



## Shorter communication

# Repetitive negative thinking as a transdiagnostic factor in depression and anxiety: A conceptual replication



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## ABSTRACT

Comorbidity among affective disorders is high. Rumination has been found to mediate cross-sectional and prospective relations between anxiety and depressive symptoms in adolescents and adults. We examined whether rumination and worry, both forms of repetitive negative thinking, also explain the associations between affective disorders. This was studied using a prospective cohort study. In a mixed sample of 2981 adults (persons with a prior history of or a current affective disorder and healthy individuals) we assessed DSM-IV affective disorders (CIDI), rumination (LEIDS-R) and worry (PSWQ). All measures were repeated 2 years and 4 years later. Using structural equation models, we found that baseline rumination and worry partly mediated the association of baseline fear disorders (social anxiety disorder, panic disorder, agoraphobia) with distress disorders (dysthymia, major depressive disorder, generalized anxiety disorder). Moreover, baseline fear disorders predicted changes in distress disorders and changes in worry and rumination mediated these associations. The association between baseline distress disorders and changes in fear disorders was mediated by changes in rumination but not by changes in worry. From these results it can be concluded that repetitive negative thinking is an important transdiagnostic factor. Rumination and worry are partly responsible for the cross-sectional and prospective co-occurrence of affective disorders and may be suitable targets for treatment.

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## Introduction

Comorbidity of mental disorders is the rule rather than the exception, especially among anxiety and depressive disorders (Brown, Campbell, Lehman, Grisham, & Mancill, 2001). Efforts to unravel why there is such a high comorbidity rate have drastically increased in recent years, as has the call for broad and disorder transcending therapies (e.g. Barlow, Allen, & Choate, 2004; Fairburn, Cooper, & Shafran, 2003). Generally it is assumed that there are certain factors that are shared between multiple disorders, which not only contribute to the occurrence of a specific disorder but are also (in part) responsible for comorbidity among these disorders. Such disorder transcending factors are commonly

referred to as transdiagnostic factors (e.g. Ehring & Watkins, 2008; Harvey, Watkins, Mansell, & Shafran, 2004). Better understanding of these shared factors is not only of theoretical importance, but also clinically relevant as it could lead to the development of more effective therapeutic interventions.

One of the main candidate cognitive processes involved in comorbidity among emotional disorders is repetitive negative thinking (RNT: Ehring & Watkins, 2008). In the anxiety literature RNT is referred to as worry, in the depression literature it is referred to as rumination. Both processes are characterized by uncontrolled, excessive and repetitive thinking about current concerns, problems, past experiences or worries about the future (Ehring & Watkins, 2008, p. 192). The main difference between the two is that worry is more future focused and rumination is more past focused (e.g. Smith & Alloy, 2009; Watkins, Moulds, & Mackintosh, 2005). However, it has to be noted that this is a simplification; both processes contain both future- and past-related aspects (e.g. McLaughlin, Borkovec, & Sibrava, 2007). Furthermore, other differences between worry and rumination have also been reported

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(see Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008 for an overview). Research has shown that both worry and rumination scores are elevated across the emotional disorders (Chelminsky & Zimmerman, 2003; see Ehling & Watkins, 2008 for an overview regarding rumination) and that these scores are higher in individuals with multiple diagnoses than in individuals with a single diagnosis (McEvoy, Watson, Watkins, & Nathan, 2013). Although these findings are in line with a transdiagnostic account, the mere presence of these cognitive processes across disorders does not qualify them as causative factors, let alone causative of comorbidity. Evidence for their causal influence comes from experimental studies showing that RNT exacerbates depressed and anxious mood (e.g. Behar, Zullig, & Borkovec, 2005; McLaughlin et al., 2007) as well as from prospective and longitudinal studies supporting RNT's involvement in the onset, maintenance and recurrence of both anxiety and depressive disorders (e.g. Just & Alloy, 1997; Nolen-Hoeksema, 2000; see Watkins, 2008 for an overview). However if RNT truly contributes to the high comorbidity rates among emotional disorders it should also mediate the relationship between anxiety and depressive disorders and vice versa. McLaughlin and Nolen-Hoeksema (2011) indeed found that rumination mediated the concurrent relationship of depression with anxiety symptoms in two large samples of adults and adolescents. Moreover, baseline depressive symptoms predicted subsequent increases in anxiety and rumination fully mediated this association. We tried to build upon this innovative study by investigating clinical diagnoses of anxiety and depression in order to examine the role of RNT in comorbidity of emotional disorders. Moreover, we not only examined rumination, but also worry as another type of RNT.

The aim of the present study is to test whether RNT also accounts for the comorbidity among emotional disorders, both cross-sectionally and longitudinally. In other words, we carried out a conceptual replication of McLaughlin and Nolen-Hoeksema (2011), by focusing on clinical diagnoses instead of symptoms and by 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.

## Methods

### Participants and design

The Netherlands Study of Depression and Anxiety (NESDA) is an ongoing longitudinal cohort study designed to investigate determinants, course and consequences of depressive and anxiety disorders. For the present study we included the total baseline sample consisting of 2981 persons aged 18 through 65 years, including healthy controls, persons with a prior history of depressive and 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 other severe psychiatric disorders (e.g. psychotic, obsessive compulsive, bipolar or severe addiction disorder) and not being fluent in Dutch.

A detailed description of the NESDA design and sampling procedures is given elsewhere (Penninx et al., 2008). The baseline assessment included assessment of demographic and personal characteristics, a standardized diagnostic psychiatric interview and a medical assessment. This study reports on the baseline and the 2-

yr and 4-yr follow-up assessments. The research protocol was approved by the Ethical Committees of participating universities and all respondents provided written informed consent.

### Measures

#### Assessment of psychiatric diagnoses

The diagnostic status (6-month prevalence) of depressive [Major Depressive Disorder (MDD), Dysthymia (DYS)] or anxiety [Panic Disorder with or without Agoraphobia (PAN), Social Anxiety Disorder (SOC), Generalized Anxiety Disorder (GAD), Agoraphobia without panic (AGO)] disorders was established at T0, T2 and T4 using the Composite Interview Diagnostic Instrument (CIDI-WHO lifetime version 2.1; Ter Smitten, Smeets, & Van den Brink, 1998). The CIDI classifies diagnoses according to DSM-IV criteria (APA, 1994). Trained interviewers can reach high interrater reliability, high test-retest reliability (Wacker, Battagay, Mulleijans, & Schlosser, 2006) and high validity for depressive and anxiety disorders (Wittchen, 1994). The CIDI was administered by more than 40 trained research assistants, including psychologists, nurses or residents in psychiatry. Research assistants received one week of training by the fieldwork coordinator, and were certified to conduct assessments following approval of audiotapes of at least two complete interviews. Question wording and probing behavior of interviewers was constantly monitored by checking a random selection of about 10% of all taped interviews. In addition, a continuous monitoring system of interviewer variances and interviewer specific item-non response was maintained through computer analyses in SPSS software.

#### Questionnaires

Worry was measured with the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 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'. The PSWQ has been proven to be a valid measure of trait worrying unaffected by the content of the worry (Davey, 1993; Molina & Borkovec, 1994) with high internal consistency, good test-retest reliability and unaffected by social desirability (Meyer et al., 1990). The PSWQ consists of two subscales: a 'General worry' subscale (11 items) and a 'Not-worry' subscale (5 items) (van Rijsoort, Emmelkamp, & Vervaeke, 1999). The 'General worry' subscale is the strongest of the two (Meyer et al., 1990; van Rijsoort et al., 1999) and only this subscale was administered in the NESDA study. Internal consistency in the present study was high, namely  $\alpha = .96$  at T0, T2 and T4.

Rumination was assessed with the subscale Rumination on Sadness of the revised version of the Leiden Index of Depression Sensitivity (LEIDS-R; Van der Does, 2002; Williams, Van der Does, Barnhofer, Crane, & Segal, 2008). The LEIDS-R is a self-report instrument, which measures cognitive reactivity to sad mood and has been found to reliably discriminate between never-depressed and recovered depressed groups (e.g., Moulds, et al., 2008; Van der Does, 2002). LEIDS-R scores also correlate with biological vulnerability markers of depression: response to acute tryptophan depletion (Booij & Van der Does, 2007) and a serotonin transporter gene polymorphism (Antypa & Van der Does, 2010). 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. An example item is: 'When in a sad mood, I more often think about how my life could have been different'. LEIDS-R scores are significantly and strongly associated ( $r = .51$ ) with scores for rumination on the Ruminative Response Scale (RRS) after

controlling for current depressive symptoms, showing that the observed relationship is independent of current mood state (Moulds et al., 2008). In the present sample the internal consistency of the RUM-scale was 0.82 at T1, 0.84 at T2 and 0.85 at T3.

*Statistical analyses*

Differences in rumination (LEIDS-R) and worry (PSWQ) baseline scores between psychopathology groups were analyzed with separate ANOVA's using five multiple imputed datasets to account for missing data on LEIDS-R and PSWQ. Significant main effects were followed-up by Bonferroni adjusted multiple comparisons. Next, structural equation models were fit using WLSMV parameter estimates in Mplus (version 7.0). Participants who did not participate in the 2-yr and/or 4-yr follow-up assessment were included in the analyses using all available pairwise present information. Standardized estimates, or path coefficients, with a theoretical range from zero (no effect) to +1 (maximum positive or negative effect) are provided. Model fit was evaluated using the Tucker–Lewis Index (TLI), the Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA). For the TLI and CFI, values between 0.90 and 0.95 are considered acceptable, and  $\geq 0.95$  as good. For the RMSEA, acceptable models have values of  $\leq 0.10$ , and good models of  $\leq 0.05$ .

In accordance with previous studies (for a review of the literature see Beesdo-Baum et al., 2009) and a previous confirmatory factor analysis (CFA) of the T0, T2 and T4 assessments of the six diagnostic variables (i.e., MDD, DYS, GAD, SAD, PAN, and AGO) as repeated measures in NESDA (Spinhoven, Penelo, de Rooij, Penninx, & Ormel, 2014), we choose the distress-fear model (Distress: MDD, DYS, GAD; Fear: PAN, SAD, AGO) to best represent the latent structure and stability of emotional disorders. Latent factor scores for distress and for fear disorders were used as dependent variables in further statistical analyses.

Next, we determined the role of rumination and worry as putative mediators of the cross-sectional relations of distress with fear disorders. More specifically, we determined whether the association of distress with fear disorders was attenuated after including both rumination and worry as independent variables into the prediction model.

Finally, we examined two longitudinal mediation models: 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. More specifically, we determined: 1) the association of T0 distress with T4 fear disorders (and vice versa); 2) the association of T0 distress/fear with T2 rumination/worry, controlling for T0 rumination/worry; 3) the association of T2 rumination/worry with T4 distress/fear, controlling for T0 distress/fear; and 4) the attenuation of the association of T0 distress with T4 fear after accounting

for changes in rumination/worry from T0 to T2 (and vice versa). 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). The significance of the indirect effect of fear disorders on distress disorders through changes in rumination/worry (and vice versa) was determined using a bootstrap approximation with 1000 iterations to obtain biased-controlled confidence intervals.

**Results**

*Descriptive statistics*

At baseline, we included 2981 participants with a mean age of 41.9 years (SD = 13.1), a mean duration of education of 12.1 years (SD = 3.3); 66.4% was female. Face-to-face follow-up assessments were conducted with a response of 87.1% ( $n = 2596$ ) at 2-yr follow-up and 80.6% ( $n = 2402$ ) at 4-yr follow-up. At baseline, 1701 participants had a current diagnosis: MDD = 37.4%, DYS = 10.2%, GAD = 15.6%, SAD = 22.3%, PAN = 22.5%, and AGO = 6.3%. As expected, comorbidity rates were high with 57.0% ( $n = 725$ ) of the 1273 participants with a 6-month recency distress diagnosis (MDD, DYS, GAD) meeting criteria for a fear disorder (SAD, PAN, AGO) and 62.9% of the 1153 participants with a fear disorder having a comorbid distress disorder. Comorbidity rates at T4 were as follows: 43.6% ( $n = 225$ ) of the 516 participants with a 6-month recency distress diagnosis fulfilled criteria for a fear disorder and 47.4% of the 475 participants with a fear disorder had a comorbid distress disorder.

We examined whether sample attrition had introduced response bias. Compared with completers, dropouts at 2-yr follow-up as well as at 4-yr follow-up were younger, less educated, more often had an anxiety or depressive disorder at baseline, and also manifested higher levels of worry (PSWQ). There was no significant association of gender with attrition.

Table 1 presents descriptive statistics on rumination and worry in participants with no 6-month recency diagnosis ( $n = 1280$ ), one or more fear disorders ( $n = 428$ ), one or more distress disorders ( $n = 548$ ), and comorbid fear and distress disorders ( $n = 725$ ). Separate ANOVA's yielded a significant main effect for group on rumination ( $F(3, 2977) = 335.49, p < .001$ ) and worry ( $F(3, 2977) = 527.33, p < .001$ ). Subsequent Bonferroni adjusted comparisons showed that all groups differed significantly from each other (all  $p < .001$ ) regards rumination and worry. In accordance with expectations the lowest scores were found in participants with no disorder and the highest scores in participants with comorbid disorders. Moreover, participants with distress disorders obtained higher scores than participants with fear disorders.

Table 2 presents the zero-order correlations of rumination and worry scores with factor scores for distress and fear disorders (see

**Table 1**

Descriptive statistics on rumination (LEIDS) and worry (PSWQ) baseline scores in participants with no 6-month recency diagnosis, one or more fear disorders (SAD, PAN, AGO), one or more distress disorder (MDD, DYS, GAD) and comorbid fear and distress disorders ( $n = 2981$ ).

| Variables             | 1. No disorder<br>( $n = 1280$ ) |      | 2. Fear disorder<br>( $n = 428$ ) |      | 3. Distress disorder<br>( $n = 548$ ) |      | 4. Fear + distress disorder<br>( $n = 725$ ) |      | F-value (3, 2977) | Contrasts     |
|-----------------------|----------------------------------|------|-----------------------------------|------|---------------------------------------|------|--|------|-------------------|---------------|
|                       | M                                | SD   | M                                 | SD   | M                                     | SD   | M  | SD   |                   |               |
| LEIDS-R (range: 0–24) | 6.3                              | 4.6  | 9.2                               | 5.0  | 11.3                                  | 4.9  | 12.5   | 4.6  | 335.49            | 1 < 2 < 3 < 4 |
| PSWQ (range: 11–55)   | 23.5                             | 10.6 | 32.4                              | 10.5 | 35.9                                  | 10.7 | 40.3   | 11.2 | 527.33            | 1 < 2 < 3 < 4 |

Note. MDD = Major Depressive Disorder; DYS = Dysthymia; GAD = Generalized Anxiety Disorder; SAD = Social Anxiety Disorder; PAN = Panic Disorder with or without Agoraphobia; AGO = Agoraphobia w/o panic; LEIDS-R = Leiden Index of Depression Sensitivity-Revised: Rumination subscale; PSWQ = Penn State Worry Questionnaire: General worry subscale; all Bonferroni adjusted comparisons  $< .001$ . Because of missing T0 values on LEIDS ( $n = 368$ ) and PSWQ ( $n = 363$ ) and assuming data are missing at random (MAR) five multiple imputed datasets were created and Table 2 presents the pooled estimates for M, SD, F-value and Contrasts. A completers analysis yielded identical results.

below). As hypothesized both rumination and worry were positively associated with each other and with distress and fear disorders, which were also positively associated with each other (all  $p < .001$ ).

Measurement model

In line with expectations, CFA showed that a Distress-Fear (MDD, DYS, GAD vs. SAD, PAN, AGO) model —  $\chi^2(110) = 201.1$ ; TLI = .99; CFI = .99; RMSEA = .02 — showed a good fit to the data (see Table 3 for factor loadings on the latent variables).

Mediation analysis

Cross-sectional analysis

T0 distress disorders were significantly associated with T0 fear disorders,  $\beta = .84, p < .001$ . The association of distress with fear disorders was attenuated,  $\beta = .70, p < .001$ , but remained significant after including T0 rumination and worry as predictors into the model (rumination:  $\beta = .12, p < .001$ , and worry:  $\beta = .14, p < .001$ ).

Longitudinal analysis

Next, we analyzed the associations between T0 distress disorders and T4 fear disorders while controlling for T0 fear disorders (and vice versa). T0 fear disorders significantly predicted T4 distress disorders, controlling for T0 distress disorders,  $\beta = .21, p < .001$ . T0 distress disorders were associated significantly with T4 fear disorders, controlling for T0 fear disorders,  $\beta = .07, p < .001$ .

T0 fear was associated with T2 rumination, controlling for rumination at T0,  $\beta = .15, p < .001$ . T2 rumination was associated with T4 distress, controlling for T0 distress,  $\beta = .14, p < .001$ . In the final mediation model, T0 fear was no longer a significant predictor of T4 distress, controlling for T0 distress and T0 rumination, when T2 rumination was added to the model,  $\beta = .11, p = .22$  (see Fig. 1). The covariance between T0 distress and fear and T0 rumination and both T0 distress and fear was accounted for in the final model. Fit indices indicated that the model showed an excellent fit to the data:  $\chi^2(37) = 103.1$ ; TLI = .99; CFI = .98; RMSEA = .02. Bootstrapping estimates showed that the indirect effect of fear through rumination on distress ( $\beta = .03$ ; 99% BCI = .01–.06) was significant. Repeating this analysis in participants with complete CIDI and LEIDS data at T0 ( $n = 2618$ ) gave similar results.

Subsequently, we analyzed worry as a putative mediator of the longitudinal fear–distress association in a similar way. T0 fear was

**Table 3**  
Factor loadings on the latent variables for the distress-fear CFA solution ( $n = 2981$ ).

| Indicator | Distress |     |     | Indicator | Fear |     |     |
|-----------|----------|-----|-----|-----------|------|-----|-----|
|           | T1       | T2  | T3  |           | T1   | T2  | T3  |
| MDD       | .81      | .85 | .82 | SAD       | .72  | .76 | .69 |
| DYS       | .81      | .86 | .83 | PAN       | .66  | .69 | .62 |
| GAD       | .69      | .73 | .70 | AGO       | .39  | .41 | .37 |

Note. MDD = Major Depressive Disorder; DYS = Dysthymia; GAD = Generalized Anxiety Disorder; SAD = Social Anxiety Disorder; PAN = Panic Disorder with or without Agoraphobia; AGO = Agoraphobia w/o panic.

associated with T2 worry, controlling for worry at T0,  $\beta = .15, p < .001$ . T2 worry was associated with T4 distress, controlling for T0 distress,  $\beta = .17, p < .001$ . In the final mediation model, T0 fear was no longer a significant predictor of T4 distress, controlling for T0 distress and T0 worry, when T2 worry was added to the model,  $\beta = .04, p = .70$  (see Fig. 2). Fit indices indicated that the model showed an excellent fit to the data:  $\chi^2(37) = 105.80$ ; TLI = .99; CFI = .98; RMSEA = .02. Bootstrapping estimates showed that the indirect effect of fear through rumination on distress ( $\beta = .06$ ; 99% BCI = .01–.11) was significant. Repeating this analysis in participants with complete CIDI and PSWQ data across waves ( $n = 2613$ ) gave similar results.

Next, we examined rumination and worry as putative mediators of the longitudinal distress–fear association. These analyses showed that the very small direct standardized path coefficient ( $\beta$ ) of .07 became insignificant ( $\beta = -.06, p = .62$ ) after including T2 rumination or T2 worry ( $\beta = -.06, p = .63$ ) into the model (figures not shown). Subsequent bootstrapping indicated a significant indirect effect of distress at T0 through rumination at T2 on fear at T4 ( $\beta$  indirect effect = .03; 99% BCI = .01–.06). The indirect effect through worry at T2, however, was not significant ( $\beta$  indirect effect = .03; 95% BCI = -.01–.06).

Finally, we analyzed worry and rumination as putative mediators of the longitudinal fear–distress association (and vice versa) in a multiple mediation model. The longitudinal fear–distress model showed an excellent fit to the data:  $\chi^2(54) = 231.47$ ; TLI = .98; CFI = .96; RMSEA = .03. Bootstrapping estimates showed that only the indirect effect of fear through rumination on distress ( $\beta = .02$ ; 99% BCI = .00–.03), although attenuated, remained significant. Also the longitudinal distress – fear model showed an excellent fit:  $\chi^2(54) = 178.16$ ; TLI = .98; CFI = .98; RMSEA = .03. Bootstrapping estimates showed that again only the indirect effect through rumination ( $\beta = .02$ ; 99% BCI = .00–.04) was significant. Repeating this analysis in participants with complete CIDI, LEIDS and PSWQ data across waves ( $n = 2613$ ) gave similar results.

Discussion

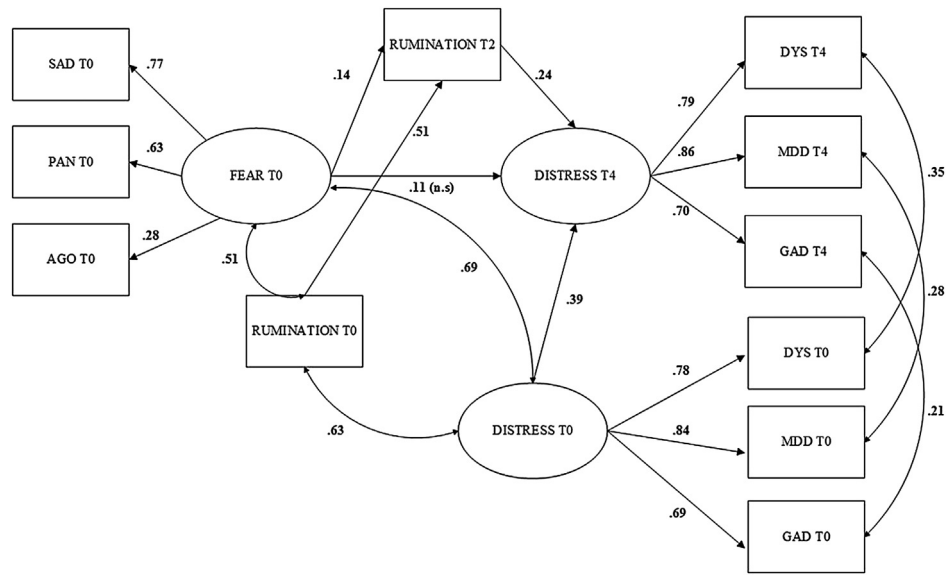
Our findings indicate that 1) repetitive negative thinking in the form of rumination and worry partly accounts for the concurrence of distress and fear disorders; 2) baseline fear disorders predicted changes in distress disorders and vice versa; and 3) changes in rumination mediated these longitudinal associations, and changes in worry mediated the fear → distress association but not the distress → fear association.

Our 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. This is not surprising as the disorders typified by the presence of worry (GAD) and rumination (MDD) were both represented in the distress disorder group. Critically, worry and rumination levels were particularly high in those

**Table 2**  
Zero-order correlations between rumination, worry and distress and fear disorders ( $n = 2981$ ).

| Variables               | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  |
|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. LEIDS, Rumination T0 | –   |     |     |     |     |     |     |     |     |     |     |
| 2. PSWQ, Worry T0       | .63 | –   |     |     |     |     |     |     |     |     |     |
| 3. CIDI, Distress T0    | .63 | .73 | –   |     |     |     |     |     |     |     |     |
| 4. CIDI, Fear T0        | .52 | .68 | .70 | –   |     |     |     |     |     |     |     |
| 5. LEIDS, Rumination T2 | .73 | .54 | .53 | .46 | –   |     |     |     |     |     |     |
| 6. PSWQ, Worry T2       | .57 | .75 | .59 | .58 | .62 | –   |     |     |     |     |     |
| 7. CIDI, Distress T2    | .53 | .57 | .69 | .48 | .60 | .67 | –   |     |     |     |     |
| 8. CIDI, Fear T2        | .50 | .59 | .59 | .81 | .54 | .67 | .76 | –   |     |     |     |
| 9. LEIDS, Rumination T4 | .65 | .52 | .53 | .45 | .70 | .57 | .56 | .52 | –   |     |     |
| 10. PSWQ, Worry T4      | .51 | .67 | .54 | .52 | .54 | .75 | .56 | .53 | .66 | –   |     |
| 11. CIDI, Distress T4   | .46 | .55 | .61 | .51 | .52 | .63 | .76 | .62 | .59 | .67 | –   |
| 12. CIDI, Fear T4       | .49 | .56 | .59 | .80 | .53 | .64 | .65 | .86 | .58 | .68 | .81 |

Note: LEIDS = Leiden Index of Depression Sensitivity-Revised: Rumination subscale; PSWQ = Penn State Worry Questionnaire: General worry subscale; CIDI = Composite Interview Diagnostic Instrument, version 2.1; Distress = combined factor scores for Dysthymia, Major Depression, Generalized Anxiety; Fear = combined factor scores for Social Anxiety, Panic, Agoraphobia; T0 = baseline; T2 = 2-yr follow-up; T4 = 4-yr follow-up; all  $p < .001$ .

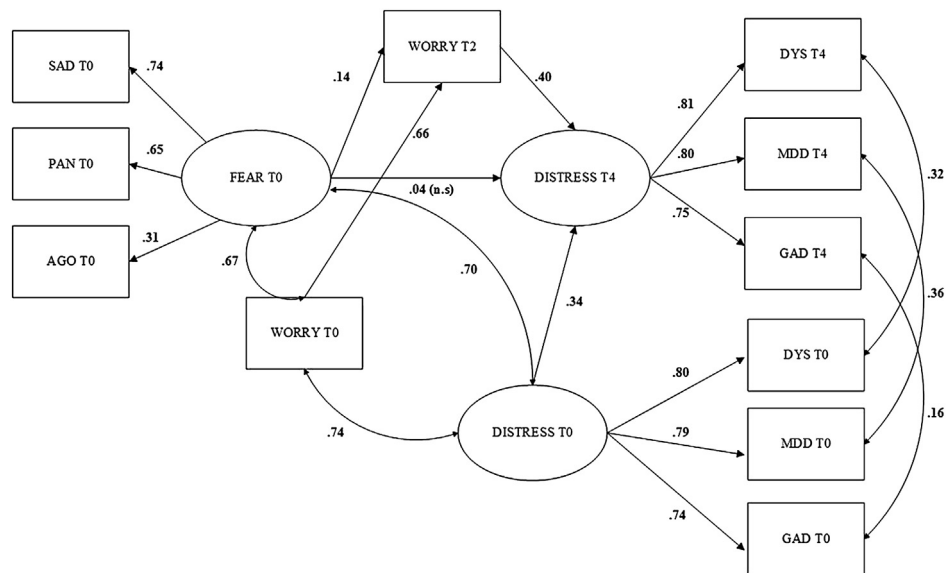


**Fig. 1.** Parameter estimates for the longitudinal mediation model of rumination mediating the prospective relations between fear and distress disorders in 2981 participants from The Netherlands Study of Depression and Anxiety (NESDA). Squares represent observed variables and ovals latent variables. Single-headed arrow path coefficients represent standardized partial regression coefficients. Two-headed arrows represent correlation coefficients. Loadings, standardized estimates, or path coefficients, with a theoretical range from zero (no effect) to +1 (maximum positive or negative effect) are provided. MDD = Major Depressive Disorder; DYS = Dysthymia; GAD = Generalized Anxiety Disorder; SAD = Social Anxiety Disorder; PAN = Panic Disorder with or without Agoraphobia; AGO = Agoraphobia w/o panic. T0 = baseline; T2 = 2-yr follow-up; T4 = 4-yr follow-up. All parameter estimates were significant at  $p < .001$ , except the association of Fear T0–Distress T4 ( $p = .22$ ), DYS T0–DYS T4 ( $p < .01$ ), MDD T0–MDD T4 ( $p < .05$ ) and GAD T0–GAD T4 ( $p < .05$ ).

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.

An additional step in exploring whether worry and rumination are transdiagnostic factors was to determine whether both cognitive processes explained the cross-sectional and longitudinal associations between fear and distress disorders. Cross-sectional

results revealed that worry and rumination partly mediated the co-occurrence of fear and distress disorders. Although promising, this does not shed light on the direction of the relationship and whether changes in worry or rumination mediate the longitudinal relationship between fear and distress disorders and vice versa. Our longitudinal data provided more insight into this question. Worry and rumination both significantly mediated the longitudinal association between baseline (T0) fear disorders and later (T4) distress



**Fig. 2.** Parameter estimates for the longitudinal mediation model of worry mediating the prospective relations between fear and distress disorders in 2981 participants from The Netherlands Study of Depression and Anxiety (NESDA). Squares represent observed variables and ovals latent variables. Single-headed arrow path coefficients represent standardized partial regression coefficients. Two-headed arrows represent correlation coefficients. Loadings, standardized estimates, or path coefficients, with a theoretical range from zero (no effect) to +1 (maximum positive or negative effect) are provided. MDD = Major Depressive Disorder; DYS = Dysthymia; GAD = Generalized Anxiety Disorder; SAD = Social Anxiety Disorder; PAN = Panic Disorder with or without Agoraphobia; AGO = Agoraphobia w/o panic. T0 = baseline; T2 = 2-yr follow-up; T4 = 4-yr follow-up. All parameter estimates were significant at  $p < .001$ , except the association of Fear T0–Distress T4 ( $p = .70$ ), GAD T0–GAD T4 ( $p = .13$ ) and DYS T0–DYS T4 ( $p < .05$ ).

disorders. Moreover, multiple mediation analyses showed that only rumination was a significant mediating variable independent of worry in both the longitudinal distress–fear and fear–distress relationship. Importantly, the three time-point set up of our study allowed for the mediator to reflect *change* in worry/rumination scores. So, fear disorders (T0) predicted change (T0–T2) in worry/rumination scores, and this change in worry/rumination scores subsequently predicted changes in distress disorders (T4). These mediation results suggest that the increased risk of a future distress disorder when suffering from a fear disorder is partly attributable to rumination in particular. Partly attributable, as the mediation effects are small. The same applies for the longitudinal distress (T0) → fear (T4) association with the exception that only rumination significantly mediated this association and worry did not.

The results from the present study suggest that RNT in the form of worry and rumination is indeed involved in the high comorbidity between fear and distress disorders. This support for the transdiagnostic account suggests that transdiagnostic treatments could benefit from including interventions aimed at reducing RNT. With regards to treatments specifically targeting worry and rumination, several options are available. Worry has received most attention, probably because it is the key feature of GAD. The most well-known treatment targeting worry is metacognitive therapy (Wells, 1999), which has proven to be reasonably successful (e.g. van der Heiden, Muris, & van der Molen, 2012; Wells & King, 2006). Rumination on the other hand has only recently started to receive attention as a specific element that needs to be targeted in therapy. Results from rumination focussed cognitive behavioral therapy (Watkins et al., 2007) are promising, and in line with the transdiagnostic hypothesis, this treatment also reduced the prevalence of comorbid disorders (Watkins et al., 2011).

Existing transdiagnostic CBT protocols for anxiety disorders, however, typically do not explicitly address RNT, but emphasize education, cognitive restructuring and exposure (Reinholt & Krogh, 2014). The unified protocol for emotional disorders (Barlow et al., 2004) also does not explicitly address RNT, but increasing emotional awareness as one of the three core components may be useful in improving emotion regulation in high worriers or ruminators. A recent systematic review of the efficacy of transdiagnostic CBT for anxiety disorders (Reinholt & Krogh, 2014) suggests that although transdiagnostic CBT is equally efficacious as diagnosis-specific therapy, transdiagnostic treatment may result in a larger decrease in comorbidity than observed in most previous trials of diagnosis-specific CBT. More explicitly, addressing RNT as a core process inherent both to anxiety and depressive disorders should be seriously considered when further developing and testing transdiagnostic therapies. Such a transdiagnostic approach could be more effective especially in diagnostically heterogeneous samples of patients with comorbid anxiety and depressive disorders (Clark, 2009).

The present study has several strengths. It has a longitudinal design and a representative sample of participants with depressive and/or anxiety disorder(s) from different recruitment settings. Furthermore, structured diagnostic interviews are used to assess presence of depressive and anxiety disorders instead of using only self-report measures of psychopathology.

Our study also has a few limitations that should be kept in mind when interpreting the results. Most importantly, mediation effects are relatively small. This is in line with findings from the McLaughlin and Nolen-Hoeksema (2011) study where the indirect effect was of a comparable small magnitude. Thus although RNT seems to be a factor involved in explaining comorbidity, it only accounts for a part of it. These results therefore warrant the search for additional factors influencing the occurrence of comorbidity. Secondly, we used a fear–distress measurement model to categorize

the disorders as this model showed the best fit to repeated CIDI diagnoses in NESDA, but a DSM-IV based anxiety–depression measurement model might have yielded different results due to the high comorbidity between GAD and MDD (now both subsumed under distress disorders). A third limitation concerns the limited number of clinical diagnoses included in the present study. Emotional disorders such as PTSD and OCD were not represented, neither were other disorders known for elevated levels of RNT among which pain disorders, eating disorders and hypochondriasis (for an overview of disorders with elevated RNT levels see Ehrling & Watkins, 2008). Fourth, the present study did not include a generic RNT instrument. Therefore, our findings may not be representative of all types of repetitive negative thinking such as post-event processing. Also, we did not measure other candidate transdiagnostic factors like perfectionism (for an overview see Egan, Wade, & Shafran, 2011) and intolerance of uncertainty (e.g. Mahoney & McEvoy, 2012). Finally, we used the less well-known LEIDS-R scale to measure rumination, while most studies, including the study of McLaughlin and Nolen-Hoeksema (2011), have used the Ruminative Response Scale (RRS). Consequently, although LEIDS and RRS scores are highly correlated (Moulds et al., 2008), our present study findings may depend on our specific measure for rumination and await replication using the RRS.

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.

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## References

- Antypa, N., & Van der Does, A. J. W. (2010). Serotonin transporter gene, childhood emotional abuse and cognitive vulnerability to depression. *Genes, Brain and Behavior*, 9, 615–620.
- APA. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- Barlow, D. H., Allen, L. B., & Choate, M. L. (2004). Toward a unified treatment for emotional disorders. *Behavior Therapy*, 35(2), 205–230.
- Beesdo-Baum, K., Höfler, M., Gloster, A. T., Klotsche, J., Lieb, R., Beauducel, A., et al. (2009). The structure of common mental disorders: a replication study in a community sample of adolescents and young adults. *International Journal of Methods in Psychiatric Research*, 18, 204–220.
- Behar, E., Zullig, A. R., & Borkovec, T. D. (2005). Thought and imaginal activity during worry and trauma recall. *Behavior Therapy*, 36(2), 157–168.
- Booij, L., & Van der Does, A. J. W. (2007). Cognitive and serotonergic vulnerability to depression: convergent findings. *Journal of Abnormal Psychology*, 116, 86–94.

- Brown, T. A., Campbell, L. A., Lehman, C. L., Grisham, J. R., & Mancill, R. B. (2001). Current and lifetime comorbidity of the DSM-IV anxiety and mood disorders in a large clinical sample. *Journal of Abnormal Psychology, 110*(4), 585.
- Chelminsky, L., & Zimmerman, M. (2003). Pathological worry in depressed and anxious patients. *Journal of Anxiety Disorders, 17*(5), 533–546.
- Clark, D. A. (2009). Cognitive behavioral therapy for anxiety and depression: possibilities and limitations of a transdiagnostic perspective. *Cognitive Behaviour Therapy, 38*(S1), 29–34.
- Davey, G. C. L. (1993). A comparison of 3 worry questionnaires. *Behaviour Research and Therapy, 31*(1), 51–56.
- Egan, S. J., Wade, T. D., & Shafran, R. (2011). Perfectionism as a transdiagnostic process: a clinical review. *Clinical Psychology Review, 31*(2), 203–212.
- Ehring, T., & Watkins, E. R. (2008). Repetitive negative thinking as a transdiagnostic process. *International Journal of Cognitive Therapy, 1*(3), 192–205.
- Fairburn, C. G., Cooper, Z., & Shafran, R. (2003). Cognitive behaviour therapy for eating disorders: a “transdiagnostic” theory and treatment. *Behaviour Research and Therapy, 41*(5), 509–528.
- Harvey, A. G., Watkins, E., Mansell, W., & Shafran, R. (2004). *Cognitive behavioural processes across psychological disorders*. Oxford, United Kingdom: Oxford University Press.
- van der Heiden, C., Muris, P., & van der Molen, H. T. (2012). Randomized controlled trial on the effectiveness of metacognitive therapy and intolerance-of-uncertainty therapy for generalized anxiety disorder. *Behaviour Research and Therapy, 50*(2), 100–109.
- Just, N., & Alloy, L. B. (1997). The response styles theory of depression: tests and an extension of the theory. *Journal of Abnormal Psychology, 106*(2), 221.
- Mahoney, A. E., & McEvoy, P. M. (2012). A transdiagnostic examination of intolerance of uncertainty across anxiety and depressive disorders. *Cognitive Behaviour Therapy, 41*(3), 212–222.
- 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. *Journal of Affective Disorders, 151*(1), 313–320.
- McLaughlin, K. A., Borkovec, T. D., & Sibrava, N. J. (2007). The effects of worry and rumination on affect states and cognitive activity. *Behavior Therapy, 38*(1), 23–38.
- McLaughlin, K. A., & Nolen-Hoeksema, S. (2011). Rumination as a transdiagnostic factor in depression and anxiety. *Behaviour Research and Therapy, 49*(3), 186–193.
- Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy, 28*(6), 487–495.
- Molina, S., & Borkovec, T. D. (1994). The Penn State Worry Questionnaire: psychometric properties and associated characteristics. In G. C. L. Davey, & F. Tallis (Eds.), *Worrying perspectives on theory, assessment and treatment*. Chichester: John Wiley.
- 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. *Behavior Therapy, 39*(1), 65–71.
- Nolen-Hoeksema, S. (2000). The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. *Journal of Abnormal Psychology, 109*(3), 504.
- Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science, 3*(5), 400–424.
- Penninx, B. W., Beekman, A. T. F., Smit, J. H., Zitman, F. G., Nolen, W. A., Spinhoven, P., et al. (2008). The Netherlands Study of Depression and Anxiety (NESDA): rationale, objectives and methods. *International Journal of Methods in Psychiatric Research, 17*(3), 121–140.
- Reinholt, N., & Krogh, J. (2014). Efficacy of transdiagnostic cognitive behavior therapy for anxiety disorders: a systematic review and meta-analysis of published outcome studies. *Cognitive Behaviour Therapy, 43*(3), 171–184.
- van Rijsoort, S., Emmelkamp, P., & Vervaeke, G. (1999). The Penn State Worry Questionnaire and the Worry Domains Questionnaire: structure, reliability and validity. *Clinical Psychology & Psychotherapy, 6*(4), 297–307.
- Smith, J. M., & Alloy, L. B. (2009). A roadmap to rumination: a review of the definition, assessment, and conceptualization of this multifaceted construct. *Clinical Psychology Review, 29*(2), 116–128.
- Spinhoven, P., Penelo, E., de Rooij, M., Penninx, B. W., & Ormel, J. (2014). Reciprocal effects of stable and temporary components of neuroticism and affective disorders: results of a longitudinal cohort study. *Psychological Medicine, 44*, 337–348.
- Ter Smitten, M. H., Smeets, R. M. W., & Van den Brink, W. (1998). *Composite International Diagnostic Interview (CIDI), version 2.1, 12 months* (in Dutch). Amsterdam: World Health Organization.
- Van der Does, W. (2002). Cognitive reactivity to sad mood: structure and validity of a new measure. *Behaviour Research and Therapy, 40*(1), 105–120.
- Wacker, H. R., Battegay, R., Müllejan, R., & Schlosser, C. (2006). Using the CIDI-C in the general population. In C. N. Stefanis, A. D. Rabavilas, & C. R. Soldatos (Eds.), *Psychiatry: A world perspective* (pp. 138–143). Amsterdam: Elsevier Science Publishers.
- Watkins, E. R. (2008). Constructive and unconstructive repetitive thought. *Psychological Bulletin, 134*(2), 163.
- Watkins, E., Moulds, M., & Mackintosh, B. (2005). Comparisons between rumination and worry in a non-clinical population. *Behaviour Research and Therapy, 43*(12), 1577–1585.
- Watkins, E. R., Mullan, E., Wingrove, J., Rimes, K., Steiner, H., Bathurst, N., et al. (2011). Rumination-focused cognitive-behavioural therapy for residual depression: phase II randomised controlled trial. *The British Journal of Psychiatry, 199*(4), 317–322.
- Watkins, E., Scott, J., Wingrove, J., Rimes, K., Bathurst, N., Steiner, H., et al. (2007). Rumination-focused cognitive behaviour therapy for residual depression: a case series. *Behaviour Research and Therapy, 45*(9), 2144–2154.
- Wells, A. (1999). A metacognitive model and therapy for generalized anxiety disorder. *Clinical Psychology & Psychotherapy, 6*(2), 86–95.
- Wells, A., & King, P. (2006). Metacognitive therapy for generalized anxiety disorder: an open trial. *Journal of Behavior Therapy and Experimental Psychiatry, 37*(3), 206–212.
- 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. *Cognitive Therapy and Research, 32*(1), 83–104.
- Wittchen, H. U. (1994). Reliability and validity studies of the WHO-Composite International Diagnostic Interview (CIDI): a critical review. *Journal of Psychiatric Research, 28*(1), 57–84.