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The Relationship Between Worry, Rumination, and Comorbidity:  
Evidence for Repetitive Negative Thinking as a Transdiagnostic Construct

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### Abstract

**Background:** Repetitive negative thinking (RNT) increases vulnerability to multiple anxiety and depressive disorders and, as a common risk factor, elevated RNT may account for the high levels of comorbidity observed between emotional disorders. The aims of this study were to (a) compare two common forms of RNT (worry and rumination) across individuals with non-comorbid anxiety or depressive disorders, and (b) to examine the relationship between RNT and comorbidity. **Methods:** A structured diagnostic interview and measures of rumination, worry, anxiety, and depression were completed by a large clinical sample with an anxiety disorder or depression ( $N = 513$ ) presenting at a community mental health clinic. **Results:** Patients without ( $n = 212$ ) and with ( $n = 301$ ) comorbid diagnoses did not generally differ across the principal diagnosis groups (depression, generalised anxiety disorder, social anxiety disorder, panic disorder) on worry or rumination. As predicted, comorbidity was associated with a higher level of RNT. **Limitations:** Cross-sectional design precluded causal conclusions and findings may not generalize to excluded anxiety disorders. **Conclusions:** Consistent with the transdiagnostic hypothesis, RNT was associated with a range of anxiety disorders and depression and with comorbidity for those with a principal depressive disorder, supporting recent evidence that RNT is a transdiagnostic process. The presence of RNT, specifically worry and rumination, should be assessed and treated regardless of diagnostic profile. Future research may show that both pure and comorbid depressed or anxious patients receive incremental benefit from transdiagnostic protocols developed to treat core pathological processes of RNT traditionally associated with separate disorders.

*Key Words:* Rumination; worry; repetitive thinking; comorbidity; transdiagnostic

## 1. Introduction

Repetitive thinking on negative themes is a feature of most emotional disorders, suggesting that it is a transdiagnostic phenomenon (Ehring and Watkins, 2008; Harvey et al., 2004). Worry and rumination are two commonly investigated forms of repetitive negative thinking (RNT). Worry has been defined as “a chain of thoughts and images, negatively affect-laden, and relatively uncontrollable” (Borkovec et al., 1983, p. 10) and is typically measured with the Penn State Worry Questionnaire (PSWQ, Meyer et al., 1990). Rumination has been defined as “...behavior and thoughts that focus one’s attention on one’s depressive symptoms and on the implications of these symptoms” (Nolen-Hoeksema, 1991, p. 569) and is frequently measured with the Ruminative Responses Scale (RRS, Nolen-Hoeksema and Morrow, 1991). Researchers have recently argued that worry and rumination share common *processes* and have questioned the degree to which they vary across diagnoses once disorder-specific *content* is accounted for (e.g., Harvey et al., 2004; McEvoy et al., 2010; Watkins, 2008). RNT has been demonstrated to increase vulnerability to multiple anxiety and depressive disorders and, as a common risk factor, elevated RNT may be a mechanism that accounts for the high levels of comorbidity observed between emotional disorders (Brown et al., 2001; Ruscio et al., 2011). The transdiagnostic account suggests that higher levels of RNT are associated with increased vulnerability to multiple emotional disorders and, given that worry and rumination share the underlying RNT construct, it would be expected that they would show similar relationships to comorbidity across emotional disorders.

Despite worry and rumination being traditionally studied within the anxiety and depression literatures, respectively, there is evidence that they are most parsimoniously considered as a common RNT process. Watkins et al. (2005) compared worry and rumination in a non-clinical sample and found no differences on a range of related appraisals and strategies. Watkins (2008) notes that the only replicated difference between worry and rumination is temporal orientation, with worry being more future-focused and rumination

more past-focused (Papageorgiou and Wells, 1999). These findings, along with the fact that anxiety and depressive disorders are highly comorbid, make it unsurprising that worry and rumination are significantly correlated with each other (Fresco et al., 2002; Muris et al., 2004; Segerstrom et al., 2000). Numerous other cross-sectional and longitudinal studies have found that worry and/or rumination are associated with both anxiety and depression symptoms (Fresco et al., 2002; Hong, 2007; McLaughlin and Nolen-Hoeksema, 2011; Meyer et al., 1990; Muris et al., 2005; Segerstrom et al., 2000). Interestingly, Ruscio et al. (2011) recently found that naturalistic RNT prospectively predicted negative responses (including anxiety and depression symptoms) to failure for individuals with Generalized Anxiety Disorder (GAD) and major depressive disorder (MDD). Naturalistic RNT was also associated with worry ( $r = .35$ ) and the two RRS subscales (Brooding  $r = .42$ ; Reflection  $r = .46$ ) to a similar degree. These findings support the contention that RNT is a transdiagnostic process that is common to worry and rumination, which leads to the plausible hypothesis that RNT could at least partially explain the high rates of comorbidity between anxiety and depressive disorders.

Using exploratory factor analysis some studies have found that worry and rumination, as measured by the PSWQ and RRS, respectively, are distinguishable (e.g., Fresco et al., 2002). However, these measures include multiple sources of method variance that could explain why their items load separately. First, the RRS instructions ask respondents to answer items with respect to when they feel sad, blue, or depressed, whereas respondents complete PSWQ items with respect to what is 'typical' for them. Second, the RRS includes items assessing depression symptoms. Third, all PSWQ items include the term 'worry'. Together, these method differences could obscure the fact that both measures are assessing a similar underlying construct of RNT. When common instructions are used and diagnosis-specific terms are removed, RRS and PSWQ items have been found to load on a single RNT factor (McEvoy et al., 2010). Importantly, this RNT factor has been found to be uniquely associated with a range of emotions (depression, anxiety, shame, general distress) in a non-clinical

sample, and with symptoms of social phobia, generalised anxiety disorder (GAD), panic disorder and agoraphobia, and depression within a clinical sample (Mahoney et al., 2012).

While some studies have found that individuals with GAD score more highly on the PSWQ than those with other disorders (Chelminski and Zimmerman, 2003; Meyer et al., 1990), other studies have found elevated worry in multiple disorders (Brown et al., 1992). Starcevic (1995) compared individuals with GAD or MDD and found that PSWQ scores were equally elevated in both groups, resulting in the conclusion that worry may be common to both disorders with the difference lying only in the worry domains. Likewise, the RRS has been associated with symptoms on a range of anxiety disorders (Nolen-Hoeksema et al., 2008). However, most studies to date have been limited in the breadth of emotional disorders examined. In addition, many have used only one measure of RNT, which has prevented them from testing whether various forms of RNT share a similar relationship to comorbidity across disorder groups. A more rigorous transdiagnostic examination of the relationship between RNT and comorbidity requires multiple measures of RNT to be administered to a mixed diagnosis and highly comorbid sample.

In one of the few studies examining the relationship between RNT and comorbidity, Watkins (2009) investigated rumination in a sample of 116 depressed patients. Watkins found that rumination was uniquely associated with both depression and anxiety. However, Brooding, which is a particularly maladaptive subtype of rumination (Treyner et al., 2003), was associated with the presence of comorbid obsessive compulsive disorder (OCD) and GAD but not social anxiety disorder (SAD). It is unclear how these findings would generalise to a clinical sample with principal anxiety and depressive disorders, or to other forms of repetitive thinking such as worry. Chelminski and Zimmerman (2003) compared worry across individuals with 'pure' anxiety disorders (GAD, SAD, specific phobia, post-traumatic stress disorder, OCD, panic disorder) and found that those with GAD scored more highly than those with most other anxiety disorders or depression, but those with GAD alone did not

differ from those with comorbid GAD and MDD. The latter finding suggests that having comorbid MDD did not increase worry compared to those with GAD alone, perhaps due to a ceiling effect. Whilst these findings are consistent with worry being most characteristic of GAD there are several important limitations of existing research that need to be addressed before firm conclusions can be made.

The first limitation is the sources of method variance between the RRS and PSWQ mentioned above, which, especially when used in isolation, may inflate their association with particular diagnoses and obscure transdiagnostic relationships. In contrast, if similar patterns are observed between both measures and comorbidity across multiple diagnoses, this would be particularly compelling evidence of their transdiagnostic status. Second, few studies have examined transdiagnostic associations between RNT and comorbidity within complex clinical samples referred to tertiary clinics. It is unclear whether or not findings from analogue or diagnostically 'pure' samples are generalizable to individuals with emotional disorders who present at tertiary referral clinics, where comorbidity is the norm rather than the exception (Brown et al., 2001).

With these limitations in mind, this study had two main aims. The first aim was to compare scores on measures of both worry and rumination across groups with only one (i.e., 'pure') anxiety or depressive disorder. The transdiagnostic hypothesis predicts that worry and rumination will be elevated across both depression and anxiety disorders. However, there may be some differences between disorders when the content of RNT matches that of the disorder. Specifically, items confounded with depression symptoms in the RRS may inflate the relationship between rumination and major depression relative to other disorders. We therefore examined subscales within the RRS (i.e., Reflection and Brooding) that excluded depression symptoms in addition to the total scale score. Likewise, the term 'worry' in all PSWQ items may inflate the relationship between worry scores and GAD relative to other disorders.

The second aim was to examine the relationship between RNT and comorbidity. The transdiagnostic hypothesis would predict that higher levels of RNT (worry and rumination) would be associated with higher rates of comorbidity regardless of the particular principal or comorbid disorders. Alternatively, if different forms of RNT are more characteristic of some disorders than others then the relationship between RNT and comorbidity should be more pronounced for some primary and comorbid disorders than others.

## 2.0 Method

### 2.1. Participants

Patients ( $N = 513$ ) were consecutive referrals from health professionals to a community mental health clinic specialising in the psychological treatment of anxiety and depressive disorders. The mean age of the sample was 36.59 years ( $SD = 12.79$ , range = 18 – 73) and 63% were women. Inclusion criteria for the current study were (a) a principal Diagnostic and Statistical Manual for Mental Disorders (DSM-IV, American Psychiatric Association, 1994) anxiety or depressive disorder (MDD or dysthymia) and (b) aged at least 18 years of age. Exclusion criteria were (a) a principal disorder other than an anxiety or depressive disorder, (b) being a current psychiatric in-patient, (d) psychosis, (e) a level of substance use that was judged by the assessing clinician as likely to interfere with engagement in treatment, or (f) a high suicide risk, including specific plans and/or intentions to attempt suicide. Patients were not excluded if they had suicidal ideation and/or vague plans but without intent. Seventy-two percent were using psychotropic medication. Approximately 38% were in a married or de facto relationship and 48% were employed. Highest educational qualification were university, 30%; technical or trade certificate, 24%; high school, 26%; primary/elementary, 15%; and other, 5%.

Two hundred and thirteen patients had pure (i.e. single) disorders, whereas 300 had more than one disorder. Principal diagnoses were determined by the most distressing and debilitating disorder at the time of the diagnostic assessment. Around half (52%) of the

patients with a principal anxiety disorder had a comorbid anxiety and/or depressive disorder, whereas 63% of patients with a principal depressive disorder had a comorbid disorder.

Principal diagnoses for those with only one anxiety or depressive disorder included GAD ( $n = 39$ ), Panic disorder (PD,  $n = 19$ ), SAD ( $n = 37$ ) (i.e., total with a 'pure' principal anxiety disorder,  $n = 95$ ), and depression (MDD or dysthymia,  $n = 117$ ). All analyses were initially run with MDD and dysthymia as separate disorders, but no substantive differences were found between them so only combined results are reported. Principal disorders for those with comorbid anxiety or depressive disorders include GAD ( $n = 18$ ), PD ( $n = 29$ ), SAD ( $n = 56$ ) (i.e., total principal anxiety disorders with comorbid disorders,  $n = 103$ ), and depression ( $n = 198$ ). PD may have been with or without agoraphobia. Other anxiety disorders were excluded as principal disorders as too few patients met criteria for comparisons to be meaningful.

## 2.2 Measures

**2.2.1 Mini International Neuropsychiatric Interview (MINI PLUS Version 5.0, Sheehan et al., 2001).** The MINI is a structured interview used to diagnose Axis I disorders based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 2000). It has good validity and converges with lengthier diagnostic interviews, including the Structured Clinical Interview for DSM (SCID) and Composite International Diagnostic Interview (CIDI, Lecrubier et al., 1997; Sheehan et al., 1997). The MINI is superior to unstructured interviews at detecting comorbid diagnoses (Pinninti et al., 2003). Kappa statistics for interrater reliability of diagnoses (principal and comorbid) range from .79 to 1.00 (Sheehan, et al., 1998), with the majority of kappa values (i.e., 70%  $\geq .90$ ) indicating outstanding interrater reliability ( $< 0.40 =$  poor;  $0.40-0.59 =$  moderate;  $0.60-0.79 =$  substantial;  $> .80 =$  outstanding (Landis and Koch, 1977).

### **2.2.2 Ruminative Response Scale (RRS, Nolen-Hoeksema and Morrow, 1991).**

The RRS consists of 22-items from the Response Styles Questionnaire. Respondents are asked to indicate what they tend to do when feeling sad, down or depressed on a four-point

Likert scale ranging from ‘almost never’ (1) to ‘almost always’ (4). Although a total score was traditionally used, Treynor et al. (2003) proposed that an alternative version of the RRS consists of three factors, namely Brooding, which is defined as a “passive comparison between one’s current situation with some unachievable standard”, Reflection, which refers to “deliberate self-contemplation in order to problem solve and overcome low mood” (Treynor et al., 2003, p. 256), and Depression, which consists of items that overlap with measures of depression symptomatology (e.g. “think about your feelings of fatigue and achiness”). Researchers have increasingly dealt with the potential confound between rumination and symptom measures of depression by removing Depression items from the RRS (e.g., Segerstrom et al., 2000). Evidence suggests that the Brooding subscale is more pathological than the Reflection scale (Treynor et al., 2003; Watkins, 2009). In the current study, the internal reliabilities for the total RRS (including Depression, Brooding, and Reflection items), Brooding and Reflection scales were .92, .67, and .78, respectively. Depression items were included in the total RRS score because we wanted to identify how these items may impact on results, compared to the subscales that exclude these items. The original version of the RRS was used in this study, so mean item ratings were calculated for each scale to optimise comparability to the version used in some other studies. Total scores can easily be computed by multiplying mean scores by 22.

**2.2.3 Penn State Worry Questionnaire (PSWQ, Meyer et al., 1990).** The PSWQ is a 16 item trait-based questionnaire used to measure pathological worry. Respondents rate the extent to which each item applies to them on a 5-point scale ranging from ‘not at all typical of me’ (1) to ‘very typical of me’ (5). Five negatively worded items are reverse scored before summing to form a total score ranging from 16 to 80 with higher scores reflecting greater levels of worry. The PSWQ has demonstrated good validity and reliability when modeled as a single factor with specified method effects accounting for the reverse-worded items

(Brown, 2003; Hazlett-Stevens et al., 2004). In the current study, the internal reliability of the total score was .75.

**2.2.4 Beck Anxiety Inventory (BAI, Beck et al., 1988).** The BAI is a 21-item self-report measure designed to assess anxiety symptom severity over the previous week. The BAI has demonstrated good psychometric properties (Creamer et al., 1995). Internal reliability coefficients range from .85 and .94, with a test-retest reliability coefficient of .75. In the current study, internal reliability of the BAI was .91.

**2.2.5 Beck Depression Inventory (BDI-II, Beck et al., 1996).** The BDI-II is a 21-item measure of depression symptoms experienced during the previous fortnight. Internal consistency ( $\alpha = .92$ ) and test-retest reliability ( $r = .93$  over 1 week) are established (Beck et al., 1996), and evidence for construct validity has been demonstrated (e.g. Dozois et al., 1998). Support for convergent and discriminant validity has also been reported (Osman et al., 1997; Steer et al., 1997). In the current study, internal reliability for the BDI was .91.

### **2.3 Procedure**

Consecutive referrals by health professionals who met the service's inclusion criteria were sent a battery of questionnaires to complete and bring to their initial clinical assessment. At the initial appointment, masters- or doctorate-level Clinical Psychologists with two or more years of clinical experience and extensive training in the protocol completed a clinical interview and structured diagnostic assessment using the MINI PLUS. All clinicians were supervised weekly by senior staff, and completed assessments were discussed at weekly clinic review meetings to confirm diagnoses and service inclusion criteria. The process of receiving informed written consent for using patients' data for research purposes was approved by the Area Health Service's Mental Health Human Research Ethics Committee.

## **3. Results**

### **3.1 Descriptive statistics**

The mean RRS score for the total sample ( $N = 513$ ) was 57.64 (converted to a score out of 88 by multiplying mean item rating by 22) and the mean PSWQ score was 61.47. These scores are representative of scores obtained in previous clinical samples. Among anxiety disorder and depressive clinical samples comprised typically of outpatients, the mean RRS generally falls in the mid-50s to mid-60s with standard deviations of around 11 (Watkins & Baracaia, 2002; Watkins & Moulds, 2007), although a mean score as low as 35.4 (SD = 11.7) was reported for one outpatient major depressive sample (Lam et al., 2003) and 33.4 (SD = 12.8) for another sample with social phobia (Perini et al., 2006). Corresponding mean PSWQ score is around 60 (Perini et al., 2006; Watkins & Moulds, 2007, SDs = 11-16). In non-clinical samples assessed as having no lifetime history of major depression or major depression and dysthymia, the mean RRS score falls in the mid-30s (Watkins & Baracaia, 2002; Watkins & Moulds, 2007, SDs = 8-11) and among undergraduates and community volunteers falls between 35 and 41 (Perini et al 2006; Schoofs et al., 2010, SDs = 9 – 11). The mean PSWQ score ranges between around 32 and 41 in non-clinic samples (Perini et al 2006; Schoofs et al 2010; Watkins & Moulds, 2007, SDs = 9-11). Thus, our sample scored more than two standard deviations above non-clinical means and within the clinical range.

There was a concern that ceiling effects may be present for RNT measures and this warranted investigation prior to hypothesis testing. Within this scenario, individuals who present with one principal diagnosis, such as depression or GAD, already present with very high levels of RNT, and thus a ceiling effect would confound investigation of the relationship between (even higher) RNT and comorbidity. Histograms and skewness statistics were inspected to determine whether ceiling effects were present on the RRS total, Brooding, Reflection, and PSWQ study variables. All histograms showed normally distributed variables and skewness statistics ranged between -.57 to .12, well below the threshold of -3 (Tabachnick & Fidell, 2007) which delineates problematic skewness and would alert to a potential ceiling effect.

### 3.2 Comparisons between ‘pure’ anxiety and depressive disorders

To test the first hypothesis that both forms of RNT (worry and rumination) would be elevated across multiple disorders, a multivariate analysis of variance (MANOVA) was run with Principal Diagnosis as the between-subjects variable. The MANOVA included the RRS subscales (Brooding, Reflection) and PSWQ as dependent variables, given that they are all conceptualised as measures of the underlying construct of RNT. A separate univariate ANOVA was conducted for the RRS total score because we wanted to test how the pattern of RRS subscale means would differ from the total score mean, which included the items contaminated by depression symptoms. Given that the RRS total score is not independent from the RRS subscale scores, it could not be included as another dependent variable within the MANOVA. Only patients with a pure (i.e., single) diagnosis were included in the first analysis.

The Wilk’s lambda multivariate test was statistically significant,  $F(3,9) = 4.91, p < .001$ , suggesting that RNT differed across pure diagnostic groups. Univariate between-subjects tests with Bonferroni adjustment for Brooding, Reflection, and PSWQ, as well as the univariate ANOVA comparing mean total RRS scores, are shown in Table 1. The effect of Principal Diagnosis was significant for the RRS total, Brooding, and Reflection ratings, but not for the PSWQ, although this mainly resulted from patients with Panic Disorder differing from other disorders. Consistent with the transdiagnostic hypothesis, analyses showed no significant differences across most diagnostic groups on the RNT measures least contaminated by diagnosis-specific symptoms or instructions (i.e., Brooding, Reflection, PSWQ), with the exception that those with panic disorder tended to score lower than some groups on Brooding and Reflection. However, some diagnostic differences were observed on the RRS total scale, which included diagnosis-specific symptoms (i.e., higher mean total RRS score for depression vs GAD, SAD, PD).

### 3.3 The impact of comorbid disorders on level of RNT

To test the second hypothesis that higher levels of RNT would be associated with comorbidity regardless of principal or comorbid disorder, individuals with more than one anxiety or depressive disorder were compared based on their principal disorder, with the presence or absence of seven other disorder groups included as covariates (simple phobia, depression, dysthymia, GAD, PD, SAD, other disorders). Low frequency comorbid disorders were included in an ‘other disorders’ group ( $n = 29/301$ ). This group included anxiety disorders (i.e., obsessive-compulsive disorder, post-traumatic stress disorder, agoraphobia without PD), eating disorders, and somatoform disorders. Although heterogeneous, this group was judged relevant to the testing of the hypothesis, in which it was expected that higher RNT would be associated with the presence of psychological comorbidity irrespective of the specific principal or comorbid diagnosis.

First, a MANOVA was conducted to examine the relation between RNT (i.e. Brooding, Reflection, and PSWQ) and principal diagnosis in the comorbid subsample. The Wilk’s lambda multivariate test was statistically significant,  $F(3,9) = 2.49, p = .008$ . Univariate between-subjects tests with Bonferroni adjustment for Brooding, Reflection, and PSWQ, as well as an univariate ANOVA comparing groups on total RRS, are shown in Table 1. Tests were significant for the total RRS, Brooding, and Reflection, but not PSWQ. Notably, multivariate and univariate between-subject results for the ‘comorbid’ subsample were similar to the ‘pure’ subsample with two exceptions. First, the PD group did not endorse the RRS less strongly than the GAD and SAD groups. Second, univariate comparisons failed to show significant differences between diagnostic groups on the Brooding scale.

As a final test of these relationships the groups were separated into ‘pure’ principal depression or anxiety groups, one comorbid disorder, and two or more comorbid disorders. The anxiety disorder groups (GAD, PD and SAD) were collapsed into a single ‘pure’ principal anxiety disorder group for this analysis. A MANOVA was conducted separately for those with principal depressive disorders and those with principal anxiety disorders, with

Number of Disorders (1, 2, 3+) as the between-subjects variable and RNT (Brooding, Reflection, and PSWQ) as the dependent variable. Separate ANOVAs were conducted for the RRS total score because this was not independent of the RRS subscale scores in the MANOVA. The Wilk's lambda multivariate test was statistically significant for the depression group,  $F(3,6) = 3.92, p = .001$ , indicating that levels of RNT increased with increasing comorbidity, but not for the anxiety group,  $F(3,6) = 1.46, p = .19$ . For the depression group, univariate between-subject tests with Bonferroni corrections were statistically significant for Brooding and PSWQ, and an ANOVA comparing total RRS score was statistically significant. For the anxiety group, the only significant difference was on the total mean RRS score (Table 2).

#### 4. Discussion

Worry and rumination are two commonly studied forms of repetitive negative thinking (RNT) that are consistently found to be associated with each other, and with anxiety and depression. The first aim of this study was to compare individuals with various 'pure' anxiety and depressive disorders to determine if, as predicted by the transdiagnostic approach, worry and rumination were endorsed across multiple disorders. With respect to worry, the transdiagnostic hypothesis was supported, with no significant differences across all four diagnostic groups (GAD, PD, SAD, and depression). This finding suggests that worry is a common feature across the anxiety and depressive disorders included here and is therefore consistent with a transdiagnostic conceptualisation of worry. Although worry is a core defining feature of GAD, individuals with other principal diagnoses reported that they too engaged in pathological worry despite not meeting criteria for GAD. Also consistent with the transdiagnostic hypothesis, the RRS subscales least contaminated by diagnosis-specific depression symptoms (i.e., Brooding and Reflection) did not significantly differ between the depression, SAD, and GAD groups. These findings are particularly striking, given that the RRS instructions explicitly direct respondents to complete items with respect to when they

feel down, sad, or depressed. Consistent with the notion that symptom contamination inflates the relationship between the RRS and depression in particular, the total RRS scale including items confounded with depression symptoms was most strongly endorsed by the depression group.

When principal diagnostic groups were compared, but this time for patients with comorbidities rather than ‘pure’ diagnoses, the results were very similar. Controlling for comorbidity, there were no differences in Brooding, Reflection, or PSWQ between any of the principal diagnostic groups, with the exception of those with principal depression scoring more highly on the Reflection subscale than those with principal panic disorder. Total RRS scores were again higher for the depressed group compared to the PD and GAD, but not SAD, groups. These findings suggest that various forms of RNT that are uncontaminated with diagnosis-specific symptoms are associated with multiple anxiety disorders as well as depression.

The second aim of this study was to test the hypothesis that higher RNT would be associated with greater comorbidity. This hypothesis was partially supported. For the principal depression group, the presence of comorbid disorders was associated with higher Brooding and PSWQ scores, but not higher Reflection scores. Additionally, higher total RRS scores were associated with higher comorbidity for both the principal depression and principal anxiety disorder groups. Accordingly, RNT may increase vulnerability to comorbidity, particularly for those with principal depressive disorders. Our finding that for those with principal anxiety disorders, the relationship between the RRS and comorbidity held only for the total score, and not for Brooding or Reflection, suggests that this relationship can be explained solely by the RRS items contaminated by depressive symptoms. In contrast, for those with principal depressive disorders the relationship between RNT and comorbidity appears to be more robustly associated with comorbidity.

Our findings that both worry and rumination were elevated to a similar degree across multiple anxiety and depressive disorders, particularly when items contaminated with disorder-specific symptoms were removed, are consistent with the burgeoning transdiagnostic literature. Harvey et al. (2004) published an extensive review identifying several definite and probable transdiagnostic constructs. These authors concluded that RNT was a definite transdiagnostic construct, which has been further supported by more recent studies (Mahoney et al., 2012; McEvoy et al., 2010; Ruscio et al., 2011). Our findings are also consistent with the large body of evidence that worry and rumination are associated with symptoms of both anxiety and depression (e.g. Segerstrom et al., 2000), are elevated across multiple emotional disorders (e.g. Starcevic, 1995), and are more similar than different in terms of their frequency, duration, source (external vs internal), appraisals, emotions and strategies used in response to the initial intrusion (e.g., Watkins et al., 2005).

Nolen-Hoeksema and Watkins (2011) presented a transdiagnostic model of psychopathology where distal risk factors (e.g., environmental context, congenital abnormalities) lead to more proximal risk factors, including RNT. This model suggests that whilst higher levels of RNT increase the risk of psychopathology and comorbidity, specific moderators (e.g., environmental context factors or biological characteristics) determine the precise nature of the psychopathology that subsequently manifests (i.e., specific disorder or disorders). Our findings that various forms of RNT were associated with multiple disorders and with higher rates of comorbidity are fully consistent with this model. However, Nolen-Hoeksema and Watkins' (2011) model predicts that once a certain level of RNT is activated, the precise principal and comorbid disorders may be determined by specific moderators. Thus, the absence of a relationship between comorbidity and the Brooding, Reflection, and PSWQ scales in the principal anxiety disorder group in this study may be due to the need for moderators not measured here to determine the nature and extent of comorbidities. Future research investigating RNT in relation to both distal risk factors and diagnosis-specific

moderators will be informative for identifying mechanisms by which transdiagnostic risk factors lead to multiple specific disorders (i.e., multifinality), and by which individuals with the same risk factor (RNT) manifest different disorders (i.e., divergent trajectories).

The primary clinical implication of these findings is that elevated RNT is likely to be captured across diagnoses regardless of the specific measure of RNT used. The need to distinguish between rumination and worry may be generally unnecessary for assessment purposes, and recently developed transdiagnostic measures of RNT might be sufficient in most cases (e.g., Ehring et al., Mahoney et al., 2012; McEvoy et al., 2010). These findings do not rule out the possibility that at least some diagnosis-specific content and processes initiate, maintain, and/or exacerbate engagement in RNT, but rather suggest that the use of diagnosis-specific measures of RNT may be unnecessary to investigate these *processes* across disorders. Indeed, there is evidence that common processes are associated with both worry and rumination. For instance, various forms of RNT have been associated with more intense and prolonged negative emotions (Nolen-Hoeksema et al., 2008), attentional biases (Koster et al., 2011), avoidance strategies (Moulds et al., 2007), and metacognitions (McEvoy et al., 2010; McEvoy et al., 2013; Papageorgiou and Wells, 1999; Watkins and Moulds, 2005). It is therefore important that future research move beyond comparing various forms of RNT across disorders, and rather examine vulnerability and maintaining factors for RNT that are common and distinct across disorders. Our findings also suggest that RNT should be assessed and treated (if elevated) regardless of the principal anxiety or depressive disorder, given that it may be an important maintaining factor and increase vulnerability to comorbid disorders (Ehring & Watkins, 2008; Watkins, 2008). Consistent with this, variants of cognitive therapy explicitly designed to target RNT have been found to reduce anxiety and depression, and both worry and rumination (Watkins et al., 2007, 2011).

This study has several strengths, including the use of a large clinical sample, the use of two separate measures of RNT, comparisons between diagnostically ‘pure’ and comorbid

subsamples, examination of both number and type of comorbid disorders, and a range of principal anxiety and depressive disorders. However, several limitations must be considered. First, the generalizability of our findings may be restricted to those with principal depression, SAD, GAD, and PD (with or without agoraphobia). Too few patients had some principal anxiety disorders, including OCD and post-traumatic stress disorder (PTSD), to include in the analyses. While there is some evidence that OCD and PTSD are associated with RNT, there is also evidence for differences (Abramowitz et al., 2003; Clohessy and Ehlers, 1999; Langlois et al., 2000; van Rijsoort et al., 2001; Wahl et al., 2011). Moreover, differences in numbers across the four principal disorders were large, which may have affected power to detect differences between some groups. Second, no inter-rater reliability data were available for diagnostic interviews so, although experienced masters- and doctorate-level diagnosticians administered the structured interview, we could not demonstrate that the diagnoses were consistent across clinicians. Third, our study is cross-sectional and as such causal conclusions about the relationship between RNT and comorbidity could not be made. However, our study does provide some initial empirical justification for future prospective and experimental studies to investigate the relationships between RNT and trajectories towards comorbidity.

This study found that RNT in the forms of worry and rumination (especially Brooding) were equally elevated across multiple depression and anxiety disorders, were not differentially associated with specific types of comorbid disorders, and were related to number of comorbid diagnoses particularly for those with principal depression. These findings are consistent with both worry and rumination being transdiagnostic constructs. Future research should focus on identifying and manipulating factors that increase vulnerability to and the maintenance of RNT, so that targeted treatments can be developed to prevent and ameliorate the negative emotional, cognitive, and behavioural sequelae of this pernicious process.

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Table 1

*Descriptive Statistics on the BDI and BAI and Diagnostic Comparisons on RNT in the 'Pure' (i.e., no comorbid Axis I diagnoses) and 'Comorbid' Subsamples*

Hypothesis set	Measures	Comparison				Univariate between-subject tests		
		Depression <i>M</i> ± <i>SD</i>	PD <i>M</i> ± <i>SD</i>	GAD <i>M</i> ± <i>SD</i>	SAD <i>M</i> ± <i>SD</i>	<i>F</i>	<i>pη</i> <sup>2</sup>	Sig. diff in test comparison
	Pure	( <i>n</i> = 117)	( <i>n</i> = 19)	( <i>n</i> = 39)	( <i>n</i> = 37)			
	BDI total	27.73 ± 9.85	14.37 ± 10.52	17.03 ± 9.64	15.84 ± 10.41			
	BAI	16.89 ± 9.63	17.63 ± 9.48	15.95 ± 9.54	16.32 ± 9.05			
1	RRS total	2.66 ± .51	1.83 ± .57	2.31 ± .53	2.33 ± .64	15.38***	.18	Dep > GAD, SAD > PD
1	Brooding	2.72 ± .75	2.07 ± .81	2.78 ± .76	2.77 ± .69	4.74**	.06	Dep, GAD, SAD > PD
1	Reflection	2.52 ± .66	1.77 ± .76	2.22 ± .59	2.21 ± .76	8.22***	.11	Dep > PD
1	PSWQ	58.21 ± 12.38	57.58 ± 11.89	63.47 ± 10.28	56.95 ± 11.08	2.52	.03	ns
	Comorbid	( <i>n</i> = 198)	( <i>n</i> = 29)	( <i>n</i> = 18)	( <i>n</i> = 56)			
	BDI total	32.77 ± 10.81	25.52 ± 9.05	23.83 ± 10.78	26.61 ± 8.27			
	BAI	23.30 ± 12.07	31.28 ± 11.91	18.56 ± 11.83	20.70 ± 10.37			
2	RRS total	2.84 ± .50	2.45 ± .52	2.37 ± .50	2.61 ± .48	10.73***	.10	Dep > PD, GAD, SAD

2	Brooding	2.99 ± .72	2.71 ± .71	2.57 ± .60	2.88 ± .73	2.95*	.03	ns
2	Reflection	2.58 ± .67	2.21 ± .69	2.26 ± .78	2.43 ± .64	3.79*	.04	Dep > PD
2	PSWQ	63.38 ± 10.34	63.34 ± 8.93	67.22 ± 8.16	61.64 ± 9.25	1.47	.01	ns

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*Note.* Mean scale ratings are provided for the RRS. Total scale scores can be calculated by multiplying the mean rating by 22. Dep = depression/dysthymic disorder, Dysth = dysthymic disorder. GAD = generalised anxiety disorder, PD = panic disorder, PSWQ = Penn State Worry Questionnaire, RRS = Ruminative Response Scale total score, SAD = social anxiety disorder. \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

Table 2

*Pure vs. Comorbid Subsample Scores on the RRS and PSWQ by Anxiety or Depressive Principal Diagnosis Category*

Measures	Comparison			Univariate between-subject tests		
	Pure	Comorbid	Comorbid	<i>F</i>	<i>pη</i> <sup>2</sup>	Sig. diff in test comparison
	(1 diagnosis) <i>M ± SD</i>	(2 diagnoses) <i>M ± SD</i>	(3+ diagnoses) <i>M ± SD</i>			
1. Depression	( <i>n</i> = 117)	( <i>n</i> = 142)	( <i>n</i> = 56)			
RRS	2.66 ± .51	2.80 ± .48	2.95 ± .52	7.09**	.04	3+ > 1
Brooding	2.72 ± .75	2.94 ± .71	3.11 ± .74	6.16**	.04	2, 3+ > 1
Reflection	2.52 ± .66	2.55 ± .64	2.68 ± .73	1.15	.01	ns
PSWQ	58.21 ± 12.38	62.64 ± 10.69	65.25 ± 9.22	9.04***	.06	3+ > 2 > 1
2. Anxiety	( <i>n</i> = 95)	( <i>n</i> = 82)	( <i>n</i> = 21)			
RRS	2.22 ± .61	2.49 ± .54	2.65 ± .27	7.93***	.08	3+ > 2 > 1
Brooding	2.63 ± .79	2.74 ± .74	2.90 ± .58	1.32	.01	ns
Reflection	2.13 ± .71	2.32 ± .74	2.41 ± .43	2.45	.03	ns
PSWQ	59.75 ± 11.25	62.88 ± 9.51	63.95 ± 7.61	2.74	.03	ns

*Note.* PSWQ = Penn State Worry Questionnaire, RRS = Ruminative Response Scale. Mean scale ratings are provided for the RRS. Total scale scores can be calculated by multiplying the mean rating by 22.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .