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Mechanisms Driving Pre- and Post-Stressor Repetitive Negative Thinking:

Metacognitions, Cognitive Avoidance, and Thought Control

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Abstract

Background and Objectives: Repetitive negative thinking (RNT) is common to multiple emotional disorders and occurs before, during, and following a stressor. One replicated difference between common forms of RNT such as worry and rumination is temporal orientation towards a stressor, with worry being more future-oriented and rumination more past-oriented. Different mechanisms may drive RNT at these different time points. The Repetitive Thinking Questionnaire (RTQ) was developed to measure RNT as it relates to multiple emotions and disorders. The original RTQ measured RNT following a stressor, whereas a recently developed looming version (RTQ-L) measured RNT in anticipation of a stressor. The aims of this study were to examine the relationships between RTQ-L and mechanisms theorized to drive engagement in RNT, and to identify common and distinct mechanisms associated with RNT before and after a stressor. *Method:* Participants ($N = 175$) completed the RNT-L in anticipation of a stressor, along with measures of metacognitive beliefs, cognitive avoidance strategies, and thought control strategies. *Results:* Consistent with the original post-event version of the RTQ, the RTQ-L was associated with positive and negative metacognitive beliefs, cognitive avoidance, and thought control strategies, although there were some differences in the specific cognitive avoidance and thought control strategies associated with RNT at each time point. *Limitations:* Replication with clinical samples is required. The correlational design precluded causal conclusions. *Conclusions:* Common and distinct mechanisms may drive RNT before and after a stressor.

Key Words: repetitive thinking; transdiagnostic; metacognitions; cognitive avoidance; thought control

1.0 Introduction

Repetitive negative thinking (RNT) involves perseverative cognitive activity that revolves around negative themes and is subjectively experienced as difficult to control (Ehring & Watkins, 2008). RNT has been associated with multiple emotional disorders and is therefore considered to be a transdiagnostic construct (Harvey, Watkins, Mansell, & Shafran, 2004). Worry and rumination are two forms of RNT that have typically been examined within the anxiety and depression literatures, respectively. Worry is conceptualized as an attempt to prevent future catastrophes and is associated with increases in negative affect, interference with cognitive function, and inhibition of physiological processes associated with the extinction of fear responses (Borkovec, Alcaine, & Behar, 2004; Borkovec, Ray, & Stöber, 1998). Depressive rumination refers to repetitive thinking in response to sad mood in which the individual contemplates the causes, meanings, and implications of their mood, as well as problems and events from the past (Nolen-Hoeksema, 1991, 2004). Depressive rumination has been associated with the onset, maintenance, and relapse of depressive episodes (see Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008 for review), and experimental studies have reliably demonstrated a causal role of rumination on mood states (Nolen-Hoeksema & Morrow, 1993).

Despite evolving within different literatures, evidence is building that worry and rumination may be more similar than different. Watkins, Moulds, and Mackintosh (2005) compared thoughts associated with worry and rumination and found that they differed on only seven out of 53 dimensions. In their review of the literature, Ehring and Watkins (2008) concluded that there are more similarities than differences across the processes of worry and rumination, including the fact that they are repetitive, difficult to control, negative in content, predominantly verbal, and relatively abstract. The only replicated differences were reported to be the thought content and temporal orientation, with worry more likely to be about the

future and depressive rumination more likely to be about the past. Another interesting difference found in Watkins et al.'s (2005) study was the worry was more likely to be associated with a feeling of insecurity, whereas rumination was more likely to be deemed to have a basis in reality. Together, these findings suggest that worry is more likely to be about future events, where an outcome is unpredictable but expected to be negative, whereas depressive rumination is more likely to be about past events and as such the outcome is known (and thus more likely to be based in reality) and is perceived to be negative. Extending this line of thought, Nolen-Hoeksema et al. (2008) speculated that worry may occur when people are uncertain, because the event is in the future, but they see the event as potentially controllable. Worrying is thus a strategy used to avert potentially negative outcomes. In contrast, rumination occurs when people are more certain about an event, given that it is more likely to have already occurred, and, as a consequence, the event is not controllable. These differences suggest that different mechanisms may contribute to RNT before or after a particular stressor.

Worry and rumination have traditionally been measured using different instruments, such as the Ruminative Responses Scale (RRS, Nolen-Hoeksema & Morrow, 1991) for depressive rumination and the Penn State Worry Questionnaire (PSWQ, Meyer, Miller, Metzger, & Borkovec, 1990) for worry. Although items from these scales tend to load on separate factors (e.g., Fresco, Frankel, Mennin, Turk, & Heimberg, 2002; Goring & Papageorgiou, 2008), when diagnosis-specific confounds are removed (e.g., items measuring depression symptoms in the RRS, different instructions, the use of the term 'worry' in all PSWQ items) they tend to load on the same factor (McEvoy, Mahoney, & Moulds, 2010), which supports the idea that the underlying constructs may be more similar than different. Importantly, the RRS and PSWQ have also both been found to be associated with symptoms

of depression and anxiety (e.g., Segerstrom, Tsao, Alden, & Craske, 2000), suggesting that they are not unique to a particular emotional state.

Given the evidence that RNT is transdiagnostic, researchers have started developing instruments that index RNT without diagnosis-specific content. For instance, Ehring and colleagues (2011) recently developed the Perseverative Thinking Questionnaire (PTQ) as a content-independent measure of three aspects of RNT; core characteristics (repetitiveness, intrusiveness, and difficulties with disengagement), perceived unproductiveness, and the capturing of mental capacity. The PTQ was significantly associated with other measures of RNT and with symptoms of anxiety and depression. McEvoy et al. (2010) developed the Repetitive Thinking Questionnaire (RTQ) by removing diagnosis-specific content and instructions from three existing measures of RNT, including the PSWQ, the RRS, and the Post-Event Processing Questionnaire (McEvoy & Kingsep, 2006; Rachman, Grüter-Andrews, & Shafran, 2000), which is a measure of RNT typically used within the social phobia literature. McEvoy et al. found that all items from these three measures loaded on a single RNT factor, with the exception of the four negatively worded PSWQ items, which reflected an absence of RNT. Interestingly, scores from the RNT subscale were significantly and uniquely associated with various emotions, including anxiety, depression, shame, anger, and general distress. Moreover, the RNT subscale was also significantly associated with mechanisms theorized to driving engagement in RNT, including positive and negative metacognitive beliefs, cognitive avoidance, and particular thought control strategies.

Several models of RNT, including the Self-Regulatory Executive Function (S-REF) model (Wells & Matthews, 1996) and the avoidance theory of worry (Borkovec et al., 2004), suggest that positive and negative metacognitive beliefs and cognitive avoidance increase the incidence of RNT. For example, positive metabeliefs that "worrying about my problems helps me to cope" and "worrying will help me to solve my problems" are likely to motivate

engagement in RNT. Once worrying is initiated, negative metabeliefs, for example that worrying itself is harmful or dangerous, are likely to escalate the perceived threat from worry and thereby increase RNT further. Consistent with these models, McEvoy et al. (2010) found that the RNT subscale of the RTQ was significantly associated with both positive and negative metacognitive beliefs, even when controlling for depression and anxiety symptoms. However, given that the original RTQ measured RNT following a stressor, the question remains as to whether the same beliefs are associated with RNT in anticipation of a stressor.

Borkovec et al.'s (2004) avoidance theory suggests that worry functions as a misguided attempt to prevent feared outcomes or to prepare for future danger (Borkovec & Roemer, 1995). Consistent with this theory, worry has been associated with measures of experiential (Roemer, Salters, Raffa, & Orsillo, 2005) and cognitive (Sexton & Dugas, 2008) avoidance, and has been found to distract individuals from more distressing cognitive material such as negative imagery (Borkovec & Inz, 1990), and to suppress distressing somatic sensations (Borkovec & Hu, 1990). Depressive rumination may also serve avoidant functions, including avoidance of engaging in an aversive external environment, and as a means of justifying withdrawal, inactivity, and the relinquishing of responsibility (Martell, Addis, & Jacobson, 2001; Moulds, Kandris, Starr, & Wong, 2007; Nolen-Hoeksema et al., 2008). The Cognitive Avoidance Questionnaire (CAQ, Gosselin et al., 2002; Sexton & Dugas, 2008) measures five cognitive avoidance strategies, including thought *Substitution* (replacing distressing thoughts with less distressing ones), *Transformation* of images into less distressing verbal thoughts, *Distraction* (e.g., I often do things to distract myself from my thoughts), *Avoidance* of stimuli that trigger unpleasant thoughts, and thought *Suppression* (deliberate attempts to remove thoughts from consciousness). Consistent with the proposal that RNT serves an avoidant function, McEvoy et al. (2010) found that the RNT subscale of the RTQ was significantly and positively correlated with all five subscales, and that the

Substitution, Transformation, and Avoidance scales explained unique variance in RNT, even when controlling for symptoms of depression and anxiety. Thus, the more individuals used these avoidance strategies the more RNT they reported engaging in.

A range of additional thought control strategies have also been shown to be counter-productive and, in fact, increase the frequency of distressing thoughts (e.g., Clark, Winton, & Thynn, 1993; Wegner, Schneider, Knutson, & McMahon, 1991). In an attempt to capture potentially maladaptive thought control strategies, Wells and Davies (1994) developed the Thought Control Questionnaire (TCQ), which consists of five scales measuring cognitive Distraction (e.g., 'I keep myself busy'), Social Control/Reassurance (e.g., 'I talk to a friend about the thought'), Worry (e.g., 'I focus on different negative thoughts'), Punishment (e.g., 'I punish myself for thinking the thought'), and Reappraisal (e.g., 'I try to reinterpret the thought'). These researchers found that the Worry and Punishment subscales were associated with the PSWQ, suggesting that attempts to think about 'other' more minor worries and punishing oneself for having thoughts were both associated with more RNT. Similarly, Fehm and Hoyer (2004) found that the Punishment and/or Worry subscales were significantly associated with a broad array of measure of psychopathology, including anxiety, depression, worry, social anxiety, agoraphobia, and obsessive compulsive disorder. Interestingly the Distraction subscale was negatively associated with symptoms of depression, worry, and social anxiety, suggesting that distracting oneself from worries was associated with fewer symptoms. Coles and Heimberg (2005) compared individuals with generalized anxiety disorder to non-anxious controls on various thought control strategies and found that those with GAD were more likely to use worry and punishment (i.e., criticising oneself) but less likely to use social control (i.e., speaking with peers regarding their worries) or distraction. McEvoy et al. (2010) found that the RNT subscale of the RTQ was significantly and uniquely associated with Social Control, Punishment, and Reappraisal thought control strategies, such

that the more individuals used these strategies the more they engaged in RNT. In sum, punishment appears to be consistently associated with more RNT, and findings on the remaining thought control strategies differ somewhat between studies, which may be a function of different samples (e.g., clinical versus non-clinical) or different measures of RNT.

Given the replicated differences in the temporal orientation of worry and rumination (i.e., future- vs. past-focus, respectively), an important question is whether or not the same mechanisms drive RNT both before and after a stressor. If the same mechanisms are associated with RNT at both time points, it would suggest that the same treatment protocol could be used to target both anticipatory and post-event RNT. In contrast, if different mechanisms were operating at each time point, it would be important to target each of these mechanisms in treatment. The original post-event version of the RTQ was designed to exclude diagnosis-specific content and its relationship to metacognitions, cognitive avoidance, and thought control has been previously examined (McEvoy et al., 2010). A looming version of the RTQ (RTQ-L) has also been recently developed, which is comprised of items modified from the original version so that they assess RNT in anticipation of a stressor. The RTQ-L is therefore uniquely placed to identify common and distinct mechanisms driving RNT before and after a stressor.

The main aim of the first study was therefore to determine whether the RTQ-L would replicate the significant associations found between the original RTQ and positive and negative metacognitive beliefs, cognitive avoidance strategies, and thought control strategies. It was hypothesised that the RTQ-L would be significantly and positively associated with positive metabeliefs and with negative metabeliefs (i.e., uncontrollability and dangerousness). Likewise, it was expected that the RTQ-L would be associated with cognitive avoidance strategies, and thought control strategies, especially punishment. It was expected that all associations would remain significant when controlling for anxiety and depression.

2.0 Study 1

2.1 Method

2.1.1 Participants

Participants (N = 175, 61% women) were university undergraduate students with a mean age of 19.71 years (SD = 1.97, Range = 17 - 31). This was the same sample used to develop the RTQ-L (McEvoy, Moulds, & Mahoney, 2012).

2.1.2 Measures

2.1.2.1 Repetitive Thinking Questionnaire-Looming Version (RTQ-L, McEvoy et al., 2012). The RTQ-L comprised items modified from the original RTQ (McEvoy et al., 2010). The RTQ comprised of 31-items measuring perseverative thinking independent from symptoms of particular disorders (e.g., including the word "depression", the term "worry" was replaced by "thoughts or images"). Whereas the RTQ asked respondents to complete the items with reference to a recent past distressing event, the RTQ-L asked respondents to complete items with reference to an upcoming stressor (i.e., upcoming university exams). The RTQ-L is comprised of two factors. The first factor, labelled Repetitive Negative Thinking (RNT, 18 items), closely resembled the RNT factor in the original RTQ and included items reflecting engagement in repetitive thinking (e.g., *I think about the situation all the time*), negative thoughts about oneself (e.g., *You have thoughts about all your shortcomings, failings, faults, mistakes*), and 'why' questions (e.g., *You have thoughts or images like "Why can't I get going?*). The second factor, labelled Isolated Contemplation (IC, 4 items), includes items about isolating oneself and reflecting on negative feelings, loneliness, and listening to sad music. These items did not load on a separate factor in the original RTQ. Internal consistency was very high for the RNT scale (α = .94, average inter-item correlation = .46) and high for the IC scale (α = .79, average inter-item correlation = .49). The RNT and IC scales were moderately correlated with one another (Pearson's r = .52, p < .001). A 9-item

version of the RNT (i.e., RNT-Short scale) was correlated very highly (r = .97) with the full

18-item version, and was found to have almost identical psychometric properties (McEvoy et

al., 2012). Ratings were made across a 5-point response scale: *Not true at all (1), Somewhat*

true (3), or *Very true (5).*

        2.1.2.2 Meta-Cognitions Questionnaire – 30 (MCQ-30; Wells & Cartwright-Hatton,

2004). The MCQ-30 measures five domains of positive and negative metacognitive beliefs,

metacognitive monitoring, and judgments of cognitive confidence. The five subscales are: (1)

positive beliefs about worry, (2) negative beliefs about uncontrollability and danger, (3)

cognitive confidence (assessing confidence in attention and memory), (4) negative beliefs

concerning the consequences of not controlling thoughts, and (5) cognitive self-

consciousness (the tendency to focus attention on thought processes). Wells and Cartwright-

Hatton (2004) reported good internal consistency (*r* = .72- .92) and test-retest reliability (*r* =

,59 - .87) across the total score and subscales, as well as providing evidence for the factor

structure and convergent validity . The 4-point response scale is: *Do not agree (1), Agree*

slightly (2), Agree moderately (3), or *Agree very much (4).* As in the RTQ, references to

worry were replaced by references to thoughts and thinking (e.g., 'Worrying about my

problems helps me cope' became 'Thinking about my problems helps me cope'). Cronbach's

alphas ranged from .78 to .89 in the current study, which were indicative of high internal

consistencies across the subscales.

        2.1.2.3 Thought Control Questionnaire (TCQ; Wells & Davies, 1994). This 30-item

measure assesses various strategies used to control unpleasant or unwanted thoughts. Five

subscales describe the different strategies: (1) distraction, (2) social control, (3) punishment,

(4) worry, and (5) reappraisal. Each item is endorsed on a four-point rating scale as follows;

Never (1), Sometimes (2), Often (3), or *Almost Always (4)*. Data concerning internal

consistency (α across subscales = .65- .78), factor structure, sensitivity to change, and

convergent and discriminant validity have been provided (Reynolds & Wells, 1999). Internal consistencies in the current study ranged from .71 to .83.

2.1.2.4 Cognitive Avoidance Questionnaire (CAQ; Gosselin et al., 2002; Sexton & Dugas, 2008). The CAQ is a 25-item measure that assesses an individual's use of five cognitive avoidance strategies in response to threatening thoughts. Subscales measure the strategies of: (1) thought substitution, (2) transformation of images into verbal thoughts, (3) distraction, (4) avoidance of stimuli that trigger unpleasant thoughts, and (5) thought suppression. Participants respond along a 5-point scale ranging from *Not at all typical (1)* to *Completely typical (5).* The English version of the CAQ demonstrates good internal consistency (α = .73-.95) and test–retest reliability (r = .70-.85; Sexton & Dugas, 2008). Sexton and Dugas also found support for the measure's factor structure, convergent validity, and divergent validity. Internal consistencies in the current study ranged from .75 to .91.

2.1.2.5 Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988). The BAI consists of 21 items and measures the severity of anxiety symptoms over the previous week. Reliability and validity are established; internal consistency reliability coefficients range from .85 and .94, with a test-retest reliability coefficient of .75.

2.1.2.6 Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a 21-item measure of depression symptoms experienced during the previous fortnight. Internal consistency (α = .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, Dobson, & Ahnberg, 1998; Osman, Kopper, Barrios, Gutierrez, & Bagge, 2004). Support for convergent and discriminant validity has also been reported (Osman, Downs, Barrios, Kopper, Guitierrez, & Chiros, 1997; Steer, Ball, Ranieri, & Beck, 1997).

2.1.3 Procedure

Participants were first year undergraduate psychology students who received credit towards their course requirements for their involvement. Participants were recruited in the weeks leading up to their end of semester university exams, with the questionnaires being completed an average of 18.27 days (SD = 10.51) prior to the first exam in the reference period. The mean number of exams to be sat during the upcoming reference period was 2.87 (SD = 1.21). Participants were instructed to complete the RTQ-L with reference to their feelings and experiences in anticipation of the upcoming university exams. They were then asked to complete the remaining measures (MCQ-30, BDI-II, BAI, TCQ, and CAQ). This study received approval from the School of Psychology's Human Research Ethics Panel (HREAP, Behavioral) at The University of New South Wales.

2.2 Results

2.2.1 Relationships Between the RTQ-L Scales and Metacognitions

The RNT scale was significantly correlated with the total score and all five MCQ-30 subscales (Table 1). The IC scale was significantly correlated with the total score and all MCQ-30 subscales, except the Positive Beliefs scale. In order to control for symptoms of depression and anxiety, and thus the influence of current mood state on associations, BDI and BAI scores were entered into the first step of a hierarchical multiple linear regression analysis (HMLR), followed by the MCQ-30 subscales in a second step (Table 2). Separate models were run for the RNT and IC scales. As predicted, Uncontrollability and Dangerousness beliefs were significant and positive predictors of the RNT and IC scales, suggesting that higher scores on these scales were associated with more repetitive thinking. Also as predicted, the Positive Beliefs scale was positively associated with RNT scores. In addition, the Cognitive Confidence scale was negatively associated with IC scores, such that higher levels of confidence in attention and memory were associated with less IC.

2.2.2 Relationships between the RTQ-L Scales and Cognitive Avoidance Strategies

The RNT and IC scales were significantly correlated with the CAQ total score and all five subscales (Table 1). Once again, BDI and BAI were entered on the first step of a HMLR in separate models for the RNT and IC. When the CAQ subscales were entered into the second step, only the Substitution scale was a significant and unique predictor (Table 2). The association was positive but weak, suggesting that higher levels of RNT were associated with the tendency to substitute distressing thoughts and images for less distressing ones. The CAQ scales did not add a significant proportion of explanatory power above and beyond the BDI and BAI for the IC scale.

2.2.3 Relationships between the RTQ-L Scales and Thought Control Strategies

The RNT scale was also significantly correlated with the TCQ total score as well as the Worry, Punishment, and Reappraisal subscales, whereas the IC scale was significantly correlated with the total score, Worry, and Punishment subscales (Table 1). TCQ subscales found to have significant bivariate correlations with the RNT and IC subscales were then entered in the second step of separate HMLRs. BDI and BAI were entered in step 1. The Worry, Punishment, and Reappraisal scales remained significant predictors of RNT, such that higher scores on these scales were associated with higher RNT scores (Table 2). In contrast, the second step failed to explain a significant proportion of additional variance in IC.

2.3 Discussion for Study 1

It was hypothesized that the RTQ-L would replicate the significant associations demonstrated between the original RTQ and positive and negative metacognitive beliefs, cognitive avoidance strategies, and thought control strategies (McEvoy et al., 2010). The RNT scale was significantly correlated with all MCQ-30 subscales, although, as predicted, only uniquely with the Positive Beliefs and Uncontrollability and Dangerousness scales. Also

consistent with the original RTQ, the cognitive avoidance strategy of Substitution as measured by the CAQ was uniquely associated with the RNT scale. The Substitution scale measures strategies such as thinking about other people's problems instead of one's own, and thinking about trivial details rather than details that are more worrying. Given that this scale measures strategic repetitive thinking, albeit about potentially more benign aspects of problems, it is not surprising that it was uniquely and positively associated with the RNT scale. The Transformation and Avoidance scales of the CAQ were also associated with RNT in the original post-event version but not the looming version in this study, which may suggest that these strategies are more powerful drivers of post-event relative to anticipatory RNT. It may be that once an outcome is perceived to be negative following an event, and thus can no longer be controlled, then trying to transform distressing images into verbal thoughts or to avoid thoughts about the event altogether are seen as some of the few options available to cope with distressing emotions. In contrast, before a stressor these strategies for controlling RNT may be perceived to be less helpful than more direct attempts at preventing the negative outcome, and thus they may be less likely to be utilized.

The thought control strategies of Worry, Punishment, and Reappraisal were all positively associated with anticipatory RNT, suggesting that attempting to engage in more benign verbal worries, punishing oneself for having thoughts, and reappraising one's thoughts were all associated with more anticipatory RNT. Interestingly, the TCQ-Worry subscale was not associated with the original post-event version of the RTQ, although the association with the RNT scale was weak in this study. This finding suggests that the extent to which individuals attempted to direct their attention to less distressing worries was paradoxically associated with more RNT, and that this strategy was somewhat unique to anticipatory RNT. In contrast, the TCQ-Social Control scale was associated with the post-event version of the RTQ but not the looming version used in this study, suggesting that there

was no significant relationship between seeking support from one's social network and the extent of anticipatory RNT. Punishment and Reappraisal were associated with more RNT in both the post-event and looming versions, suggesting that these strategies may drive RNT regardless of the temporal orientation of the stressor.

One of the main limitations of Study 1 was that direct comparisons between pre- and post-stressor RNT could not be made within the same sample. Differences between mechanisms driving pre- and post-stressor RNT in Study 1 and the original study could be due to differences across the samples, rather than differences across the processes driving RNT at the two time points. Study 2 was designed to address this limitation.

3.0 Study 2

3.1 Aim

The main aim of Study 2 was to test if the unique associations with MCQ-30, CAQ, and TCQ subscales found with pre-stressor (Study 1) and post-stressor (McEvoy et al., 2010) RNT would be replicated when RNT is measured at both time points within the same sample.

3.2 Method

3.2.1 Participants

Participants ($N = 91$, 82.4% women) were a new sample of university undergraduate students with a mean age of 20.11 years ($SD = 4.18$, Range = 17 - 42). Most were single (94.5%) with high school as the highest qualification (90.1%), and of Asian (48%) or Caucasian (30%) ethnicity. Almost half (42%) were employed.

3.2.2 Measures

The same measures were administered in Study 2 as in Study 3, with the addition of the original, post-stressor version of the RTQ (McEvoy et al, 2010) and the negative affect subscale of the PANAS.

3.2.2.1 *Repetitive Thinking Questionnaire (RTQ, McEvoy et al., 2010).* The RTQ is a 31-item self-report measure of perseverative thinking comprising of two subscales; Repetitive Negative Thinking (RNT, 27 items) and Absence of Repetitive Thinking (ART, 4 items). The ART subscale comprised of the negatively worded items that are largely unrelated to symptoms and mechanisms (McEvoy et al., 2010), so it was not examined in this study. Items are rated along a 5-point scale: *Not at all true* (1), *Somewhat true* (3), or *Very true* (5). The factor structure, internal consistency (α = .72 - .93), convergent validity, and predictive utility of the RTQ have been demonstrated in student (McEvoy et al., 2010) and clinical (Mahoney et al., 2012) samples. Temporal orientation was standardised by asking participants to complete the RTQ items in reference to their experience following the stressor.

3.2.2.2 *Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988).* The 10-item Negative Affect subscale of the PANAS was used to measure the range and degree of negative emotions experienced by participants in anticipation of the reference distressing situation. The negative emotions include: *distressed*, *upset*, *guilty*, *scared*, *hostile*, *irritable*, *ashamed*, *nervous*, *jittery*, and *afraid,* and are rated on a 5-point response scale; *Very slightly or not at all (1), A little (2), Moderately (3), Quite a bit (4)* or *Extremely (5).* Crawford and Henry (2004) have provided evidence of internal consistency (α = .85- .89) and construct validity (including convergent and divergent validity) for the PANAS. For consistency with the original RTQ study, we examined associations between the RTQ (pre- and post-stressor) and PANAS total score (pre- and post-stressor Cronbach's αs = .91 and .92 in this study, respectively), as well as four subscales derived from a factor analysis in the original study (McEvoy et al., 2010). *Anxiety* included the items nervous, afraid, scared, and jittery. *Anger* included the items irritable and hostile. *Shame* included the items guilty and ashamed. *General Distress* included the items distressed and upset. Average scale scores were calculated for each of these factors.

3.2.3 Procedure

As in Study 1, participants were first year undergraduate psychology students who completed the questionnaires an average of 11.89 days (SD = 4.47) prior to their first exam in the reference period. The mean number of exams was 2.21 (SD = .99). Participants were instructed to complete the RTQ-L with reference to their feelings and experiences in anticipation of their upcoming university exams. They were then asked to complete the remaining measures (PANAS, MCQ-30, BDI-II, BAI, TCQ, and CAQ). The new element to this study was that participants completed the original post-stressor version of the RTQ, along with the PANAS, MCQ-30, BDI-II, and BAI, an average of 8.04 days (SD = 6.23) following their final exam. The TCQ and CAQ were only completed prior to the exam period. This study received approval from the School of Psychology's Human Research Ethics Panel (HREAP, Behavioral) at The University of New South Wales.

3.3 Results

3.3.1 Descriptive statistics and internal reliability

The full RNT subscales were highly correlated across the two time points (r = .70, p < .001), as were the two short forms (r = .64, p < .001). The average RNT rating prior to the stressor (M = 2.69, SD = .84) was significantly higher than afterwards (M = 1.67, SD = .62), $t(90)$ = 16.16, p < .001, d = 1.40. Cronbach's alphas were high: RNT-pre (.93), RNT-pre short (.89), RNT-post (.96), RNT-post short (.93). [NEED TO REPORT PSYCHOMETRICS OF THE IC SCALE as well as MCQ, CAQ, TCA] The Number of Days the questionnaires were completed before and after exams was not correlated with total RNT-pre (r = -.12, p > .05) or RNT-post (r = .09, p > .05) subscale scores.

3.3.2 Bivariate correlations between the RTQ and mechanisms scales

Table 1 reports Pearson bivariate correlation coefficients between the pre- and post-stressor RNT subscale scores (total and short versions) and MCQ-30, CAQ, and TCQ

subscales. Correlations with the IC subscale are reported for the looming version, but the main aim of this study was to compare the RNT constructs at each time point so this subscale is not considered further. The MCQ total score and all subscales except the Positive Beliefs subscale were significantly and positively correlated with pre- and post-stressor RNT. The association between the Cognitive Self-Consciousness subscale and post-event RNT (short scale) just fell short of statistical significance. Pre- and post-stressor RNT were significantly and positively correlated with the CAQ total and all subscales. The Worry and Punishment subscales of the TCQ were significantly and positively correlated, whereas the Social Control subscale was significantly and negatively correlated, with pre- and post-stressor RNT.

3.3.3 Hierarchical MLRs predicting pre- and post-stressor RNT

Table 3 shows that BDI-II and BAI scores significantly predicted RNT at both time points. A series of HMLR analyses were then conducted for pre- and post-stressor RNT separately. When pre-stressor RNT was the criterion variable, pre-stressor BDI-II and BAI were entered as step 1, and MCQ, CAQ, or TCQ subscale scores were entered in step 2 of separate models. When post-stressor RNT was the criterion variable, and post-stressor BDI-II and BAI were entered in step 1 and post-stressor MCQ subscale scores were entered in step 2 of separate models. However, because the CAQ and TCQ were only completed at the first time point, both pre- and post-stressor BDI-II and BAI scores were entered in step 1 to control for depression and anxiety when the CAQ and TCQ were completed and when the post-stressor RNT subscale was completed. For the MCQ, the Uncontrollability and Dangerousness and Need for Control subscales were the only unique predictors of both pre- and post-stressor RNT. For the CAQ, step 2 added significant explanatory power overall for pre-stressor RNT, but no single scale remained as a unique predictor. The CAQ did not add explanatory power for post-stressor RNT. For the TCQ, only the Punishment subscale remained as a unique predictor for both pre- and post-stressor RNT.

3.3.4 Relationships between emotions and pre- and post-stressor RNT

Pre- and post-stressor RNT was significantly correlated with the total PANAS score (rs = .75 and .64, respectively, ps < .001). The relationship between various emotions and RNT were then examined by simultaneously entering four PANAS subscales (anxiety, anger, shame, and general distress) previously used to examine the relationship between the RTQ and emotions (McEvoy et al., 2010; McEvoy et al., 2012) into multiple linear regressions predicting pre- and post-stressor RNT separately. BDI-II was also entered as a predictor to control for general mood state. These models explained a large proportion of the variance in both pre- and post-stressor RNT, with the Anxiety subscale of the PANAS and the BDI-II being significant unique predictors (Table 4). The general distress subscale was also a unique predictor of pre-stressor RNT.

4.0 General Discussion

[focus on commonalities and differences across all studies. Relate similarities to theory and previous findings. Speculate on differences due to method, sample, theory, etc.]

The original Repetitive Thinking Questionnaire (RTQ; McEvoy et al., 2010) was developed as a trans-emotional and trans-diagnostic measure of RNT. The original RTQ instructed respondents to indicate their degree of engagement in repetitive thinking following a recent distressing event. A looming version of the RTQ (RTQ-L) was recently developed to measure RNT with reference to an upcoming stressor and was found to comprise two factors (McEvoy et al., 2011). The RNT factor of the RTQ-L was similar to the RNT factor in the original RTQ and measured engagement in repetitive thinking, negative thoughts about oneself, and 'why' questions (e.g., *You have thoughts or images like "Why can't I get going?"*). The Isolated Contemplation (IC) factor included items about isolating oneself and reflecting on negative feelings, loneliness, and listening to sad music. The RNT scales of the RTQ and

RTQ-L were found to be significantly and uniquely associated with an array of negative emotions (anxiety, depression, shame, anger, general distress), and the original RTQ was associated with mechanisms theorized to driving engagement in RNT, including positive and negative metacognitive beliefs, cognitive avoidance strategies, and thought control strategies. Given that two forms of RNT, namely worry and rumination, have been found to differ in temporal orientation to a stressor (future- vs. past- orientation, respectively), it may be that different mechanisms drive RNT before and after a stressor. By using a common transdiagnostic measure of RNT, this study was uniquely placed to identify whether or not similar mechanisms are associated with RNT in anticipation of and following a stressor, by comparing findings from the RTQ-L to those of the original RTQ (McEvoy et al., 2010).

[Placed in Study 1 Discussion: It was hypothesized that the RTQ-L would replicate the significant associations demonstrated between the original RTQ and positive and negative metacognitive beliefs, cognitive avoidance strategies, and thought control strategies (McEvoy et al., 2010). The RNT scale was significantly correlated with all MCQ-30 subscales, although, as predicted, only uniquely with the Positive Beliefs and Uncontrollability and Dangerousness scales.] These two MCQ-30 scales were the only two that uniquely predicted RNT in the original post-event version of the RTQ (McEvoy et al., 2010). This finding suggests that respondents engaged in RNT to the degree that they believed RNT was helpful, uncontrollable, and dangerous regardless of the temporal orientation to the stressor, and is consistent with Wells and Matthews (1996) Self-Regulatory Executive Function (S-REF) model. The S-REF model proposes that positive beliefs initiate repetitive thinking which, in turn, is maintained in part by uncontrollability and dangerousness beliefs because they lead to dysfunctional thought control strategies. Our findings suggest that metacognitive beliefs predict both post-event and anticipatory RNT.

[Also consistent with the original RTQ, the cognitive avoidance strategy of Substitution as measured by the CAQ was uniquely associated with the RNT scale. The Substitution scale measures strategies such as thinking about other people's problems instead of one's own, and thinking about trivial details rather than details that are more worrying. Given that this scale measures strategic repetitive thinking, albeit about potentially more benign aspects of problems, it is not surprising that it was uniquely and positively associated with the RNT scale.] The findings that (a) all of the CAQ subscales were moderately correlated with RNT, (b) adding the CAQ subscales in the hierarchical MLR explained a significant proportion of variance in RNT above and beyond depression and anxiety symptoms, but (c) that only the Substitution scale was uniquely associated with RNT, suggests that cognitive avoidance is related to more RNT but that most of the variance is shared across the CAQ subscales. [The Transformation and Avoidance scales of the CAQ were also associated with RNT in the original post-event version but not the looming version in this study, which may suggest that these strategies are more powerful drivers of post-event relative to anticipatory RNT. It may be that once an outcome is perceived to be negative following an event, and thus can no longer be controlled, then trying to transform distressing images into verbal thoughts or to avoid thoughts about the event altogether are seen as some of the few options available to cope with distressing emotions. In contrast, before a stressor these strategies for controlling RNT may be perceived to be less helpful than more direct attempts at preventing the negative outcome, and thus they may be less likely to be utilized.] These possibilities are speculative but provide intriguing avenues for future research.

[The thought control strategies of Worry, Punishment, and Reappraisal were all positively associated with anticipatory repetitive thinking as measured by the RNT scale. This finding suggests that attempting to engage in more benign verbal worries, punishing oneself for having thoughts, and reappraising one's thoughts were all associated with more

anticipatory RNT. Interestingly, the TCQ-Worry subscale was not associated with the original post-event version of the RTQ, although the association with the RNT scale was weak in this study. This finding suggests that the extent to which individuals attempted to direct their attention to less distressing worries was paradoxically associated with more RNT, and that this strategy was somewhat unique to anticipatory RNT. In contrast, the TCQ-Social Control scale was associated with the post-event version of the RTQ but not the looming version used in this study, suggesting that there was no significant relationship between seeking support from one's social network and the extent of anticipatory RNT. Punishment and Reappraisal were associated with more RNT in both the post-event and looming versions, suggesting that these strategies may drive RNT regardless of the temporal orientation of the stressor.]

The pattern of relationships between the IC scale and metacognitions, cognitive avoidance, and thought control strategies differed from those of the RNT scale. In terms of metacognitions, the Cognitive Confidence subscale, which indexes trust in one's memory, was negative and uniquely associated with IC such that more confidence in memory (i.e., lower scores on the MCQ subscale) was associated with more engagement in IC. This finding is inconsistent with predictions based on the S-REF model, which suggests that less Cognitive Confidence should be associated with more engagement in RNT. However, the IC scale's associations with the other constructs suggests that aspects of IC may actually be less pathological than RNT. For instance, in terms of positive metabeliefs, IC was most strongly associated with potentially realistic beliefs that thinking about one's thoughts, feelings, problems, and life can help to understand these experiences and remain organized. IC was not associated with potentially less realistic positive beliefs that thinking about one's experience is helpful in more practical respects (e.g., prevent or solve problems). Moreover, the CAQ and TCQ scales failed to explain a significant proportion of additional variance in IC above

and beyond BDI and BAI, suggesting that IC was not significantly associated with cognitive avoidance or thought control strategies once current mood state was accounted for. While the Uncontrollability and Dangerousness scale of the MCQ was associated with IC, this association was substantially weaker than that with the RNT scale. As mentioned above, some but not all of the items included in the IC factor have been associated with less psychopathology over time in previous research (Treynor, Gonzalez, & Nolen-Hoeksema, 2003), although we note some contradictory findings (e.g., Calmes & Roberts, 2007).

This study has limitations that must be considered. First, further research testing the reliability and generalizability of our findings to clinical samples and a broader array of stressors is required. Second, the cross-sectional and correlational design of our study precludes causal conclusions. Prospective and experimental designs are required to better understand the temporal and causal relationships between RNT, metacognitions, thought control, and cognitive avoidance strategies. Third, because the RTQ was developed from existing measures of RNT it was not designed *a priori* to measure particular components of maladaptive RNT. In contrast, the PTQ (Ehring et al., 2011) was recently developed as a measure of the higher order RNT construct as well as three lower-order factors representing core characteristics of RNT (repetitiveness, intrusiveness, difficulties with disengagement), perceived unproductiveness of RNT, and RNT capturing mental capacity. Future research examining the mechanisms maintaining each of these lower order features of RNT may be helpful to further refine theory and treatment innovations.

This study found evidence that mechanisms associated with post-event RNT are also associated with anticipatory RNT, although there were some differences in the types of cognitive avoidance strategies and thought control strategies associated with RNT at each time point. Positive metabeliefs, and negative metabeliefs, relating to uncontrollability and dangerousness of thoughts and images, were common to both anticipatory and post-event

processing. These findings suggest that treatment strategies designed to modify metacognitions, cognitive avoidance, and thought control strategies are likely to ameliorate engagement in both anticipatory and post-event RNT. Together, our findings suggested that items in the RNT scale may reflect a more pathological process than those in the IC scale. This study is one of the first to examine anticipatory RNT and to compare findings to post-event RNT using the same measure. The RTQ appears to be a useful tool with which to examine RNT both before and after a stressor.

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