



Is repetitive negative thinking a transdiagnostic process? A comparison of key processes of RNT in depression, generalized anxiety disorder, obsessive-compulsive disorder, and community controls

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ABSTRACT

Background and objectives: The transdiagnostic view of repetitive negative thinking (RNT) claims that different forms of RNT are characterized by *identical* processes that are applied to disorder-specific content. The purpose of the study was to test whether the processes of RNT differ across major depression disorder (MDD), generalized anxiety disorder (GAD), and obsessive-compulsive disorder (OCD).

Methods: Forty-two individuals diagnosed with MDD, 35 individuals with GAD, 41 individuals with OCD, and 35 community controls were asked to think of a typical RNT episode and to rate its processes (core processes; use of mental capacity, unproductivity, abstractness, verbal quality, duration). Ratings were compared across groups using planned contrasts and analysis of variance.

Results: All individuals with a clinical diagnosis rated the key processes of RNT and avoidance function of RNT as higher than healthy controls. There were no differences between individuals diagnosed with MDD, GAD or OCD on key processes and avoidance function of RNT.

Limitations: Results are based on retrospective self-reports, which might restrict validity of the measurements.

Conclusions: Data support the transdiagnostic hypothesis of RNT. Transdiagnostic prevention and intervention techniques seem highly recommendable given these findings.

1. Introduction

The experience of getting stuck in one's own negative thoughts is extremely common and its pathological forms have been discussed as maintaining factors in several mental disorders (e.g., Harvey, Watkins, Mansell, & Shafran, 2004; McEvoy, Mahoney, & Moulds, 2010; Nolen-Hoeksema, Stice, Wade, & Bohon, 2007; Olatunji, Naragon-Gainey, & Wolitzky-Taylor, 2013). Repetitive thought (Segerstrom, 2000) and repetitive negative thinking (RNT; Ehring & Watkins, 2008) have been introduced as umbrella terms for this phenomenon. For consistency, we exclusively use the term RNT in this article. Important variants of RNT are rumination, typically defined as 'a mode of responding to distress that involves repetitively and passively focusing on symptoms of

distress and the possible causes and consequences of these symptoms' (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008, p. 400), and worry, characterized as, 'a chain of thoughts and images, negatively affect-laden and relatively uncontrollable' (Borkovec, Robinson, Pruzinsky, & Depree, 1983, p. 10). RNT thus refers to negative, repetitive, and uncontrollable thoughts that are intrusive and difficult to disengage from (Ehring & Watkins, 2008).

1.1. RNT as a transdiagnostic phenomenon

It is widely agreed that RNT is a transdiagnostic phenomenon, contributing to the onset and maintenance of multiple disorders (Harvey et al., 2004; McEvoy, Watson, Watkins, & Nathan, 2013;

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McLaughlin & Nolen-Hoeksema, 2011). The transdiagnostic view has received support from a large number of studies using diverse research questions and methodologies. Numerous studies have demonstrated that RNT is associated with *multiple* mental disorders including depression (for a review, see Thomsen, 2006; Watkins, 2008), generalized anxiety disorder (GAD; e.g., Kircanski, Thompson, Sorenson, Sherdell, & Gotlib, 2015), and obsessive-compulsive disorder (OCD; Wahl, Schoenfeld, et al., 2011).

The transdiagnostic view is further supported by prospective, experimental, and treatment studies indicating that RNT contributes to the onset and maintenance of several mental disorders. First, prospective studies have demonstrated that rumination predicts depressive and anxiety symptoms, bulimia symptoms, and alcohol abuse in initially nonsymptomatic individuals (e.g., Hong, 2007; Michl, McLaughlin, Shepherd, & Nolen-Hoeksema, 2013; Nolen-Hoeksema et al., 2007; Vanderhasselt, Brose, Koster, & De Raedt, 2016). In patients with clinical depression, rumination predicts depressive symptoms after controlling for baseline depression (Kuehner & Weber, 1999; Nolen-Hoeksema, 2000; Rohan, Sigmon, & Dorhofer, 2003). Additionally, worry predicts anxiety and depression prospectively in students (Calmes & Roberts, 2007; Hong, 2007; Ryum et al., 2017).

Second, experimental studies have shown that induction of worry and rumination in the laboratory results in very similar affective states: an increase in negative affect, depression, and anxiety and a decrease in positive affect and relaxation (McLaughlin, Borkovec, & Sibrava, 2007). Importantly, laboratory effects of reduced positive mood after rumination are generalizable to everyday life experiences (Huffziger, Ebner-Priemer, Koudela, Reinhard, & Kuehner, 2012). Finally, reduction in RNT was associated with subsequent improvement in anxiety and depressive symptoms, even when controlling for the effects of time, previous depression and anxiety, referral source, and treatment time (Kertz, Koran, Stevens, & Bjorgvinsson, 2015).

1.2. The process versus content distinction

Some authors have argued that it is important to differentiate the content and processes of RNT to better understand its nature (Ehring & Watkins, 2008; Roach, Salt, & Segerstrom, 2010). In line with this distinction, a narrower and more parsimonious conceptualization of transdiagnostic RNT claims that different forms of RNT not only share commonalities but are characterized by *identical* processes that are applied to disorder-specific content (Ehring & Watkins, 2008; Watkins, 2008).

Factor analytic studies and studies using structure equation modeling have generally supported the idea of a shared underlying process dimension of RNT (McEvoy & Brans, 2013; McEvoy et al., 2010). This process dimension of RNT had similar associations with anxiety and depression (Hur, Heller, Kern, & Berenbaum, 2017; Klemanski, Curtiss, McLaughlin, & Nolen-Hoeksema, 2017; McEvoy & Brans, 2013; McEvoy et al., 2010; Spinhoven, Drost, van Hemert, & Penninx, 2015; note, however, D'Hudson & Saling, 2010, for inconsistent results) or anxiety, depression, and obsessive-compulsive symptoms (Arditte, Shaw, & Timpano, 2016). Additionally, prospective studies investigating the relationship between common processes of RNT, depression, and anxiety lent further support to the hypothesis that the shared process of RNT is crucially involved in its dysfunctional effects (Raes, 2012; Topper, Molenaar, Emmelkamp, & Ehring, 2014).

The transdiagnostic hypothesis can be tested in different ways, with each approach showing a different pattern of advantages and disadvantages. For example, the factor analyses and structure equation models described above provide evidence of the cross-sectional and prospective associations between RNT measured transdiagnostically and different types of symptoms in large samples. However, these studies rely on established questionnaire measures of RNT and do not allow for comparing specific process characteristics across diagnosed groups. To fill this gap, a phenomenological comparison of process

characteristics of RNT in carefully diagnosed clinical groups appears promising. To our knowledge, only one study so far has compared processes independently across different mental disorders. Kircanski et al. (2015) compared rumination and worry in individuals diagnosed with MDD, GAD, MDD and comorbid GAD, and in healthy controls, using experience-sampling methodology in a natural setting. Some of their results support the “identical processes” hypothesis. All clinical groups were characterized by equivalent high levels of rumination and worry in daily life. In addition, both rumination and worry were associated with unpleasantness and repetitiveness. There was also some indication that worry and rumination are characterized by specific processes; for example, only rumination was associated with uncontrollability and only worry was associated with abstractness.

1.3. This study

Our study focuses on the processes of the “identical processes, different content” hypothesis and compares processes of RNT across three mental disorders. In addition to the most commonly studied and phenomenologically very similar disorders MDD and GAD, we included OCD as a third diagnostic group. OCD is also characterized by RNT (e.g. Freeston & Ladouceur, 1997). Correlational studies in nonclinical samples (Grisham & Williams, 2009; Shaw, Carbonella, Hall, & Timpano, 2017; Wahl, Ertle, Bohne, Zurowski, & Kordon, 2011) and in clinical samples (Dar & Iqbal, 2015; Raines, Vidaurri, Portero, & Schmidt, 2017) have indicated that obsessive-compulsive symptoms and a ruminative thinking style are positively associated. Two forms of RNT are distinguishable: RNT about symptoms of OCD (i.e., obsessions and compulsions) and obsessional rumination, that is, obsessive thoughts followed by mental forms of neutralizing (Wahl, Schoenfeld, et al., 2011). Thus, by including OCD we were able to investigate whether the “identical processes” hypothesis also holds for a disorder that typically shows more than one RNT process.

In contrast to Kircanski et al. (2015), we asked participants to describe the process characteristics of a *typical RNT episode* without distinguishing a priori between rumination and worry. This has two advantages: (a) All types of RNT processes are included, and (b) the study does not have to depend on participants' judgments of whether a process is a form of worry or rumination.

1.4. Process characteristics

To compare process characteristics of a typical RNT episode across the disorder groups, we first focused on the five characteristics of RNT suggested by Ehring et al. (2011), namely, *repetitiveness*, *intrusiveness*, and *uncontrollability* as the core characteristics of RNT as well as *unproductivity* and the perceived *use of mental capacity* as additional features. Second, we assessed *duration of an RNT episode* as a further characterizing feature of RNT (see Roach et al., 2010).

Third, the *perceived abstractness* of RNT as well as the degree to which it is characterized as a *verbal activity* were included as additional features. Watkins (2008) postulated that highly abstract and analytical forms of RNT are dysfunctional, and negative effects of abstract analytical thinking (as opposed to more concrete, experiential forms of RNT) have been confirmed in experimental studies (Rimes & Watkins, 2005; Watkins & Moulds, 2005, 2007a; Watkins & Teadsale, 2001). The idea of dysfunctional abstractness is also central to conceptualizations of worry (Goldwin & Behar, 2012; McGowan et al., 2017; Stöber & Borkovec, 2002). Stöber (2000) suggested that the abstractness of negative thinking and predominantly verbal quality features are conceptually linked. In his view the abstractness blocks the production of vivid imagery. Consistent with this idea, positive associations between abstractness and reduced imagery during RNT were found (Behar et al., 2012; McGowan et al., 2017). Both worry and rumination have been described as a predominantly verbal activity as opposed to an imagery-laden mental activity (Hirsch, Hayes, Mathews, Perman, & Borkovec,

2012; Langlois, Freeston, & Ladouceur, 2000; McGowan et al., 2017; Molina, Borkovec, Peasley, & Person, 1998; Wahl, Schoenfeld, et al., 2011; Watkins, Moulds, & Mackintosh, 2005), and deficits in imagery frequency and duration seem to be particularly pronounced in individuals with GAD compared to healthy controls (Hirsch et al., 2012).

Finally, we assessed whether participants perceived their RNT as a form of *avoidance*. Although avoidance function is strictly speaking not a dysfunctional process per se, it has been suggested that it is inherently linked to the dysfunctional RNT processes. For example, the avoidance theory of worry (Borkovec, Alcaine, & Behar, 2004) states that the predominantly verbal quality of worrying allows a person to avoid even stronger emotional reactions in response to a threatening stimuli, and this theory has received some empirical support (e.g., Borkovec & Hu, 1990; for a review see; Newman & Llera, 2011). Similarly, Nolen-Hoeksema et al. (2008) proposed that rumination deters individuals from solving their problems in a practical way, and there is empirical support for the hypothesis that rumination is associated with both behavioral and cognitive avoidance in nonclinical samples (Dickson, Ciesla, & Reilly, 2012; Moulds, Kandris, Starr, & Wong, 2007) and in individuals diagnosed with MDD (Brockmeyer et al., 2015; Ottenbreit, Dobson, & Quigley, 2014).

1.5. Hypotheses

The hypotheses regarding processes were twofold: (1a) We expected all clinical groups to show a higher degree of dysfunctional processes of RNT, namely, the core characteristics (repetitiveness, intrusiveness, and uncontrollability), unproductivity, use of mental capacity, duration of RNT, level of abstractness, verbal quality, and avoidance function compared to healthy controls. (1b) We expected no differences between clinical groups on these processes of RNT. The transdiagnostic view is supported only if both parts of Hypothesis 1 are met.

2. Method

2.1. Participants and procedure

Clinical participants were recruited at six inpatient and outpatient clinics specialized in the treatment of anxiety disorders and depression in Germany. Community controls were recruited through advertising on a university website and in newspapers. Structured Clinical Interview for DSM-IV (SCID) interviews (Wittchen, Wunderlich, Gruschwitz, & Zaudig, 1997) were conducted by experienced clinicians or thoroughly trained master's students as part of the clinical routine at the clinics. Inclusion in the study was based on *Diagnostic and Statistical Manual of Mental Disorders* diagnoses (4th ed.; *DSM-IV*; American Psychiatric Association, 1994). Participants in the MDD group ($n = 42$) met *DSM-IV* criteria for current MDD but had no current diagnoses of GAD or OCD and no diagnoses of GAD or OCD within the last 12 months. Similarly, participants in the GAD group ($n = 35$) met *DSM-IV* criteria for current GAD but had no current diagnosis of MDD or OCD and no diagnoses of MDD or OCD within the last 12 months. Finally, participants in the OCD group ($n = 41$) met *DSM-IV* criteria for current OCD but had no current diagnoses of MDD or GAD and no diagnosis of MDD or GAD within the last 12 months. Exclusion criteria were current substance abuse or dependence, psychotic symptoms, or suicidal intent. Participants in the community control group (healthy controls, HC, $n = 35$) had no past or current psychopathology based on the screening form of the SCID (Wittchen et al., 1997). Testing took place individually in a single session.

All participants gave their informed consent. The study was covered by an ethics approval of the University of Lübeck.

2.2. Measures

Participants consecutively completed two sets of questionnaires.

The first assessed the processes of a typical RNT episode. The second set of questionnaires assessed different types of RNT as well as symptom severity using standardized questionnaires.¹

2.2.1. First set of questionnaires

All questions referred to a *typical* RNT episode. This was defined as a situation in which individuals would think for an extended period of time about negative events, anticipated difficulties, and current problems. To avoid a priori categorization of the RNT episode as “rumination” or “worry,” these terms were not used in the first part of the questionnaire. The Perseverative Thinking Questionnaire (PTQ; Ehring et al., 2011) was used to assess process characteristics of RNT. The PTQ is a 15-item measure with three subscales: (1) *core characteristics* of RNT (repetitiveness, intrusiveness, uncontrollability, e.g., “The same thoughts keep coming back to my mind again and again”); (2) *unproductiveness* (e.g., “I think about many problems without solving any of them”); and (3) *use of mental capacity* (e.g., “My thoughts take up all my attention”). Participants were asked to indicate the frequency with which the described processes occur during typical RNT episodes (0 = never, 1 = rarely, 2 = sometimes, 3 = frequently, 4 = almost always). The three subscales have excellent internal consistency and high concurrent validity with other measures of RNT. Internal consistency in the current sample was high (Cronbach's $\alpha = 0.95$ for PTQ core features, 0.83 for PTQ unproductivity, and 0.89 for PTQ use of mental capacity).

Duration was assessed with one item: “Once you have started with the dwelling, how long does it usually take until you stop again?” Answers were provided in minutes.

Abstractness and verbal (vs. imagery) quality were assessed with four items each (e.g., abstractness: “My dwelling is usually very abstract”; verbal (vs. imagery) quality: “My dwelling is characterized by images and internal pictures”). Answers were provided on Likert scales with 0 = never, 1 = rarely, 2 = sometimes, 3 = often, 4 = almost always. Prior to presenting the items, we provided descriptions of the dimensions abstractness versus concreteness and verbal quality versus imagery quality as follows:

“Concrete” means that the consequences are very detailed and many aspects will be considered. For example, if you are thinking about losing your job, “concrete” means that you are dwelling on whether you can still afford to have a car and to take vacations. If you are thinking about making a mistake, “concrete” means that you are thinking about a specific situation in great detail. “Abstract” means that you are thinking about losing your job or making mistakes in a very general way.”

and

“If we have a lot of vivid images while we are thinking, this means that the thinking is characterized by imagery. For example, you might construe a vivid image of a situation that you were in. In contrast, if our thinking is mainly characterized by verbal thoughts and few images, than this can be called verbal thinking. Principal axis factoring was conducted to investigate whether the entered items load on two theoretically meaningful factors.² All of the items intended to measure abstractness and three of the four items intended to measure verbal quality could be meaningfully clustered on two moderately related factors. The final two scales were calculated by summation of the item scores separately for abstractness and verbal quality, excluding the item that did not load on the factor verbal quality. Thus scores ranged between 0 and 16 for abstractness and between 0 and 12 for verbal quality. Internal consistency of the two scales was high (Cronbach's $\alpha = 0.85$ for abstractness, 0.82 for verbal quality).” The perceived *avoidance function* of RNT was assessed with eight items devised for this

¹ Questionnaires are available from the first author on request. They contained additional items that were not analyzed for the present study.

² Details of the principal axis factoring for abstractness and verbal quality can be found in Table A.1 in the appendices.

purpose (e.g., “By engaging in dwelling I distract myself from even worse thoughts or problems”; “At least I don't have to deal with worse things when I am dwelling”). Answers were provided on Likert scales with 0 = never, 1 = rarely, 2 = sometimes, 3 = often, 4 = almost always. A principal axis factoring was conducted.³ All items had loadings > 0.4 on one factor and thus the final scale was calculated by summation of the item scores, resulting in a scale with scores ranging between 0 and 16 and with high internal consistency (Cronbach's $\alpha = 0.89$).

2.2.2. Second set of questionnaires

Depressive symptoms were assessed with the revised Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996; German version by Hautzinger, Bailer, Worall, & Keller, 1994), GAD symptoms with the Generalized Anxiety Disorder Questionnaire (GAD-Q; Newman et al., 2002), and OCD symptoms with the Obsessive-Compulsive Inventory, Revised (OCI-R; Foa et al., 2002; Goenner, Leonhart, & Ecker, 2008). Additionally, habitual rumination tendencies were assessed with the brooding scale of the Response Style Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991; German version by Kuehner & Weber, 1999) and severity of worry was assessed with the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990; German version by Stöber, 1995). All measures have well-established psychometric properties (e.g., Robinson, Klenck, & Norton, 2010; Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Internal consistencies were high for all variables in the present sample (Cronbach's $\alpha = 0.93$ for the BDI-II, 0.83 for the dimensional items of the GAD-Q 0.88 for the OCI-R, 0.77 for the RSQ brooding scale, and 0.92 for the PSWQ).

2.3. Statistical analysis

Box plots were used for a visual inspection of outliers. Inspection of the duration of one particular RNT episode (measured in minutes) resulted in one outlier which was ascribed a value of 1 min above the second highest value in the distribution (Winsorizing). Skewness and kurtosis of distributions were checked and Kolmogorov–Smirnov tests were used to test whether assumptions of normal distributions were met. Some variables were not normally distributed. Levene statistics were used to test for homogeneity of variances. With few exceptions, homogeneity could be assumed. Analysis of variance (ANOVA) is robust against violations of the assumptions if sample sizes are equal (Donaldson, 1968), and thus ANOVA was used to analyze group differences on clinical variables. Planned contrasts were used to test whether the clinical groups had higher scores than the healthy controls on the process variables (Hypotheses 1a). ANOVA was used to investigate whether there were any differences on processes variables between the clinical groups (Hypothesis 1b) and all effect sizes for pairwise comparisons between the clinical groups were described. Post hoc group comparisons were analyzed with Tukey post hoc tests if homogeneity of variance could be assumed and with Games–Howell post hoc tests if homogeneity was violated. Differences on dichotomous variables (gender, years in education) were analyzed using chi-square tests.

Omnibus alpha was set at .05 and familywise Bonferroni corrections were applied for process variables regarding Hypothesis 1a and b to account for multiple testing.

3. Results

3.1. Participant characteristics

Demographic characteristics, clinical measures, and results of

³Details of the principal axis factoring for the avoidance function of RNT can be found in Table A.2 in the appendices.

pairwise comparisons are presented in Table 1.

The GAD group included more women compared to the other groups, $\chi^2(3, N = 153) = 14.86, p < .01$, Cramer's $V = 0.31$. Participants in the GAD and OCD group were younger than participants in the MDD and healthy control group, $F(3, 149) = 14.89, p < .001, \eta^2 = 0.20$, and education of the participants in the GAD group was higher than in the remaining groups, $\chi^2(9, N = 153) = 52.83, p < .01$, Cramer's $V = 0.34$. Both effects can be accounted for by the fact that all OCD patients and the majority of GAD patients were recruited at university outpatient clinics, which are commonly frequented by students.

Measures of symptom severity showed the expected group differences. Depression (BDI-II) differed between groups; it was highest in the MDD group, followed by GAD and OCD, in which it was higher than in the nonclinical controls, $F(3, 148) = 43.66, p < .001, \eta^2 = 0.54$.⁴ Symptoms of OCD (OCI-R) were highest for the OCD group, and all clinical groups had higher scores than the nonclinical control group, $F(3, 148) = 21.42, p < .001, \eta^2 = 0.34$.⁴ The MDD group and the GAD group had higher symptoms of GAD (GAD-Q) than the OCD group, and all clinical groups had higher scores than the healthy control group, $F(3, 149) = 47.90, p < .001, \eta^2 = 0.55$.

Around one-fifth of the participants in each clinical group (MDD: $n = 8, 19\%$; GAD: $n = 7, 20\%$; OCD: $n = 7, 17.0\%$) had one or more concurrent comorbid disorders (for MDD: panic disorder with or without agoraphobia: $n = 1, 2.4\%$; agoraphobia without panic disorder: $n = 3, 7.1\%$; social anxiety disorder: $n = 4, 9.5\%$; somatoform disorder: $n = 1, 2.4\%$; and pain disorder: $n = 1, 2.4\%$; for GAD: panic disorder with or without agoraphobia: $n = 2, 5.7\%$; social anxiety disorder: $n = 1, 2.9\%$; somatoform disorder: $n = 1, 2.9\%$; and bulimia nervosa: $n = 1, 2.9\%$; for OCD: social anxiety disorder: $n = 2, 4.8\%$; specific phobia: $n = 3, 7.3\%$; anorexia nervosa: $n = 2, 2.8\%$; attention deficit disorder: $n = 1, 1.4\%$). Thirty (71.4%) of the MDD and 14 (34.1%) of the OCD patients were taking psychotropic medication at the time of testing. Unfortunately, information about taking medication was only available for nine of the 35 GAD patients. Of these nine patients, two (22.2%) were on psychotropic medication.

Means, standard deviations, and significant groupwise comparisons of habitual brooding (assessed with the RSQ) and tendency to worry (assessed with the PSWQ) are shown in Table 1. Brooding was not different between the GAD and MDD group, nor between the GAD and OCD group, but all clinical groups had higher scores than the non-clinical group, $F(3, 148) = 23.10, p < .001, \eta^2 = 0.34$.⁵ Degree of worry was higher in the GAD group than in all other groups and higher in the OCD and MDD groups than in the nonclinical group, $F(3, 147) = 38.90, p < .001, \eta^2 = 0.43$.⁶

3.2. Processes of RNT

Means and standard deviations of the process variables are shown in Table 2. Testing Hypothesis 1a, planned contrasts revealed that any clinical group showed higher average values on core features of RNT, $t(150) = 10.92, p < .001, d = 1.78$, on unproductivity, $t(149) = 7.43, p < .001, d = 1.22$, on use of mental capacity, $t(149) = 6.71, p < .001, d = 1.10$, on duration of RNT, $t(143) = 3.08, p < .001, d = 0.52$, and avoidance function, $t(148) = 2.94, p < .05, d = 0.48$, compared to healthy controls. Thus the effect sizes for the processes assessed with the PTQ (core processes, unproductivity, use of mental capacity) were large and the effect sizes for duration of RNT and avoidance function of RNT were moderate. The mean duration of RNT in the clinical groups was 32.85 min ($SD = 31.56$), compared to 15.59 min ($SD = 12.79$) in the healthy control group. All F values

⁴Data were missing on the OCI-R and BDI-II for $n = 1$ MDD patient.

⁵Data were missing on this variable for $n = 1$ MDD patient.

⁶Data were missing on this variable for $n = 1$ MDD patient and $n = 1$ OCD patient.

Table 1
Sociodemographic and clinical characteristics of participants.

Variable	Group							
	MDD <i>n</i> = 42		GAD <i>n</i> = 35		OCD <i>n</i> = 41		HC <i>n</i> = 35	
	<i>M</i> (<i>SD</i>) or %		<i>M</i> (<i>SD</i>) or %		<i>M</i> (<i>SD</i>) or %		<i>M</i> (<i>SD</i>) or %	
Age	45.45 _a	(10.65)	29.83	(13.76)	32.32	(11.30)	40.49 _a	(11.14)
% female	59.5 _a		88.6		66.7 _a		45.7 _a	
Education								
% 9 years	45.0		2.9		11.9		20.0	
% 10 years	30.0		11.4		47.6		11.4	
% 13 years	22.5		85.7		40.5		68.6	
BDI-II	25.30 _a	(11.32)	15.36 _b	(9.21)	11.48 _b	(7.73)	3.37	(3.20)
OCI-R	22.23	(11.61)	22.81	(12.49)	27.83 _a	(12.81)	8.26 _b	(6.56)
GAD-Q	8.65 _a	(3.68)	8.70 _a	(2.43)	6.67 _b	(3.95)	1.04	(1.41)
RSQ-brood	13.53 _a	(3.07)	12.82 _{a,b}	(4.17)	11.39 _b	(2.99)	8.11	(2.27)
PSWQ	54.49 _b	(8.41)	59.88 _a	(7.11)	51.59 _b	(11.82)	37.39	(8.06)

Note. BDI-II = Revised Beck Depression Inventory; GAD = generalized anxiety disorder (current); GAD-Q = Generalized Anxiety Questionnaire; HC = healthy controls; MDD = major depressive disorder (current); OCD = obsessive-compulsive disorder (current); OCI-R = Obsessive-Compulsive Inventory, Revised; PSWQ = Penn State Worry Questionnaire; RSQ-brood = Response Style Questionnaire, brooding subscale.

^{a,b}, different subscripts within rows indicate different pairwise comparisons with Games–Howell post hoc comparisons for unequal variance and Tukey post hoc comparisons for equal variances; *p* < .05.

Table 2
Means and standard deviations per group of processes, and avoidance function of repetitive negative thinking (RNT).

Process	MDD <i>n</i> = 42		GAD <i>n</i> = 35		OCD <i>n</i> = 41		HC <i>n</i> = 35	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
PTQ core features	26.00	5.36	25.46	4.54	23.10	7.76	12.31 ^a	5.77
PTQ unproductivity	8.70	2.02	8.37	2.51	6.71 ^b	2.74	4.43 ^a	2.48
PTQ use of mental capacity	8.08	2.40	8.40	1.88	7.10	3.30	4.46 ^a	2.68
Duration per RNT episode (minutes)	33.30	28.11	35.06	34.60	29.52	32.89	15.59 ^a	12.78
Abstractness	4.90	3.02	4.91	3.75	5.48	3.81	6.31	3.81
Verbal quality	6.75	2.77	6.29	2.82	6.36	3.12	5.57	3.01
Avoidance function	8.78	5.71	7.77	5.97	7.45	6.94	4.60 ^a	5.10

Note. GAD = generalized anxiety disorder; HC = healthy controls; MDD = major depressive disorder; OCD = obsessive-compulsive disorder; PTQ = Perseverative Thinking Questionnaire.

^aHealthy controls had lower ratings compared to any clinical group.

^bOCD group had lower ratings compared to GAD and MDD groups.

p < .05.

remained significant after Bonferroni correction (adjusted $\alpha = 05/6 = 0.008$). For level of abstractness, $t(150) = -1.84$, $p = .07$, $d = -0.30$, and verbal quality of RNT, $t(149) = 1.63$, $p = .11$, $d = 0.26$, the planned contrasts did not reveal significant differences between the combined clinical group and healthy controls. Mean scores of abstractness and verbal quality were generally low for all groups.

Testing Hypothesis 1b, only unproductivity resulted in significant group differences, $F(2, 108) = 8.18$, $p < .001$, $\eta^2 = 0.13$. Post hoc Tukey tests revealed that the MDD group ($d = 0.88$) and GAD group ($d = 0.67$) had higher scores than the OCD group, with medium to large effect sizes. Effect sizes d for pairwise comparisons between the clinical groups are shown in Table 3. All other process variables did not differ between clinical groups after Bonferroni correction (adjusted $\alpha = 05/$

$6 = 0.008$); core features of RNT, $F(2, 108) = 3.39$, $p = .037$, $\eta^2 = 0.06$; use of mental capacity, $F(2, 108) = 2.63$, $p = .08$, $\eta^2 = 0.05$; duration of RNT, $F(2, 108) = 0.74$, $p = .76$, $\eta^2 = 0.005$; level of abstractness, $F(2, 108) = 0.16$, $p = .85$, $\eta^2 = 0.003$; verbal quality of thoughts, $F(2, 108) = 0.20$, $p = .82$, $\eta^2 = 0.004$; avoidance function, $F(2, 108) = 0.30$, $p = .74$, $\eta^2 = 0.005$. Group differences between the GAD and MDD group were consistently very small for all processes variables (d ranging between $< .01$ and $.17$). For the PTQ scales core features and use of mental capacity, differences between the OCD group and the two other groups were small to medium (d ranging between $.34$ and $.47$). The remaining differences between OCD and the two other groups were small (d ranging between 0.02 and 0.21).

4. Discussion

The study compared the reported experience of key processes of RNT across participants with MDD, GAD, and OCD as well as non-clinical community controls. The transdiagnostic view of RNT states that—across mental disorders—*identical* processes are applied to disorder-specific content (Ehring & Watkins, 2008; Watkins, 2008). The core processes of RNT (repetitiveness, intrusiveness, uncontrollability) and also unproductivity, use of mental capacity, duration of a typical RNT episode and avoidance function of RNT were rated as higher by all clinical groups compared to the community controls, with large effect sizes for the processes assessed with the PTQ (core processes,

Table 3
Effect Sizes *d* for Pairwise Comparisons Between the Clinical Groups.

Process	MDD and GAD	MDD and OCD	OCD and GAD
PTQ core features	.11	.44	.36
PTQ unproductivity	.15	.88	.67
PTQ use of mental capacity	.15	.34	.47
Duration per RNT episode (minutes)	.06	.12	.16
Abstractness	< .01	.17	.15
Verbal quality	.16	.13	.02
Avoidance function	.17	.21	.05

unproductivity, use of mental capacity) and moderate effect sizes for duration of RNT and avoidance function of RNT. This is consistent with Hypothesis (1a), which predicted that all clinical groups show a higher degree of dysfunctional processes of RNT. Additionally, with one exception (unproductivity), the study did not find any differences on any of these reported experiences of processes between clinical groups, which is almost entirely consistent with Hypothesis 1b (no differences between clinical groups on these processes of RNT).

Our results support the predictions of the transdiagnostic view of RNT. They show that individuals diagnosed with MDD, GAD, or OCD engage in RNT episodes that are characterized by largely identical processes, namely, intrusiveness, repetitiveness, and difficulties controlling these thoughts. In these individuals' experiences RNT captures mental capacity to a considerable degree, lasts an average of half an hour, and results in avoidance of even more negative emotions across disorders. This confirms the view that RNT is a time-consuming negative activity in several disorders, and that there are no differences between clinical groups on key processes of RNT. The only process that slightly deviated from this pattern was the perceived unproductivity of RNT. Here, the OCD group was in between MDD and GAD on one side and the community controls on the other, possibly because compulsive ruminations might reduce anxiety in the short term and thus be perceived as—at least relatively—less unproductive. The finding that on most RNT processes, OCD—with its distinctive symptoms—did not differ from GAD and MDD, which are two phenomenologically very similar disorders, supports the assumption that the 'identical processes of RNT' hypothesis might also hold for other mental disorders, which should be tested in future studies.

Our findings are consistent with previous studies using factor analysis and structure equation modeling showing that different forms of RNT share common underlying processes (Hur et al., 2017; Klemanski et al., 2017; McEvoy & Brans, 2013; McEvoy et al., 2010). They are also in line with recent studies that have found positive associations between behavioral and cognitive forms of avoidance and rumination in individuals diagnosed with MDD (Brockmeyer et al., 2015; Ottenbreit et al., 2014) and in individuals without any mental disorder (Dickson et al., 2012; Moulds et al., 2007). Results are particularly interesting given that the avoidance function of RNT has often been conceptualized as a result of the abstract mode of RNT (e.g. Borkovec et al., 2004), a finding that we cannot support with our data.

For abstractness and verbal quality of RNT, we unexpectedly did not find that the clinical groups rated typical RNT episodes as more abstract or as being more verbal than community controls. Overall, the ratings of abstractness and verbal quality were not very high. In this respect our findings are at odds with the majority of previous studies showing that several forms of RNT including rumination and worry are characterized by high abstractness (Goldwin & Behar, 2012; Watkins & Moulds, 2007a) and high verbal quality (McGowan et al., 2017; Molina et al., 1998; Wahl, Schoenfeld, et al., 2011; Watkins et al., 2005). One possible explanation for these discrepancies is the difference in methodology. Our study used retrospective self-reports, whereas the majority of previous studies used independent ratings with the Stöber concreteness scale (Stöber, Tepperwien, & Staak, 2000). Yet Watkins (2016) pointed out that individuals vary in the degree to which they are consciously aware of the functions of RNT, and self-report measures such as those used in this study might reveal more about the *perceived* characteristics and functions of RNT or metacognitive thoughts of RNT than real consequences. Given the limitations of self-report data, we consider it premature at present to reject the hypothesis that abstractness and verbal quality are central features of RNT that differentiate problematic RNT from more adaptive forms of RNT. Nevertheless, our data are in line with some studies that are also inconsistent with the assumption that abstractness and high verbal quality are requisite dysfunctional qualities of RNT (Hoyer, Becker, & Roth, 2001; Kircanski et al., 2015).

In sum, our phenomenological comparison indicates that typical RNT episodes in individuals diagnosed with MDD, GAD, or OCD share

repetitiveness, intrusiveness, uncontrollability, and use of mental capacity. Together with studies using factor analysis and structure equation modeling (Hur et al., 2017; Klemanski et al., 2017; McEvoy & Brans, 2013; McEvoy et al., 2010) this offers further evidence supporting the identical processes view of RNT. Given that our sample was carefully selected and there was no overlap in the diagnosis of interest, one might speculate that identical processes are even more likely in clinical groups with higher comorbidity rates. Future studies should include experimental designs and ecological momentary assessments, as well as additional processes that were not considered in the present study in order to investigate whether other research methodologies also come to similar conclusions. Importantly, future studies should include analysis of the content of the respective repetitive thought processes in order to further examine the content versus process distinction.

Identical processes are a strong argument for transdiagnostic intervention techniques, as was suggested by Harvey et al. (2004) and Mansell, Harvey, Watkins, and Shafran (2008). In fact, transdiagnostic internet delivered CBT was effective in reducing RNT frequency and positive beliefs about RNT in individuals diagnosed with MDD, GAD, or both MDD and GAD (Newby, Williams, & Andrews, 2014). A recent randomized controlled trial found that specifically targeting RNT in adolescents with elevated levels of RNT is also an effective prevention measure. Symptoms of anxiety and depression and also the prevalence rates of depression and GAD were reduced in comparison to a waitlist control group (Topper, Emmelkamp, Watkins, & Ehling, 2017).

Given the methodological limitations of the study, results should be interpreted with caution. One drawback concerns the assessment of our main variables. Data were gathered exclusively with retrospective self-reports. While self-reports have the advantage of reflecting individual's experience, which are usually the focus of psychological interventions, they also have several shortcomings. The retrospective perspective means that results might be influenced by memory biases. For example, duration of one particular RNT episode might have been systematically underestimated. A more ecologically valid form of RNT measurement might include ecological momentary assessment with smartphones, which could record duration and other characteristics of RNT exactly at the moment of occurrence. Authors have cast doubt on whether participants are able to reflect on and describe their thinking styles adequately (Bergman & Craske, 2000; Skodzik, Leopold, & Ehling, 2017; Skodzik, Zettler, Topper, Blechert, & Ehling, 2016). Although the self-report is an important source of information for studies regarding RNT and the majority of studies are based on self-reports, future studies might consider more objective measures of processes. For example, the use of mental capacity could be quantified by measuring interference with a simultaneous attention-demanding task while participants are instructed to engage in RNT. The degree of abstractness of typical episodes of RNT could be determined by a computerized text analysis program. Effect sizes indicate that the differences between OCD and the other two groups are small, yet slightly larger than between MDD and GAD for core features of RNT and use of mental capacity. These differences were possibly not significant in the current study because we controlled alpha inflation and thus compromised power. Future studies should test whether these differences are robust and clinically meaningful.

The PTQ, which was used to assess the core processes of RNT, is not sensitive enough to discriminate between different forms of RNT within one disorder. This might result in an overestimation of identical processes. Studies investigating RNT in OCD have found, for example, that there are at least two distinct forms of rumination (Wahl, Schoenfeld, et al., 2011), which is not reflected on the PTQ. Finally, a recent study indicated that a unidimensional model might represent the structure of the PTQ better than a three-factor model (McEvoy et al., 2018). Future studies investigating common processes of RNT might thus focus on the core processes of RNT (repetitiveness, intrusiveness, uncontrollability) and consider mental capacity and unproductivity as additional, metacognitive beliefs, rather than processes per se, as Samtani and Moulds (2017) suggested. Clearly, replications in independent samples using more sophisticated methods are needed to confirm the findings of this study.

We investigated a highly selective clinical group with generally low comorbidity, which might compromise external validity. We chose this approach to maximize the chances of finding any differences between groups. Future studies might include participants who are more representative of clinical samples and additionally include other mental disorders in order to investigate whether the transdiagnostic view of RNT also applies to disorders such as post-traumatic stress disorder, hypochondriasis, or schizophrenia. Finally, our approach of assuming no group differences a priori in our primary hypothesis bears methodological problems. A lack of group differences might be attributable to errors or a result of very small effects and therefore may not unequivocally indicate similarity.

5. Conclusions

To conclude, the study indicates that the reported experiences of key processes and avoidance function of RNT are identical in individuals diagnosed with MDD, GAD, or OCD and discriminate between those with and without a mental disorder. The finding that there were no differences in the key processes of RNT between individuals diagnosed with MDD, GAD, or OCD is consistent with the assumption that the key processes of RNT in MDD, GAD and OCD are identical.

Appendices

Table A.1

Summary of Principal Axis Factoring of the Process Variables Abstractness and Verbal Quality, Oblique Rotation: Correlations Between Variables and Factors After Rotation, Eigenvalues, and Internal Consistency.

Item	Factor 1	Factor 2
While dwelling my thoughts become really concrete.	.88	.23
I consider all details and concrete consequences.	.79	.18
While dwelling I usually do not think of any concrete situations but stay on a very general level.	-.74	-.19
My dwelling is usually very abstract.	-.65	-.20
My thinking is characterized by images and internal pictures.	.15	.86
While dwelling I imagine vividly what has happened or will happen.	.32	.80
While dwelling I have mainly thoughts and very few images.	-.16	-.69
Eigenvalue	3.12	1.88
Cronbach's α	.85	.82

Note. Factor 1 represents abstractness and Factor 2 represents imagery. Factor loadings over 0.40 appear in bold. One item that was originally intended to assess verbal vs. imagery quality (“Dwelling is like an internal monologue.”) was excluded from analysis because it had very low correlations with lots of other variables. Bartlett's test of sphericity, $\chi^2(22) = 476.93, p < .001$, demonstrated that correlations between items were sufficiently large, and according to the Kaiser–Meyer–Olkin measure of 0.73, sample size was good for a factor analysis (Hutcheson and Sofroniou, 1999). Factor extraction was based on the eigenvalue and scree plot, which both led to a two-factor solution, explaining a total of 60.62% of the variance. Oblique rotation was chosen because of the potential relatedness of the two factors. Factor 1 contained all items related to the perceived abstractness/concreteness of the repetitive negative thinking (RNT), and Factor 2 contained all items related to the perceived imagery quality of the RNT. Correlations between Factors 1 and 2 were low ($r = 0.26$).

Table A.2

Summary of Principal Axis Factoring of the Items Representing Functionality; Correlations Between Variables and Factor, Eigenvalue, and Internal Consistency

Item	Factor 1
While dwelling I don't think all the way through to the end so I don't have to deal with the consequences.	.52
By engaging in dwelling I avoid dealing with the topic in more detail.	.62
At least I don't have to deal with worse things when I am dwelling.	.72
By engaging in dwelling I avoid having to do something.	.70
By engaging in dwelling I distract myself from even worse thoughts or problems.	.88
By engaging in dwelling I distract myself from bad memories.	.82
By engaging in dwelling I avoid unpleasant feelings.	.73
By engaging in dwelling I try to get away from thoughts that feel like the here and now.	.71
Eigenvalue	4.59
Cronbach's α	.89

Note. Factor 1 represents functionality. Factor loadings over 0.40 appear in bold. Bartlett's test of sphericity was significant, $\chi^2(10) = 711.08, p < .001$, and sample size was judged to be very good with a Kaiser–Meyer–Olkin measure of 0.83 (Hutcheson and Sofroniou, 1999). A one-factor solution was fit to the data based on theoretical considerations and confirmed by scree plot analysis. Factor 1 explained 57.41% of total variance.

Transdiagnostic prevention and intervention techniques seem highly recommendable given these findings. Future studies might concentrate on additional descriptive variables of RNT, such as the number of repetitions during one particular RNT episode, but also on the underlying mechanisms of RNT to test whether identical mechanisms underlie identical processes (Krae, Mathews, Whyte, & Hirsch, 2016).

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