Short-term affective consequences of specificity of rumination about unresolved personal goals

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Running head: *affective consequences of goal-focused rumination*

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Background and Objectives

Rumination is a form of repetitive thinking that has been associated with both helpful and unhelpful consequences for mood and self-regulation. It has been suggested that the specificity of ruminative thought content may be one factor that determines whether state rumination about personal goals is adaptive. The present study tested the hypothesis that state rumination about unresolved personal goals is associated with unhelpful affective consequences only when rumination is low in specificity.

Methods

We measured the extent and specificity of uninstructed rumination following the cueing of resolved and unresolved personal goals using a 30-minute go/no-go task with thought probes. Changes in state positive and negative affect from before to after cueing goals, and before to after rumination during the go/no-go task were assessed.

Results

Cueing unresolved goals resulted in a significant increase in negative affect, and subsequent affective recovery during the go/no-go task. Cueing unresolved goals resulted in more goal-focused rumination than cueing resolved goals. When ruminative thoughts were low in specificity, rumination mediated the association between goal discrepancies and negative affect: greater rumination about unresolved goals significantly impaired affective recovery and perpetuated negative affect.

Limitations

The findings await replication in clinical populations, where rumination is more commonly associated with unhelpful outcomes.

Conclusions

Greater levels of goal-focused rumination were associated with unhelpful affective consequences only when rumination was low in specificity. Specificity of thought content

may be an important determinant of whether goal-focused rumination has helpful or unhelpful effects.

Keywords: rumination, goals, affect, cognition, specificity, depression

Highlights:

- cueing an unresolved goal causes uninstructed rumination
- when rumination was less specific, ruminating had unhelpful affective consequences
- when rumination was more specific, it did not mediate change in affect
- specificity may influence the affective consequences of goal-focused rumination

1. Introduction

Rumination is a form of repetitive self-focus that has been associated with both unhelpful (e.g., depression, low mood) and adaptive (e.g., goal pursuit, problem-solving) outcomes (Nolen-Hoeksema, 1991; Martin & Tesser, 1996). The perception of slower than anticipated progress in pursuing a goal is hypothesised to instigate rumination about the goal discrepancy, which continues until either satisfactory progress is restored or the individual disengages from the goal (Martin & Tesser, 1996). Rumination is therefore conceptualised as an attempt at problem-solving that is unhelpful to the extent that it does not facilitate resolution of progress or disengagement from the goal (Carver, 1996; Watkins, 2008).

An insufficient rate of goal progress may be signalled by negative affect or negative cognitions, and a subsequent improvement in rate of progress is predicted to result in an associated improvement in affective state (Carver & Scheier, 1990). When an individual does not experience rumination as helpful in reducing goal discrepancies, it is instead predicted to perpetuate and intensify negative affect. Ruminating about depressed mood (depressive rumination) does not appear to reduce goal discrepancies, and instead has well-documented negative effects on mood and problem-solving (Nolen-Hoeksema, 1996; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). The repeated pairing of rumination about goal discrepancies with the experience of negative affect is hypothesised to contribute to the emergence of depressive rumination as a maladaptive habitual response style that is implicated in the onset and maintenance of psychopathology (Watkins & Nolen-Hoeksema, 2014). Investigating which factors cause rumination to result in prolonged negative affect is thus important to better understanding the nature of the relationship between state rumination about personal goals and the depressive ruminative response style. However, little empirical research has investigated what determines when state rumination about goal discrepancies has unhelpful affective consequences as opposed to facilitating discrepancy-reduction.

Abstract-evaluative rumination is conceptualised as "representing superordinate goals including the purpose, meanings, and ends of a goal or action" (Watkins, 2011, p. 262) and is hypothesised to be associated with maladaptive outcomes in contexts of difficulty or stress (Watkins, 2008, 2011). At the other end of the continuum are more specific ruminative thoughts about "the process and means of a goal or action" (Watkins, 2011, p. 262). Less specific goal representations may make it more difficult to identify appropriate actions to facilitate problem-solving, whereas ruminating about goal discrepancies in a more specific manner may help to determine the means to reduce the discrepancy. Focusing on the higher-order meaning and significance of the goal may also make it difficult to abandon because to do so would threaten the core self. Processing goal discrepancies in a more abstract manner is predicted to have a greater negative emotional impact, because the discrepancy is conceptualised with reference to central elements of the self (Carver & Scheier, 1990). As such, ruminating about goal discrepancies in a more abstract manner is predicted to perpetuate the negative emotional impact of the goal discrepancy (Watkins, 2011). In contrast, more specific ruminative thinking is hypothesised to support problem-solving and discrepancy-reduction, and so is not predicted to perpetuate negative affect.

Consistent with Watkins' hypothesis, correlational studies support a positive association between more abstract-evaluative (less specific) thought content and maladaptive depressive rumination (Watkins, 2011; Goldwin & Behar, 2012; Goldwin, Behar, & Sibrava, 2013; Watkins & Moulds, 2007, although see also Ehring, Frank, & Ehlers, 2008), depressive symptoms, and concurrent negative affect (Takano & Tanno, 2010). Experimental work indicates that, relative to concrete self-focus, instructions to ruminate about depressed mood and personal regrets in an abstract manner has unhelpful effects on affect-regulation and problem-solving (Dey, Joormann, Moulds, & Newell, 2018; Dey, Newell, & Moulds, 2018; Moberly & Watkins, 2006; Watkins, Moberly, & Moulds, 2008; Watkins & Moulds, 2005).

Little research has examined the temporal relationship between goal-focused (as opposed to feelings-focused) state rumination and negative affect. Moberly and Watkins (2010) found that perceptions of low goal success were correlated with greater ruminative self-focus and negative affect on a momentary basis. Stevens, Bardeen, Pittman, and Lovejoy (2015) found an association between self-reported goal discrepancies and negative affect across two assessment periods; however, the role of state rumination in this relationship was not examined. Roberts, Watkins, and Wills (2013) demonstrated that cueing an unresolved (vs. resolved) personal goal resulted in significant goal-focused state rumination, and found no evidence that this increased ratings of sadness and tension. Zhan, Tang, He, Fan and Luo (2017) found that cuing unresolved goals had immediate negative affective consequences, but used a subsequent mood manipulation prior to assessing state rumination. As such, the effects of goal-focused state rumination on affect are unclear and merit further investigation.

It is possible that variation in the specificity of goal-focused state rumination may be an important factor in determining the effects of goal-focused rumination on negative affect. To our knowledge, no studies to date have examined whether the specificity of rumination about goal discrepancies predicts subsequent affective outcomes. Investigating this possibility could help to clarify the findings of Roberts et al. (2013) and Zahn et al. (2017). This is important in order to better understand what determines when rumination about goal-discrepancies has the unhelpful affective outcomes that have been linked to depression.

The present study sought to test the prediction that specificity of ruminative thoughts moderates the association between goal discrepancies (resolved versus unresolved personal goals) and affect through state rumination. We used Roberts et al.'s (2013) manipulation to cue resolved versus unresolved goal discrepancies in an unselected sample and measured subsequent levels of uninstructed state rumination during a task that is conductive to off-task thinking (a modified sustained attention to response task; SART, Roberts et al., 2013). We

additionally obtained ratings of the specificity of goal-focused ruminative thoughts during that SART and measured changes in positive and negative affect from before-to-after cueing goals, and before-to-after the SART. We predicted that state rumination mediates the association between goal discrepancies and affective change during the SART when ruminative thoughts are low in specificity, such that greater state rumination about unresolved goals perpetuates negative affect. When rumination is high in specificity, it is not predicted to be unhelpful and so we did not expect a significant pathway from goal discrepancies to negative affect through rumination.

2. Method

2.1 Participants

Based on an effect size of d = .87 (Roberts, Watkins, & Wills, 2013), a sample size of 30 per group (n = 60) is required for power of .95 to detect an effect of goal condition on state rumination during the SART. 75 participants were recruited from the University of Exeter student population using opportunity sampling. 65 participants (75.4% female) comprised the final sample[1]. 33 participants completed the unresolved goal cueing task, and 32 participants completed the resolved goal cueing task. The mean age was 20.83 (*S.D.* = 3.05, range: 18-42).

2.2 Measures and Materials

2.2.1 Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996)

The BDI-II was administered to confirm that the goal conditions were similar in levels of depressive symptoms. The BDI-II is a 21-item questionnaire that assesses the presence and severity of depressive symptoms over the preceding two weeks. Higher scores

[1] Seven participants were excluded from the final sample due to not having correctly followed the experimental protocol (over 10% errors of omission on the SART) and three were excluded from the resolved goal condition due to describing their goals as unresolved at the end of the experiment.

represent more depressive symptoms (range: 0-63). The scale has high internal consistency (α = .91; Dozois, Dobson, & Ahnberg, 1998; α = .85 in this study).

2.2.2 Ruminative Responses Scale (RRS; Nolen-Hoeksema & Morrow, 1991)

The RRS of the Response Styles Questionnaire (RSQ, Nolen-Hoeksema & Morrow, 1991) is a 22-item measure of trait depressive rumination. Responses range from 1 (*almost never*) to 4 (*almost always*) for what participants "generally do" when they are feeling sad or depressed. Item scores are summed to generate an overall score (range: 22-88); higher scores represent greater trait depressive rumination. The scale has acceptable convergent validity and high internal consistency (α = .89; Nolen-Hoeksema & Morrow, 1991; α = .93 in this study).

2.2.3 Short State Positive Affect Negative Affect Scale (Kercher, 1992)

The state PANAS is a 10-item scale assessing state positive and negative affect. Participants rate the extent to which they are experiencing 10 emotions in the present moment using a five-point scale, (1, '*Very slightly/Not at all*' to 5, '*Extremely*'). Scores are summed to generate measures of positive (range: 5-25) and negative (range: 5-25) affect. The scale has acceptable reliability and internal consistency (α = .78 for PA and α = .87 for NA; MacKinnon et al., 1998; PA: α = .70 and NA: α = .71, at the first assessment in this study).

2.2.4 Goal cueing task

The goal cueing task was identical to that reported in Roberts, Watkins, and Wills (2013). The experimental condition, which was predicted to elicit rumination, instructed participants to identify an ongoing and unresolved concern that had repeatedly come into their mind and caused them to feel negative or stressed during the previous week. Participants then rated the extent to which their unresolved goal had been bothering them (a) at its worst, and (b) in the past week, the proportion of their time that they had spent thinking about it during the last week, and the extent to which is was related to other concerns they had. A 10-

minute goal focus period followed, during which participants worked through a pre-recorded script delivered over headphones, which prompted them to focus on the concern identified (see Roberts et al., 2013, for a transcript). The control condition asked participants to spend the same period of time working through a matched recording prompting thinking about a concern that had previously troubled them, but was now resolved (Roberts et al., 2013).

2.2.5 Modified SART

The modified SART uses a simple go/no-go paradigm that is designed to place minimal demands on controlled processes and thereby elicits a repetitive automatic style of responding to the stimuli that is conducive to attentional lapses and off-task thinking (e.g., mind-wandering, rumination). Erroneous responses on no-go trials (errors of commission) and speeding of reaction times are understood to reflect attentional lapses and automatic responding respectively. As such, these constitute behavioural indices of attentional control and were the main dependent variables to assess task performance.

Participants viewed 900 neutral words sequentially[2]. Each word was presented individually for 300 ms followed by a 900 ms mask. Participants responded to each word with a button press (go trials), except on a minority of trials (no-go trials; 10%), when the word was presented in uppercase and participants were required to withhold their response. Participants were pseudo-randomly probed following 60% of no-go trials and asked to indicate the focus of their attention immediately prior to the probe by selecting from one of six response options. These options were: (a) task (i.e., the stimuli or appropriate response); (b) task performance; (c) current physical state (i.e., conditions such as hunger or sleepiness); (d) the concern identified and thought about in the previous task (i.e., the unresolved/resolved

[2] The task length was reduced from 1800 trials, as reported in Roberts, Watkins and Wills (2013), in order to reduce participant burden. This followed successful piloting in which we were able to replicate the central findings of Roberts et al. (2013) using 900 trials.

goal, and our index of state rumination); (e) other personal worries that were not connected to the problem identified in the previous task; (f) other thought types.

2.2.6 Dimensions of rumination rating scales

The rumination rating scales were 10 cm bipolar visual analogue scales that asked participants to rate their goal-focused thoughts on the occasions when they selected response 'd' during the SART. The scales included five dimensions understood to be associated with rumination (Watkins, 2008): repetitiveness, emotionality, specificity, intrusiveness, and uncontrollability. The specificity item measured the extent to which participants ruminated about their goals on a continuum from abstract to concrete thinking, and was anchored by "*big picture/vague*" and "*specific/detailed*". The anchors were determined by presenting undergraduate psychology students (n = 3) with the following description from Watkins (2008, p. 187) and asking them to generate simple descriptors of each end of this continuum after gaining feedback from their peer-group to confirm that these were readily understandable:

"High-level construals are abstract, general, superordinate, and decontextualized mental representations that convey the essential gist and meaning of events and actions, whereas low-level construals are more concrete mental representations that include subordinate, contextual, specific, and incidental details of events and actions."

The remaining items were descriptive, and intended to examine the extent to which participants would characterise ruminative thoughts during the SART in a manner that was consistent with the phenomenology of rumination. The scales were briefly explained to participants at the start of the experiment to ensure their comprehension.

2.3 Design and procedure

The study had a mixed design with one between-subjects independent variable: goal condition (resolved vs. unresolved) and a repeated-measures factor of time. Dependent

variables were state rumination reported during the thought probes in the SART and changes to positive and negative affect (before vs. after the SART). Specificity of goal-focused ruminations during the SART was a predicted moderator of the relationship between goal condition, rumination and affective change.

The study received formal ethical approval from the University of Exeter Psychology Ethics Committee prior to the commencement of data collection.

Participants attended a single 60-minute session and were randomized to the unresolved or resolved goal condition using a pre-determined randomization plan generated by an online randomization generator (www.randomization.com). Participants were informed that the study was examining cognitive and personality variables that influence the experience of spontaneous thoughts during another task. All participants provided written consent prior to participating. The BDI-II and RRS were administered, and participants then completed the goal manipulation followed by the modified SART. The rumination ratings were then completed. Before and after completing the goal manipulation, and after the modified SART, participants rated their state positive and negative affect using the 10-item PANAS. The study concluded with a formal debriefing in which the purposes of the study were explained in full.

3 Results

3.1 Sample characteristics and attentional control capabilities

The mean level of depressive symptoms on the BDI-II was 7.22 (*SD* = 5.87), and mean trait rumination scores were 43.83 (*SD* = 13.20). The two goal conditions did not differ significantly in symptoms of depression, t (63) = .72, p = .474, or trait rumination, t (63) = .37, p = .716. T-tests examined whether the two goal conditions differed in attentional control capabilities as assessed by the SART. Consistent with Roberts et al. (2013), there were no

significant group differences in mean reaction times to correct go trials, t (63) = .12, p = .905, reaction time variability (coefficient of variation), t (63) = .42, p = .679, errors of commission, t (63) = .54, p = .594, or errors of omission, t (63) = .23, p = .822. Thus, there was no evidence that goal conditions differed in attentional control capabilities as measured by the SART.

3.2 Impact of goal manipulation on state positive and negative affect

T-tests confirmed the groups did not differ in the extent to which the goal had bothered them at its worst, t (55.11) = -1.42, p = .162, but there was a significant group difference in the extent to which it bothered them at the time of testing, t (54.57) = -14.95, p < .001, and the number of thoughts about the goal during the past week, t (62.96) = -20.98, p < .001. Participants in the unresolved goal condition were more bothered by the goal (M = 6.57, SD = .87) and had had more thoughts about it in the past week (M = 7.06, SD = 1.03) than the resolved goal condition (bothered: M = 2.53, SD = 1.27, thoughts: M = 1.72, SD = 1.02). Thus, the goal manipulation worked: the goals identified in the two conditions did not differ in subjective evaluations of their severity, but participants in the unresolved goal condition reported that the goal was bothering them more than participants in the resolved goal condition.

Two 2 (goal condition: resolved, unresolved) x 3 (time: pre-goal manipulation, post-goal manipulation, post-SART) mixed ANOVAs examined the effects of the goal manipulation on state positive (PA) and negative (NA) affect as assessed by the PANAS separately (Figure 1). Q-Q plots indicated there were no major problems with skew or kurtosis. Levene's test indicated that there were not problems with homogeneity of variance.

There was a significant main effect of goal condition on NA, F (1, 63) = 6.27, p = .015, and a significant main effect of time, F (2, 126) = 26.65, p <.001, which were qualified by a significant interaction between time and goal condition, F (2, 126) = 12.24, p < .001.

Pairwise comparisons revealed a significant increase in NA between time 1 (before the goal manipulation) and time 2 (after the goal manipulation) in the unresolved goal condition (mean difference = 4.00, $p < .001$), and no significant change in the resolved goal condition (mean difference = .53, $p = .354$). The goal conditions did not differ in NA prior to the goal manipulation, F (1, 63) = .01, $p = .919$, but significantly differed in NA following the goal manipulation, F (1, 63) = 18.86, $p < .001$, reflecting greater NA in the unresolved goal condition than in the resolved goal condition (Figure 1). Cueing unresolved goals increased NA from before to after the goal manipulation.

In both conditions there was a significant reduction in NA between time 2 (after the goal manipulation) and time 3 (after the SART; unresolved goal mean difference = -3.79, $p < .001$, resolved goal mean difference = -1.03, $p = .032$). There were no significant differences between goal conditions in NA following the SART, F (1, 63) = 1.41, $p = .239$. Participants in the unresolved goal condition showed a significant reduction in NA during the SART, indicating affective recovery.

There was no significant main effect of goal condition on PA, F (1, 63) = 1.91, $p = .172$. There was a significant main effect of time, F (2, 126) = 54.53, $p < .001$, reflecting reductions in PA as the experiment progressed. There was no significant interaction between time and goal condition, F (2, 126) = 2.71, $p = .070$ [Huynh Feldt correction applied]. Pairwise comparisons revealed significant reductions in PA in both the resolved and unresolved goal conditions from before to after the goal manipulation (resolved goal mean difference = -1.47, $p = .007$, unresolved goal condition mean difference = -2.61, $p < .001$). The goal conditions did not significantly differ in PA prior to the goal manipulation, F (1, 63) = .93, p =.338, but significantly differed in PA following the goal manipulation, F (1, 63) = 4.75, p .033, reflecting less PA in the unresolved goal condition (Figure 1). There was a significant reduction in PA from before to after the SART in the resolved goal condition

(mean difference = -2.50, $p < .001$), this was not significant in the unresolved goal condition (mean difference = -.88, $p = .059$). There were no significant differences between goal conditions in PA following the SART, F (1, 63) = .19, $p = .663$.

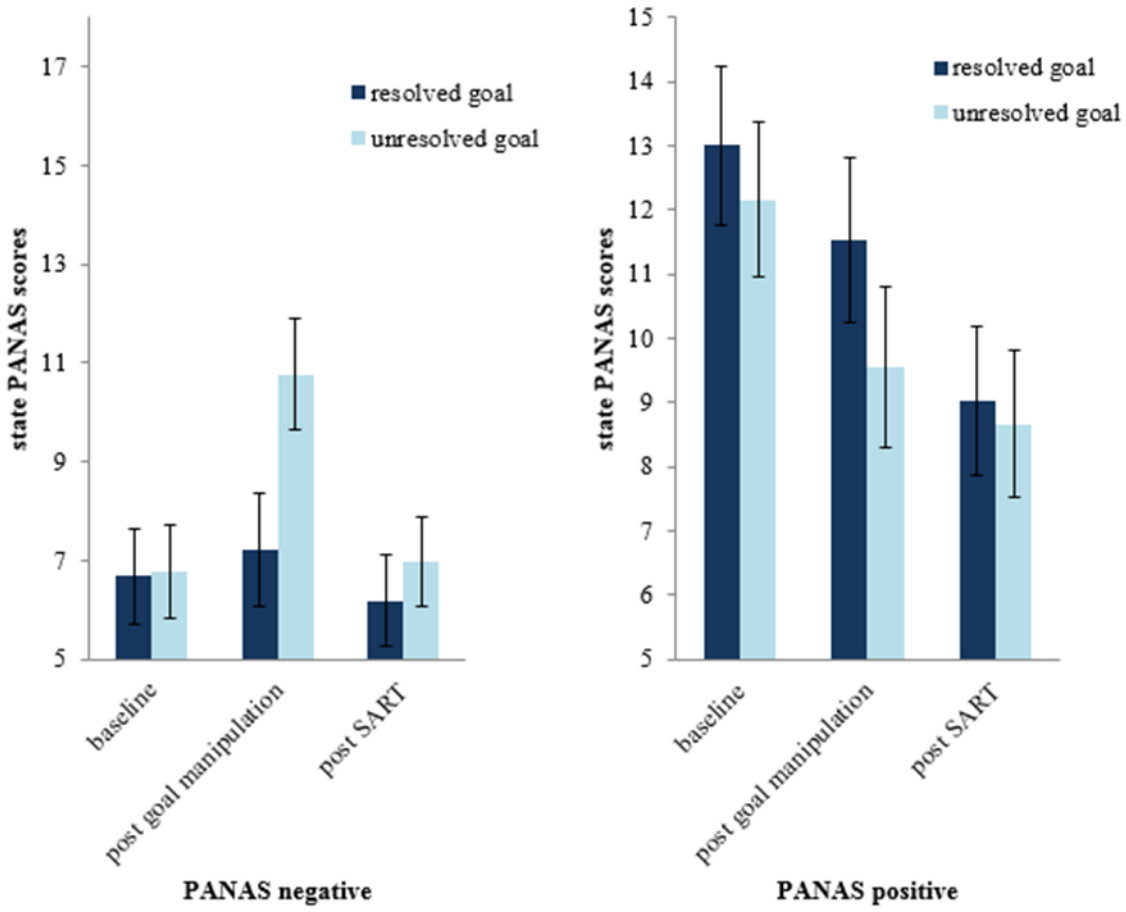

Figure 1: Positive and negative affect at different phases of the experiment on the PANAS (error bars represent standard error of the mean)

3.3 State rumination during the SART

T-tests examined the differential impact of the goal manipulation on state rumination during the modified SART task. There was a significant effect of goal condition on rumination during the modified SART task, t (33.41) = 3.72, $p = .001$. Participants in the unresolved goal condition reported more thoughts of the concern from the goal manipulation

(M = 5.09, SD = 6.96) than participants in the resolved goal condition (M = .53, SD = 1.02)[3]. There was no significant effect of goal condition on reports of any other thought type (task: p = .064; task performance: p = .463; physical state: p = .634; other worries: p = .338; all other thoughts: p = .568)[4]. Table 1 reports the descriptive statistics for responses to the thought probes, and rumination rating scales in each group.

Table 1: *Descriptive statistics for responses to SART thought probes and rumination rating scales (means and standard deviations).*

Thought probe responses (possible range: 0-60)						
	Task	Task performance	Physical state	Cued goal**	Other worries	Other
Unresolved goal	16.67 (10.12)	17.73 (15.05)	7.94 (6.35)	5.09 (6.96)	3.49 (4.24)	9.09 (8.79)
Resolved goal	21.69 (11.35)	15.47 (8.68)	8.78 (7.80)	0.53 (1.02)	2.66 (2.46)	10.41 (9.68)
Rumination ratings (possible range: 0-10)						
	Repetitive*	Emotional**	Uncontrollable*	Intrusive	Specific	
Unresolved goal	5.24 (2.18)	4.52 (1.97)	5.03 (2.11)	3.42 (2.21)	4.21 (2.23)	
Resolved goal	3.91 (2.55)	2.94 (1.56)	3.28 (2.14)	2.75 (2.16)	4.78 (2.60)	

* p<0.05, ** p<0.001, indicating a significant group difference

Analyses examined the extent to which participants rated their experience of state rumination during the SART (as assessed using the rumination rating scales) as sharing

[3] A 2 (goal condition: resolved, unresolved) x 4 (time: block 1; block 2; block 3; block 4) mixed ANOVA on ruminative responses to the thought probes revealed no significant main effect of time or interaction (ps > .3). The differential impact of the goal manipulation on subsequent rumination about the cued goal did not significantly vary as a function of time.

[4] There was no significant correlation between response 'd' and response 'e' in either goal condition: unresolved goal condition, r (33) = .19, p = .287, resolved goal condition, r (32) = -.12, p = .519.The key hypotheses for this study pertained to goal-focused rumination. However, we additionally examined whether the participants who were higher in trait rumination were more vulnerable to the effects of the unresolved goal manipulation (to see if we could replicate Roberts et al., 2013). This finding was not replicated and is reported in the supplementary materials.

common characteristics of rumination. Participants in the unresolved goal condition rated their ruminative thoughts as being significantly more repetitive, t (63) = 2.28, p = .026, emotional, t (63) =3.57, p = .001, and uncontrollable, t (63) = 3.31, p = .002, than participants in the resolved goal condition (Table 1). Bivariate correlations further examined the associations between the extent of state rumination during the SART and ratings of the intrusiveness, emotionality, repetitiveness and uncontrollability of rumination in each goal condition separately. In the unresolved goal condition there were significant positive associations between the number of ruminative thoughts and ratings of these thoughts as being repetitive, r (33) = .44, p = .010, emotional, r (33) = .44, p = .010, and uncontrollable, r (33) = .41, p = .019[5]. In the resolved goal condition, there was a significant positive association between the number of ruminative thoughts and ratings of these thoughts as intrusive, r (32) = .43, p = .014.

3.4 Specificity and affective consequences of rumination

Moderated mediation analyses were conducted to test the hypothesis that the affective consequences of ruminative thought depend on specificity of ruminative thoughts. At the group level, participants in the unresolved goal condition showed a reduction in NA during the SART. We examined the possibility that when specificity was low, greater rumination about unresolved goals would be negatively associated with reductions in NA, indicating impaired affective recovery. Thus we examined whether ratings of the specificity of state rumination moderated the indirect effect of goal condition (IV) on reduction in NA (NA before the SART – NA after the SART; DV) through the extent of state rumination during the SART (mediator). Specificity was centred such that positive values reflect higher specificity and negative values reflect lower specificity. All predictors were mean centred and

[5] Exploratory bivariate correlations examining the associations between the dimensions of rumination in each goal condition are additionally reported in the supplementary materials.

PROCESS (Hayes, 2013) was used to calculate the conditional indirect effect at different values of the moderator using the formula $a_1 (b_1 + b_3W)$, where a_1 is the pathway from the independent variable (goal condition) to the mediator (rumination), b_1 is the pathway from the mediator to the dependent variable, b_3 is the pathway from the mediator x moderator interaction (rumination x specificity) to the dependent variable, and W represents different values of specificity (Figure 2). Confidence intervals were set at 95% and 5000 samples were used to estimate bootstrapped confidence intervals for the conditional indirect effect at different values of the moderator. The Johnson-Neyman technique was used to specify moderator values defining the significance region.

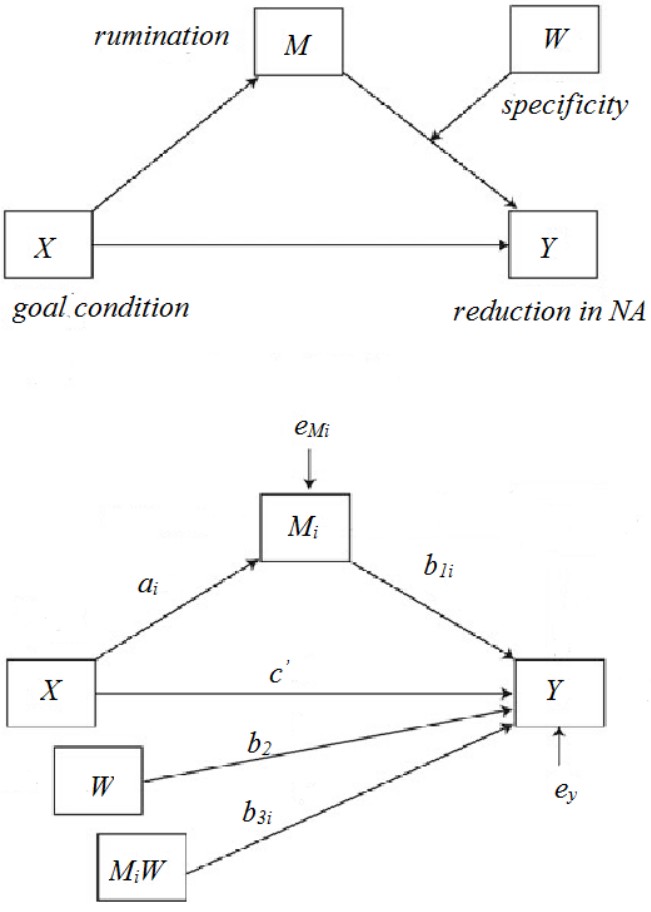

Figure 2: The conditional indirect effect of goal condition on reduction in negative affect through rumination at different levels of specificity (the moderator). Indirect effect = $a_i (b_{1i} + b_{3i}W)$ Direct effect = c'

Table 2 presents the results of this analysis. The model was a good fit, accounting for 30% of the variance in reduction in negative affect, R^2 = .30, F (4, 60) = 6.43, p < .001. The interaction between specificity and extent of state rumination on change in NA was significant, R^2 change = .06, F (1, 60) = 5.46, p = .023. The Johnson-Neyman significance region was defined by specificity levels below 0.52 (see Table 2 and Figure 3), where zero corresponds to the midpoint on the visual analogue scale. For individuals who rated the specificity of their ruminative thoughts below 0.52, rumination mediated the pathway between goal condition and reduction in NA such that greater rumination was associated with poorer affective recovery. This was not the case for individuals who rated the specificity of their ruminative thoughts at or above 0.52[6].

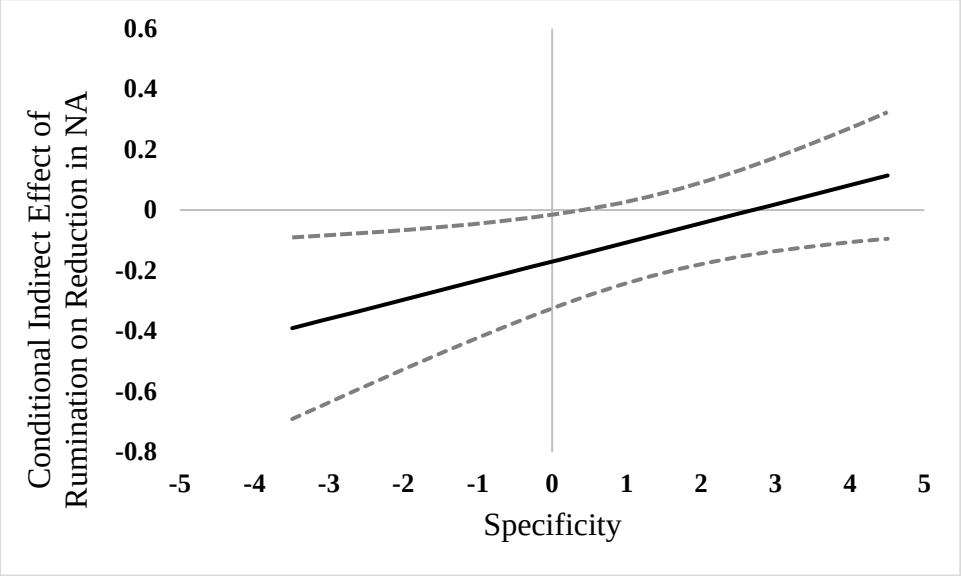

Figure 3: The conditional indirect effect (with 95% confidence limits) of frequency of rumination on reductions in negative affect as a function of specificity of ruminative thoughts.

[6] Bivariate correlations were conducted to examine the possibility that individual differences in specificity might be related to differences in the goal ratings completed during the goal cueing task or levels of trait rumination. There were no significant correlations with specificity in the unresolved goal condition (bothered at worst: r (33) = -.02, p =.896, bothered now: r (33) = -.03, p = .856, thoughts in past week: r (33) = -.19, p =.274, related to other concerns: r (33) = -.05, p = .779, trait rumination: r (33) = -.30, p = .089). These relationships were also not significant in the resolved goal condition (bothered at worst: r (32) = .03, p = .852, bothered now: r (32) = -.15, p = .415, thoughts in past week: r (32) < .001, p = .998, related to other concerns: r (32) = -.20, p = .264, trait rumination: r (32) = -.02, p = .913).

Table 2: *Regressions examining conditional indirect effects of goal condition on reduction in negative affect through frequency of rumination at high and low levels of specificity*

Rumination						
R^2 = .18, F (1, 63) = 13.46, p < .001						
Predictor	*B*	*SE*	*t*	*p*	*LCI*	*UCI*
Constant	-2.3149	0.8855	-2.6143	.0112	-4.0844	-.5454
Goal Condition	4.5597	1.2427	3.6691	.0005	2.0762	7.0431
Reduction in negative affect (PANAS negative)						
R^2 = .30, F (4, 60) = 6.43, p < .001						
Predictor	*B*	*SE*	*t*	*p*	*LCI*	*UCI*
Constant	0.6698	0.4922	1.3609	.1786	-0.3147	1.6542
Goal Condition	3.2909	0.7230	4.5517	< .0001	1.8446	4.7371
Rumination	-0.1702	0.0773	-2.2009	.0316	-0.3249	-0.0155
Specificity	-0.0192	0.1372	-0.1397	.8894	-0.2936	0.2553
Rumination*Specificity	0.0631	0.0270	2.3364	.0228	0.0091	0.1172
Moderator value defining Johnson-Neyman significance region						
(% below = 52.3077, % above = 47.6923)						
Predictor	*Effect*	*SE*	*t*	*p*	*BootLLCI*	*BootULCI*
M-1*SD* (-2.4182)	-0.3229	0.1247	-2.5900	.0120	-0.5723	-0.0735
0.4097	-0.1443	0.0722	-2.0003	.0500	-0.2887	0.0000
M+1*SD* (2.4182)	-0.0175	0.0704	-0.2487	.8044	-0.1584	0.1234

Goal condition: 0 = resolved, 1= unresolved.
LCI = lower 95% confidence interval. UCI = upper 95% confidence interval.
BootLLCI and BOOTULCI = bootstrapped lower and upper 95% confidence intervals

Simple slopes analyses probing the interaction between high (*M* +1*SD*) and low (*M* -1*SD*) levels of specificity and rumination on reduction in NA in the unresolved goal condition revealed that at low but not high levels of specificity, greater rumination perpetuated NA, t (33) = 2.18, p = .038 (Figure 4).

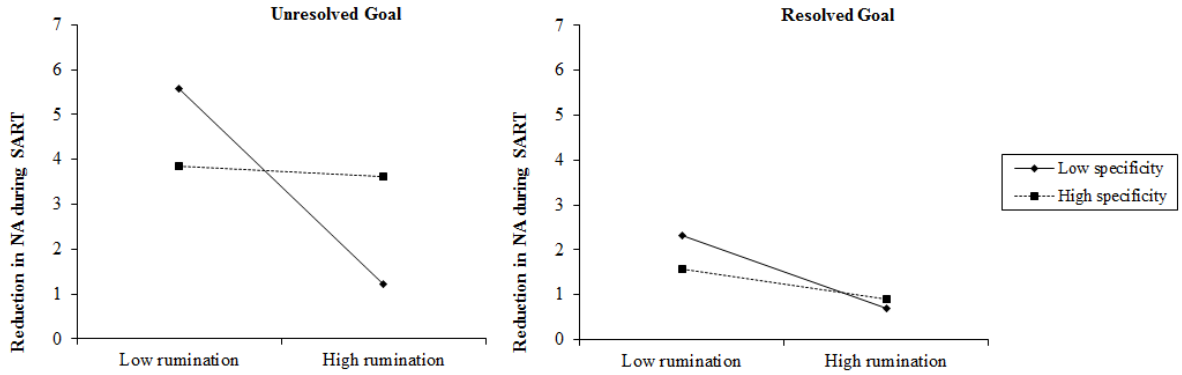

Figure 4: Simple slopes estimating the interactive effect of rumination and specificity on reduction in NA at 1 *SD* above and below the mean.

When these analyses were repeated with the other dimensions of rumination entered as covariates in the model, the critical specificity x rumination moderated mediation remained significant, R^2 change = .05, F (1, 56) = 4.13, p = .047, as did the overall model, which continued to have a large effect size, R^2 = .34, F (8, 56) = 3.56, p = .002[7].

The same analyses examining positive affect revealed no significant moderation of the indirect effect, B = .03, t = 1.20, p = .236. The hypothesised negative affective consequences of rumination about unresolved goals that is low in specificity was evident for NA but not PA.

4 Discussion

[7] Alternative post-hoc moderated mediation models, examining each of the other dimensions of rumination as potential moderators are reported in the supplementary materials.

The present research sought to test the hypothesis that when state rumination about personal goal discrepancies is low in specificity, greater rumination would have unhelpful affective consequences. Our hypotheses were supported: replicating Roberts et al. (2013), cueing personal goal discrepancies caused more goal-focused rumination than cueing resolved goals. Cueing unresolved goals resulted in an immediate significant increase in NA and participants then reported a decrease in NA during the SART (the time period in which we measured goal-focused rumination), indicating affective recovery. Goal-focused rumination during the SART did not have overall unhelpful affective consequences, except for those individuals who rated these ruminations as being low in specificity. When goal-focused rumination was low in specificity, rumination mediated the association between goal discrepancies and reductions in NA: greater rumination about unresolved goals resulted in impaired affective recovery and perpetuated NA. This pattern of results was not observed for PA. Additional analyses indicated that greater state rumination about unresolved goals was associated with such ruminations being characterised as more repetitive, emotional, and uncontrollable.

Relatively little research has examined the affective consequences of ruminating about personal goal discrepancies, and previous findings have been mixed (e.g., Roberts et al., 2013; Zahn et al., 2017). Our results may help to clarify this picture, and lend preliminary support to the hypothesis that specificity of goal-focused rumination is important in determining whether rumination has unhelpful affective outcomes. In our sample, there was no evidence that greater rumination impaired affective recovery from cueing unresolved goals, except when specificity levels were low. Future research to replicate this, and to establish the reliability of our measure of specificity, will be an important next step.

These findings indicate a potential mechanism by which problematic rumination about ongoing goal difficulties might be targeted in order to reduce unhelpful affective

consequences. Increasing the specificity of goal-focused rumination may help to reduce the proportion of such ruminations that have unhelpful short-term affective outcomes. This is of significance given the observation that depressed individuals report both heightened rumination and negative affect, and difficulties generating concrete plans to pursue their goals (Dickson & Moberly, 2013; Vincent, Boddana, & MacLeod, 2004). Consistent with this, there is evidence that training dysphoric individuals to practice a more concrete style of thinking results in significant reductions in rumination and symptoms of depression and significant increases in concreteness (e.g., Watkins, Baeyens, & Read, 2009).

An interesting avenue for future research is the extent to which specificity of goal-related ruminative thoughts can be separated from the ways that goals are construed within hierarchical motivational structures. The tendency to link lower level goal discrepancies with more abstract higher order strivings is hypothesised to be associated with increased rumination and negative affect (McIntosh, 1996). This could be a result of ruminating about goal discrepancies in a more abstract manner (e.g., once a goal discrepancy is detected, ruminating about the meaning and implications of poor progress versus the specific details of how to improve goal progress). Alternatively, it could be a result of pursuing more abstract goals (e.g., to be happy) or holding more abstract motives for lower level goal pursuit (e.g., working on a paper in order to get a good grade versus to be successful in a future career). Theoretically, one might predict that these variables would co-vary with one another (Watkins, 2011), but to our knowledge this has yet to be examined. Within our sample, there was no evidence that individual differences in specificity ratings were associated with ratings of how much the goal was related to other more general concerns or how troublesome the goal was, but we did not examine the extent to which it might be possible to differentiate specificity of ruminative content from specificity of underlying goal motives.

Our results are consistent with the assertion that goal-focused rumination does not always have problematic affective consequences (Carver & Scheier, 1998; Watkins, 2008). In our sample, when rumination was high in specificity, there was no evidence that state rumination impaired affect regulation. However, it is of note that without a standardized measure of specificity of goal-focused rumination, it is unclear how levels of specificity in our sample may correspond to those observed in the wider population. Whilst we focused on the role of specificity in unhelpful affective outcomes, an interesting avenue for future research would be determining whether specificity may play a moderating role in potential positive outcomes associated with rumination.

The present study addressed the effects of residual uninstructed rumination during a subsequent task (the SART) on affective recovery following an acute ruminative period (the goal-focus period). We measured the extent and impact of residual rumination about goal discrepancies when participants were instructed to focus on another task and therefore would not be predicted to intentionally engage in rumination. As such, we were not expecting high levels of rumination, and, consistent with previous mind-wandering research using a similar design (e.g., Stawarczyk, Majerus, & D'Argembeau, 2013), the levels of rumination observed during the SART were relatively low (in the unresolved goal condition, participants reported ruminating on average on 8.3% of thought probes). Importantly, these ruminations nevertheless significantly predicted affective recovery when such thoughts were low in specificity, with the overall model having a large effect size, and our interaction term remaining significant after controlling for the other dimensions of rumination. This is noteworthy because it is consistent with the possibility that rumination can occur at relatively low frequencies but nevertheless have a significant impact that is both clinically and theoretically meaningful in understanding the relationship between rumination and psychological distress (see, for example, the work of Rogers & Joiner, 2017, 2018, on

rumination on suicidal ideation). Conversely, ruminative thoughts may be both higher in frequency and relatively low in impact on mental health (e.g., deliberating on the concrete steps required to accomplish an important task). Rumination predicts the subsequent onset of mental health conditions such as depression and anxiety, but occurs at lower levels in individuals without current mental health symptoms (e.g., Roberts, Gilboa, & Gotlib, 1998) and the predominant measure of depressive rumination primarily assesses self-reported frequency. It is therefore valuable to delineate these earlier moderators and consequences of rumination in order to better understand the circumstances under which non-clinical levels of ruminative thinking may have maladaptive consequences. Such consequences may be an important precursor of future mood and anxiety disorders.

Consistent with Roberts et al. (2013), there was no evidence that ruminating about personal goal discrepancies resulted in impaired attentional control. This is in contrast to a substantial correlational literature linking trait depressive rumination with impaired executive function (e.g., Zetsche, Burkner, & Schulze, 2018) and indicates the importance of further experimental examination of the similarities and differences between goal-focused and symptom-focused rumination, and the potential role of depressive symptoms in the effects of rumination on cognitive performance.

This study examined the affective consequences of goal-focused rumination in a non-clinical sample with relatively low levels of depressive symptoms, and awaits replication in individuals with current or past depression. Negative mood is predicted to impact both on the perception of current goal progress, and also what an appropriate reference value for the goal may be, thereby increasing perceptions of unsatisfactory goal progress (e.g., Carver & Scheier, 1998). Consistent with this, Moberly & Watkins (2010) found evidence that momentary perceptions of goal blockage predicted negative affect and ruminative self-focus in everyday life. In individuals susceptible to depression, negative affect is understood to act

as a cue for unhelpful rumination that is low in specificity and perpetuates low mood (Watkins & Nolen-Hoeksema, 2014). Instructions to think in an abstract versus concrete manner may have different consequences for affect regulation in individuals with current or past depressive symptoms (e.g., Werner-Seidler & Moulds, 2012; Hetherington & Moulds, 2015). An important avenue for future research will thus be to examine the role of depressive symptoms in the nature and consequences of rumination about personal goal discrepancies. The underlying rationale of the present work is that it is beneficial to understand the specific nature of goal-focused rumination in order to identify the circumstances in which it is associated with maladaptive outcomes. However, in the context of treating depression, we note that an argument could be made that treatments that are effective in reducing depressive symptoms may also result in reductions in depressive rumination, even if this is not a specific treatment target. It is not clear at present what the implications of such approaches would be for rumination about goal discrepancies. Further research to delineate the associations between goal-focused rumination, trait depressive rumination, and symptoms of depression may help to clarify the implications of these possibilities.

Our findings were limited to negative affect, and it is possible that the impact of rumination about goal discrepancies on positive and negative affective systems may differ. Positive emotions are thought to increase when progressing rapidly towards a goal, and negative emotions are thought to increase when progress is slower than one had expected (Carver and Scheier, 1998). In the context of psychopathology, maladaptive rumination is generally understood to have an amplifying effect on one's current affective state (e.g., Gilbert, Nolen-Hoeksema, & Gruber, 2013). As such, when cued with a negative goal discrepancy, rumination might predominantly impact on initial negative affective responses to the goal discrepancy. In contrast, there is evidence that rumination about positive affective states and positive goal feedback amplifies positive affect and is heightened in individuals

with bipolar disorder (e.g., Johnson, Ruggero, & Carver, 2005; Nolen-Hoeksema, Vine, & Gilbert, 2013). We limited our examination of rumination to negative goal discrepancies, and an interesting avenue for future research will be to examine the relationship between rumination about positive discrepancies (faster than anticipated goal progress) and positive affect.

It is important to note that there are a number of limitations to this study. First, our research was conducted in a student sample and awaits replication in other populations. Second, we relied on retrospective self-report ratings of specificity of ruminative thoughts, and it is possible these may partially reflect the influence of unmeasured variables, such as the perceived difficulty of the goal, how easily achievable it is, or the extent to which it is linked to higher order strivings. We account for the decline in NA as a function of specificity of goal-focused rumination. There are other competing models that conceivably could account for this pattern. To avoid problems associated with multiple comparisons we do not report alternative models here, although the results of post-hoc alternative accounts are briefly summarised in the supplementary materials. Future research could consider a priori comparisons of competing accounts. Of particular importance will be the establishment of the reliability and validity of measures of specificity of rumination in this context. Our measure of rumination was a single item VAS. While there is a long tradition of using VAS scales of this kind and these bring with them advantages of minimising participant burden during research designs with multiple assessment points, it is nevertheless possible it may be more sensitive to use multiple item scales. Third, we limited our examination of the proximal effects of rumination to affective outcomes and therefore were unable to assess the longer term self-regulatory outcomes of rumination. Finally, it will be important to examine these patterns of associations in a clinical sample where problematic affective consequences of (depressive) rumination have predominantly been documented.

4.1 Conclusion

The present study demonstrated that greater rumination about unresolved personal goals was only associated with unhelpful affective consequences when rumination was low in specificity. This supports a central prediction of Watkins' (2008, 2011) model of rumination: specificity of thought content may be an important mechanism in determining whether goal-focused rumination has adaptive or maladaptive affective consequences. These preliminary findings indicate the potential value of a systematic examination of the causal associations between affect, motivation, and cognition in determining the proximal causes and consequences of rumination.

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