abnorm. Psychol. 126, 454-477.

Kraemer, H.C., Stice, E., Kazdin, A., Offord, D., Kupfer, D., 2001. How do risk factors work together? Mediators, moderators, and independent, overlapping, and proxy risk factors. Am. J. Psychiatry 158, 848-856.

Krueger, R.F., Derringer, J., Markon, K.E., Watson, D., Skodol, A.E., 2012. Initial construction of a maladaptive personality trait model and inventory for DSM-5. Psychol. Med. 42, 1879-1890.

Mahoney, A.E.J., McEvoy, P.M., Moulds, M.L., 2012. Psychometric properties of the Repetitive Thinking Questionnaire in a clinical sample. J. Anxiety Disord. 26, 359-367.

McEvoy, P.M., Brans, S., 2012. Common versus unique variance across measures of worry and rumination: Predictive utility and mediational models for anxiety and depression. Cogn. Ther. Res. 37, 183-169.

McEvoy, P.M., Mahoney, A.E., Moulds, M.L., 2010. Are worry, rumination, and post-event processing one and the same? Development of the repetitive thinking questionnaire. J. Anxiety Disord. 24, 509-519.

McEvoy, P.M., Thibodeau, M., Asmundson, G.J.G., 2014. Trait repetitive negative thinking: A brief transdiagnostic assessment. J. Exp. Psychopathol. 3, 382-398.

McEvoy, P.M., Watson, H., Watkins, E.R., Nathan, P., 2013. The relationship between worry, rumination, and comorbidity: Evidence for repetitive negative thinking as a transdiagnostic construct. J. Affect. Disord. 151, 313-320.

McNeill, I.M., Dunlop, P.D., 2016. Development and preliminary validation of the Constructive and Unconstructive Worry Questionnaire: A measure of individual differences in constructive versus unconstructive worry. Psychol. Assess. 28, 1368-1378.

Meyer, T.J., Miller, M.L., Metzger, R.L., Borkovec, T.D., 1990. Development and validation of the Penn State Worry Questionnaire. Behav. Res. Ther. 28, 487-495.

Moulds, M.L., 2014. Personal communication.

Moulds, M.L., Kandris, E., Williams, A.D., Lang, T., Yap, C., Hoffmeister, K., 2008. An investigation of the relationship between cognitive reactivity and rumination. Behav. Ther. 39, 65-71.

Muthén, L.K., Muthén, B.O., 1998-2012. Mplus user's guide (seventh ed.). Muthen & Muthen, Los Angeles, CA.

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

Nolen-Hoeksema, S., Morrow, J., 1991. A prospective study of depression and posttraumatic stress symptoms after a natural disaster: The 1989 Loma Prieta Earthquake. J. Pers. Soc. Psychol. 61, 115-121.

Nolen-Hoeksema, S., Watkins, E.R., 2011. A heuristic for developing transdiagnostic models of psychopathology: Explaining multifinality and divergent trajectories. Perspectives on Psychological Science 6, 589-609.

Olatunji, B., Wolitzky-Taylor, K.B., Sawchuk, C.N., Ciesielski, B.G., 2010. Worry and the anxiety disorders: A meta-analytic synthesis of specificity to GAD. Appl. Prev. Psychol. 14, 1-24.

Olatunji, B.O., Naragon-Gainey, K., Wolitzky-Taylor, K.B., 2013. Specificity of rumination in anxiety and depression: A multimodal meta-analysis. Clin. Psychol.: Sci. Pr. 20, 225-257.

Osman, A., Hoffman, J., Barrios, F.X., Kopper, B.A., Breitenstein, J.L., Hahn, S.K., 2002. Factor structure, reliability, and validity of the Beck Anxiety Inventory in adolescent psychiatric inpatients. J. Clin. Psychol. 58, 443-456.

Penninx, B.W., Beekman, A.T., Smit, J.H., Zitman, F.G., Nolen, W.A., Spinhoven, P., Cuijpers, P., De Jong, P.J., Van Marwijk, H.W., Assendelft, W.J., Van Der Meer, K., Verhaak, P., Wensing, M., De Graaf, R., Hoogendijk, W.J., Ormel, J., Van Dyck, R., 2008. The Netherlands Study of Depression and Anxiety (NESDA): Rationale, objectives and methods. Int. J. Methods Psychiatr. Res. 17, 121-140.

Querstret, D., Cropley, M., 2013. Assessing treatments used to reduce rumination and/or worry: a systematic review. Clin. Psychol. Rev. 33, 996-1009.

Raes, F., 2012. Repetitive negative thinking predicts depressed mood at 3-year follow-up in students. J. Psychopathol. Behav. 34, 497-501.

Ruscio, A.M., Seitchik, A.E., Gentes, E.L., Jones, J.D., Hallion, L.S., 2011. Perseverative thought: A robust predictor of response to emotional challenge in generalized anxiety disorder and major depressive disorder. Behav. Res. Ther. 49, 867-874.

Rush, A.J., Giles, D.E., Schlesser, M.A., Fulton, C.L., Weissenburger, J., Burns, C., 1986. The Inventory for Depressive Symptomatology (IDS): Preliminary findings. Psychiat. Res. 18, 65-87.

Rush, A.J., Gullion, C.M., Basco, M.R., Jarrett, R.B., Trivedi, M.H., 1996. The Inventory of Depressive Symptomatology (IDS): Psychometric properties. Psychol. Med. 26, 477-486.

Segerstrom, S.C., Tsao, J.C.I., Alden, L.E., Craske, M.G., 2000. Worry and rumination: Repetitive thought as a concomitant and predictor of negative mood. Cogn. Ther. Res. 6, 671-688.

Spinhoven, P., Drost, J., van Hemert, B., Penninx, B.W., 2015. Common rather than unique aspects of repetitive negative thinking are related to depressive and anxiety disorders and symptoms. J. Anxiety Disord. 33, 45-52.

Topper, M., Molenaar, D., Emmelkamp, P.M.G., Ehring, T., 2014. Are rumination and worry two sides of the same coin? A structural equation modelling approach. J. Exp. Psychopathol. 5, 363-381.

Treynor, W., Gonzalez, R., Nolen-Hoeksema, S., 2003. Rumination reconsidered: A psychometric analysis. Cogn. Ther. Res. 27, 247-259.

Van der Does, W., 2002. Cognitive reactivity to sad mood: Structure and validity of a new measure. Behav. Res.Ther. 40, 105-120.

Van Rijsoort, S., Emmelkamp, P., Vervaeke, G., 1999. The Penn-State Worry Questionnaire and the Worry Domains Questionnaire: Structure, reliability and validity. Clin. Psychol. Psychot. 6, 297-307.

Watkins, E., 2015. Psychological treatment of depressive rumination. Curr. Opin. Psychol. 4, 32-36.

Watkins, E.R., 2008. Constructive and unconstructive repetitive thought. Psychol. Bull. 134, 163-206.

Williams, J.M.G., Van der Does, A.J.W., Barnhofer, T., Crane, C., Segal, Z.S., 2008. Cognitive reactivity, suicidal ideation and future fluency: Preliminary investigation of a differential activation theory of hopelessness/suicidality. Cogn. Ther Res 32, 83-104.

Wittchen, H.U., 1994. Reliability and validity studies of the WHO Composite International Diagnostic Interview (CIDI): A critical review. J. Psychiat. Res. 28, 57-84.
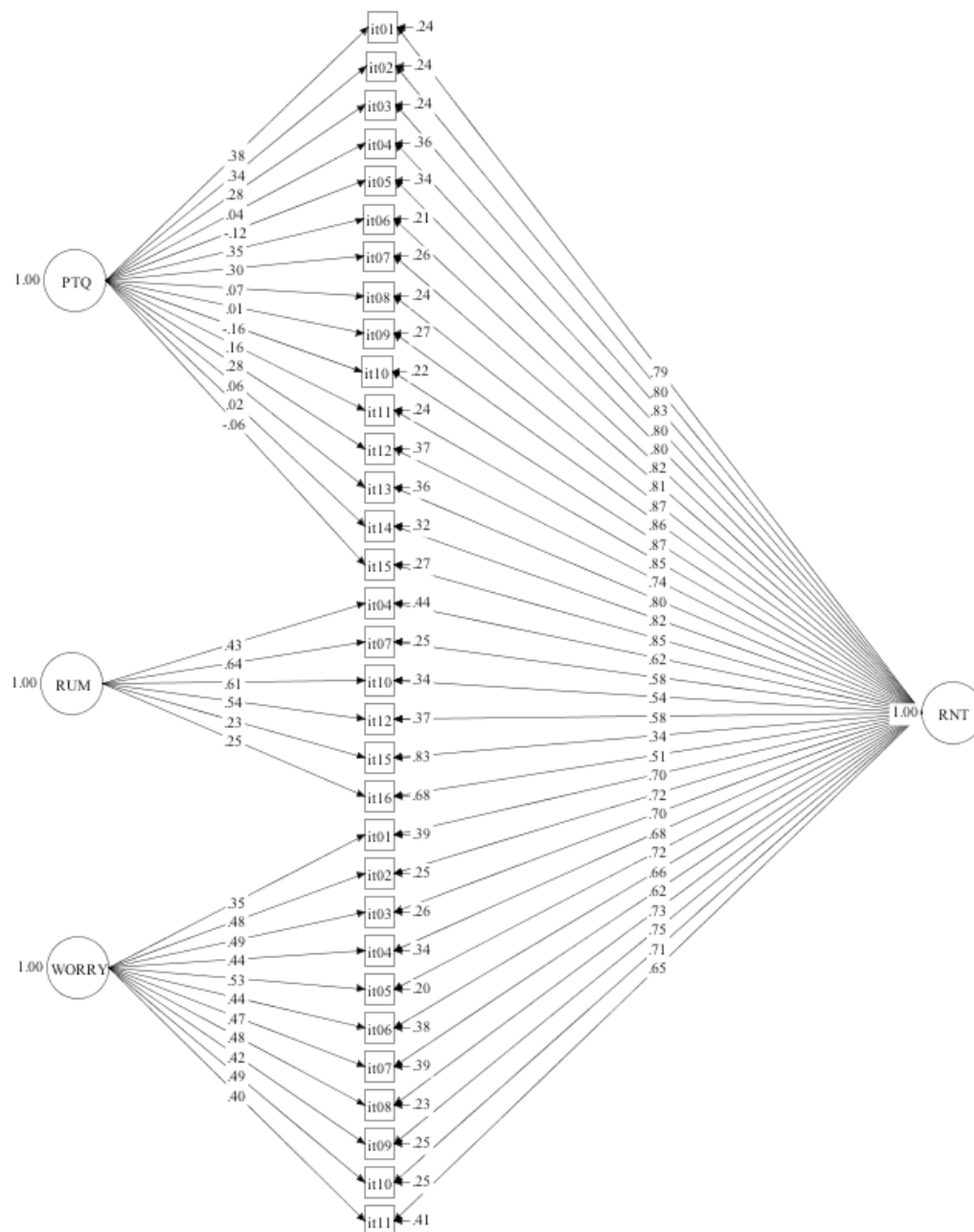
Figure. 1. Confirmatory bi-factor model of the PTQ, LEIDS-R and PSWQ with item loadings directly on a general latent factor for repetitive negative thinking and one of the three specific latent factors

Note. RNT = General latent factor for Repetitive Negative Thinking; PTQ = Specific latent factor for Perseverative Thinking Questionnaire; RUM = Specific latent factor for Leiden Index of Depression Sensitivity-Revised: Rumination on Sadness; WORRY = Specific latent factor for Penn State Worry Questionnaire; Factor loadings are standardized and are all statistically significant (*p* <.001) except PTQ4 (p <.01), PTQ9, PTQ13, PTQ14 and PTQ15 (all non-significant) on the specific factor for PTQ

Figure 2. Standardized parameter estimates for the model of the direct longitudinal relations of the latent general factor for repetitive negative thinking and the latent disorder-dependent specific factors for rumination and worry with the latent factors for depressive and anxiety disorders

Note. Model fit: CFI = 0.95; TLI = 0.95; RMSEA = 0.02; DEP = latent factor for depression disorders; ANX = latent factor for anxiety disorders; RNT = General latent factor for Repetitive Negative Thinking; RUM = Specific factor for Leiden Index of Depression Sensitivity-Revised: Rumination on Sadness; WORRY = Specific factor for Penn State Worry Questionnaire; Statistically significant standardized estimates, or path coefficients (p < .05) are depicted with a bold line.
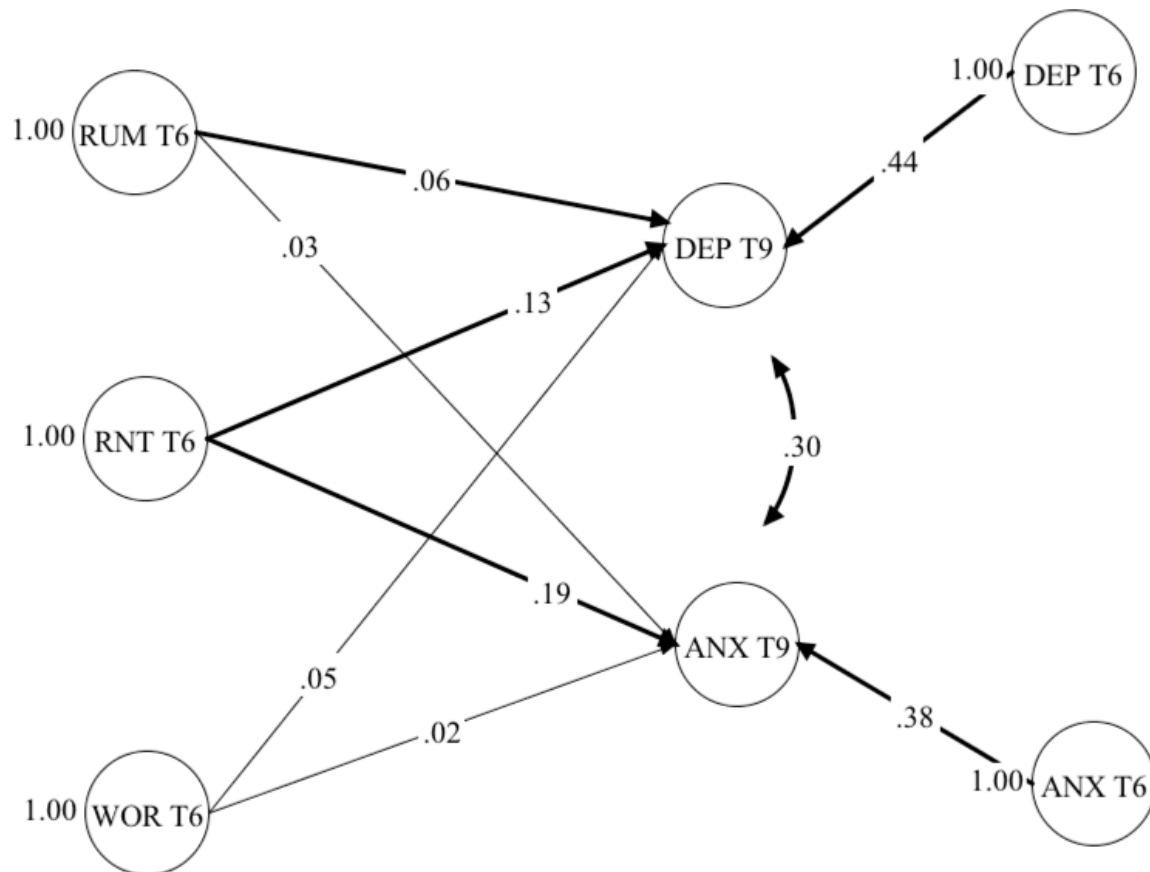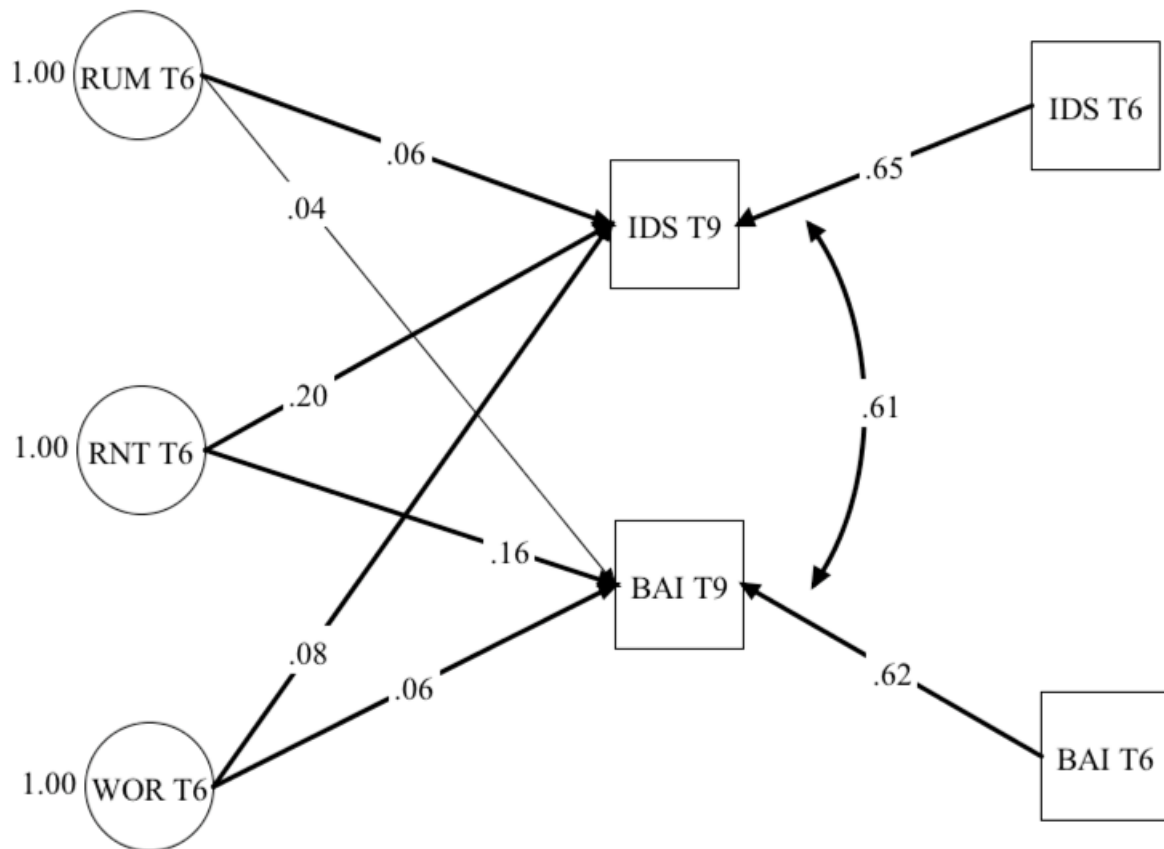
Figure 3. Standardized parameter estimates for the model of the direct longitudinal relations of the latent general factor for repetitive negative thinking and the latent disorder-dependent specific factors for rumination and worry with observed depression and anxiety severity scores

Note. Model fit: CFI = 0.92; TLI = 0.91; RMSEA = 0.06; IDS = Inventory of Depressive Symptomatology; BAI = Beck Anxiety Inventory; RNT = General latent factor for Repetitive Negative Thinking; RUM = Specific factor for Leiden Index of Depression Sensitivity-Revised: Rumination on Sadness; WORRY = Specific factor for Penn State Worry Questionnaire; Statistically significant standardized estimates, or path coefficients (p < .05) are depicted with a bold line.

Table 1. Overview of sociodemographic, clinical and psychological characteristics of the total group and four subgroups

	Total group (n = 1972)		Depressed group (n = 334)		Previously depressed group (n = 790)		Anxious group (n = 382)		Previously anxious group (n = 576)	
	M	SD	M	SD	M	SD	M	SD	M	SD
Sociodemographics										
Age	47.7	13.2	48.0	12.0	48.1	12.8	47.3	12.2	48.2	13.0

Female gender (n/%)	1300	65.9	216	64.7	536	67.8	264	69.1	390	67.6
Years of education	13.0	3.3	12.4	3.3	13.0	3.2	12.1	3.3	12.9	3.2
Clinical characteristics										
IDS	14.2	11.9	29.0	11.8	13.8	9.1	25.7	12.5	14.1	9.7
BAI	7.8	8.4	15.8	9.7	7.7	7.2	16.6	10.1	7.3	6.5
Current anxiety (CIDI) (n/%)	382	19.4	171	51.2	132	16.7	449	100.0	-	-
Current depression (CIDI) (n/%)	334	16.9	334	100.0	-	-	171	44.8	74	12.8
Repetitive negative thinking										
PTQ	35.6	13.4	48.4	11.1	35.6	11.9	46.4	12.1	35.6	11.6
LEIDS-R	12.7	4.6	17.2	4.4	12.7	4.1	16.3	4.7	12.7	4.1
PSWQ	25.9	11.4	37.5	9.9	25.7	10.1	35.8	10.9	26.1	10.2

Note. IDS = Inventory of Depressive Symptomatology; BAI = Beck Anxiety Inventory; CIDI = Composite Interview Diagnostic Instrument; PTQ = Perseverative Thinking Questionnaire; LEIDS-R = Leiden Index of Depression Sensitivity-Revised: Rumination on Sadness subscale; PSWQ = Penn State Worry Questionnaire; * p < .001

Table 2. Prediction of comorbidity, symptom severity and persistence and relapse of depressive and anxiety disorders by RNT measures

Variables	Structure Disorders [a]		Symptom Severity [b]		Depressive disorder		Anxiety Disorder	
	Depressive Comorbidity Coefficient	Anxiety Comorbidity Coefficient	Depression Severity [c] Coefficient	Anxiety Severity [d] Coefficient	Persistence (n=201;60.2%) OR	Relapse (n=166;21.0%) OR	Persistence (n=235;61.5%) OR	Relapse (n=107;18.6%) OR
Separate factors								
PTQ	0.15 ***	0.16 ***	0.16 ***	0.14 ***	1.88 **	1.86 ***	1.42 ***	1.66 **

ACCEPTED MANUSCRIPT

Rumination	0.15 ***	0.13 ***	0.15 ***	0.13 ***	1.77 **	2.95 ***	1.32	1.86 ***
Worry	0.21 ***	0.19 ***	0.20 ***	0.17 ***	1.79 **	1.96 ***	1.22	2.69 ***

General and disorder-dependent specific factors of bi-factor model

RNT	0.13 **	0.19 ***	0.20 ***	0.16 ***	1.48 **	1.62 ***	1.27 *	1.50 ***
Rumination	0.06 *	0.03	0.06 *	0.04	1.28	1.57 ***	1.10	1.20
Worry	0.05	0.02	0.08 ***	0.06 **	1.20	1.11	0.95	1.27 *

Note. [a] T9 factor scores for comorbidity among depressive disorders (Major Depressive Disorder and Dysthymia) and comorbidity among anxiety disorders (Generalized Anxiety Disorder, Social Anxiety Disorder, Panic Disorder, and Agoraphobia) adjusted for corresponding T6 scores; [b] T9 IDS and BAI scores adjusted for corresponding T6 scores; RNT = Repetitive Negative Thinking; [c] Assessed by the Inventory of Depressive Symptomatology (IDS); [d] Assessed by the Beck Anxiety Inventory (BAI); Coefficient = Standardized coefficient; OR = Odds Ratio; *** p <.001; ** p<.01; * p<.05

Table 3. Prediction of comorbidity, symptom severity and persistence and relapse of depressive and anxiety disorders by RNT measures (adjusted for sociodemographic (age, gender, education) and clinical characteristics (symptom severity and comorbid disorder)

Variables	Structure Disorders [a]		Symptom severity [b]		Depressive disorder [c]		Anxiety Disorder [d]	
	Depressive Comorbidity	Anxiety Comorbidity	Depression (IDS) Coefficient	Anxiety (BAI) Coefficient	Persistence (n=201;60.2%) OR	Relapse (n=166;21.0%) OR	Persistence (n=235;61.5%) OR	Relapse (n=107;18.6%) OR
Separate factors								
PTQ	0.01	0.06	0.16 ***	0.14 ***	1.08	1.21	1.15	1.37
Rumination	0.07	0.05	0.17 ***	0.14 ***	1.16	2.01 ***	1.33	1.54 *

Worry	0.03	0.05	0.21 ***	0.16 ***	1.05	1.19	.96	2.10 **

General and disorder-dependent specific factors of bi-factor model

RNT	0.03	0.07	0.21 ***	0.19 ***	1.07	1.22	1.08	1.40 *
Rumination	0.08 *	0.02	0.07 ***	0.05 *	1.10	1.46 **	1.03	1.17
Worry	0.04	0.02	0.09 ***	0.06 *	1.00	1.01	0.88	1.21

Note. All analyses are controlled for demographic variables; [a] Analyses additionally controlled for comorbidity and IDS and BAI scores at T6; [b] T9 IDS and BAI scores additionally controlled for corresponding T6 scores and depressive and anxiety disorders at T6; [c] Analyses additionally controlled for comorbid anxiety disorder and IDS scores at T6; [d] Analyses additionally controlled for comorbid depressive disorder and BAI scores at T6; RNT = Repetitive Negative Thinking; IDS = Inventory of Depressive Symptomatology; BAI = Beck Anxiety Inventory; Coefficient = Standardized coefficient; OR = Odds Ratio; *** p <.001; ** p<.01; * p<.05