



The Effect of State and Trait Self-Critical Rumination on Acute Distress: An Exploratory Experimental Investigation

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Abstract

Self-critical rumination is a process whereby individuals focus attention on past failures and inadequacies without consideration for improvement or problem-solving. Past research has demonstrated that self-critical rumination is a separate process from the experience of having intrusive self-critical thoughts and that engaging in self-critical rumination is strongly correlated with beliefs that it is uncontrollable or represents a weakness of character. What is less clear at this time, however, is the impact that self-critical rumination has on levels of distress when faced with failure. Thirty volunteers who were not experiencing significant levels of depression were randomly assigned across three groups: one rumination and two controls. Acute distress was measured prior to and immediately following a task, as well as upon debrief. Individuals expected to complete an impossible task, who experienced simulated self-critical rumination experienced greater levels of acute distress than controls immediately following the task. There was also a significant correlation between reported levels of trait self-critical rumination, negative metacognitive beliefs and self-esteem with levels of distress following debrief when controlling for initial levels of distress and group membership. The use of subjective self-reports and small sample size limits the findings of this exploratory study. Engaging in self-critical rumination, and associated negative metacognitive beliefs, may have a significant impact on levels of acute distress following a recent failure.

Keywords Self-criticism · Self-critical rumination · Metacognitions

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Introduction

Self-Criticism and Self-Critical Rumination

Self-criticism is an intense and persistent form of internal dialogue that expresses hostility toward the self when one is unable to attain one's own high standards (Shahar 2015). Having both state and trait components, the tendency to be self-critical has been identified as a transdiagnostic risk factor for several mental health disorders, including mood disorders, anxiety disorders, eating disorders and personality disorders (Blatt et al. 1976; McIntyre et al. 2018; Warren et al. 2016; Zuroff et al. 1999, 2016). This may be due to subjective experiences of entrapment and the tendency to engage in negative social comparison (Sturman and Mongrain 2005) or as a way of punishing oneself or correcting one's behavior (Gilbert et al. 2004). Additionally, there is evidence to suggest that apart from emotional distress, self-criticism can also lead to impairments in long-term adjustment and can have a negative impact on interpersonal relationships (Mongrain et al. 1998; Zuroff et al. 1994). Previous research has suggested that there is a moderate to strong negative correlation between self-criticism and explicit self-esteem, which is the evaluation that one makes of their own self-worth (Dunkley and Grilo 2007; Grzegorek et al. 2004; Shahar 2015). Similarly, individuals with low self-esteem are more likely to engage in greater levels of self-criticism. This could reinforce their view of not being good enough, which could increase levels of self-esteem (Fennell 1997).

Recently, researchers have started to explore the role that the process of rumination plays in maintaining levels of self-critical thinking, distress and self-esteem (Kolubinski et al. 2017; Moreira and Canavarro 2018; Smart et al. 2016). Rumination is the process of perseveratively thinking about one's emotions or problems without actively problem-solving. Its presence is a distinguishing feature between individuals with low and high levels of self-esteem (Di Paula and Campbell 2002; Nolen-Hoeksema et al. 2008; Treynor et al. 2003). The process of rumination can also contain state-based and trait-based components (LeMoult et al. 2013; Moberly and Watkins 2008, 2010; Nolen-Hoeksema 1991). The former refers to a momentary cognitive experience of engaging with emotionally-laden thoughts without problem-solving; whereas the latter indicates a propensity to do so frequently at various points over a longer period of time. Rumination can be applied to content-based thoughts related to anger, depression, post-event processing, and worry, which in turn can impact behavior and intensity of affect (Baer and Sauer 2011; Brozovich and Heimberg 2011, 2013; Bushman et al. 2005; Rector et al. 2008; Sukhodolsky et al. 2001; Treynor et al. 2003).

Unlike self-reflection, which is meant to involve an inquisitive self-appraisal for the benefit of developing greater awareness and understanding, rumination has a brooding aspect to it that facilitates neither learning nor improvement (Trapnell and Campbell 1999). Smart et al. (2016) postulated that trait self-critical rumination is the process of focusing attention specifically on self-critical thoughts and past instances of failure rather than attempting to improve oneself or one's

circumstances. The Trapnell and Campbell model of rumination, they suggest, may be considered self-focused, but is not necessarily self-critical.

Additionally, unlike depressive rumination (Nolen-Hoeksema and Morrow 1991), the focus, or content, of self-critical thoughts are transdiagnostic and may involve feelings of shame and guilt (Smart et al. 2016). Furthermore, Kolubinski et al. (2019) have demonstrated that engaging in self-critical rumination might not be the same as being self-critical. Indeed, the process of self-critical rumination appears to partially mediate the relationship between self-criticism and self-esteem.

Where most research to date has explored the role of self-criticism in predicting well-being, it may be more beneficial to understand the process with which individuals engage with self-critical thoughts. By understanding the mechanisms that activate and maintain the ruminative process, it would be possible to approach self-critical thoughts with the intent to shift from rumination to reflection.

Self-Critical Rumination and Metacognitions

A theoretical framework that could be used to explain trait-based self-critical rumination is the Self-Regulatory Executive Function (S-REF) model (Wells and Matthews 1996). In this model, emphasis is placed not on the content of one's intrusive thoughts and experiences, but rather on the mechanisms that generate, monitor and maintain the process of worry and rumination (Wells 2009). According to this model, psychological distress is linked to the activation of a particularly toxic style of responding to negative intrusive thoughts consisting of worry, rumination, threat monitoring, thought suppression and avoidance. This style of responding, referred to as the Cognitive Attentional Syndrome (CAS), is initiated and maintained through metacognitions, which are the beliefs that we hold about our cognitive experiences and ways to control and manage them.

In accordance with the S-REF model, Kolubinski et al. (2016, 2017) identified that positive and negative metacognitions are involved in self-critical rumination, as have been identified in other emotional, physical and behavioral domains (Caselli and Spada 2013; Fernie et al. 2015, 2017; Nikčević et al. 2017; Papageorgiou and Wells 2001a; Spada and Wells 2006). In this model, positive metacognitions refer to beliefs linked to the activation of the ruminative process (e.g. 'I need to repeatedly think about things that I got wrong in order to avoid making mistakes in the future') and negative metacognitions concern the potential danger and uncontrollability of ruminating once it is initiated (e.g., 'Dwelling on my past mistakes represents a weakness of character' and 'I find it hard to focus on anything else when I think about my past mistakes and failures'). This apparent contradiction between the benefits and dangers of self-critical rumination first activates, and then maintains, the CAS and can lead to an increase in emotional distress (Wells 2009; Wells and Matthews 1996).

However, unlike previous research into the role of metacognitions, self-critical rumination and the negative metacognitions associated with it appear to be related to the same construct (Kolubinski et al. 2019). Indeed, the Self-Critical Rumination Scale developed by Smart et al. (2016), for example contains items such as '*I often*

worry about all of the mistakes I have made' and 'My attention is often focused on aspects of myself that I'm ashamed of,' which are a reflection of the process of self-critical rumination. However, it also contains items that assess metacognitive beliefs (e.g., 'Sometimes it is hard for me to shut off critical thoughts about myself').

Aims and Objectives

Experiencing state-level self-critical rumination is an emotionally distressing experience in the moment. Previous research by Koster et al. (2013) reported that rumination can significantly impair one's ability to switch the focus of attention when faced with negatively-charged emotional information. Furthermore, they demonstrated that rumination, particularly the tendency to brood, is strongly correlated ($r = .63, p < .01$) with the State-Trait Anxiety Inventory (Spielberger 1983). Therefore, it could be the case that experiencing trait-levels of self-critical rumination may increase the impact of state-level rumination and maintain elements of that distress after the task is complete, since it takes longer for ruminators to shift the focus of attention away from the emotional task.

To date, most research into the effects of self-critical rumination has been correlational, based on self-report measures of trait rumination linking it to affective states. This has included depression, shame or stress (Moreira and Canavarro 2018; Smart et al. 2016) and also to levels of self-esteem (Kolubinski et al. 2017). No research has explored the direct emotional impact that state-based self-critical rumination might cause when faced with failing a task or how that might interact with trait-based rumination.

The purpose of this study was to undertake an experiment to explore the effect of self-critical rumination on acute levels of distress, which we define as a self-reported level of emotional discomfort. The experimental hypotheses put forward are that: (a) manufactured self-critical rumination will lead to significantly higher levels of distress during an impossible task when expectations of performance are not managed; and (b) there will be a positive relationship between the level of distress with each of the self-reported levels of trait self-critical rumination, the associated negative metacognitions and self-esteem. This is expected to be true immediately following the task, as well as after the debrief.

Method

Participants

Thirty student volunteers (26 female; mean age = 24.6 years [$SD = 6.04$; range 18–38 years]) were recruited among the student body at a university in London, UK. Some participants were provided with research credit as a part of their studies in psychology. Others were given an Amazon gift card. Participants were required to: (1) be at least 18 years of age; and (2) not be experiencing symptoms of depression in the moderate to severe range. The racial background of participants was 33.3%

Caucasian, followed by 23.3% Asian; 16.7% Black British, 6% White Other; 3.3% African; and 3.3% Other.

Using G*Power (Version 3.1.9.4; Faul et al. 2009), the research team determined a priori that this sample size would provide us with enough statistical power ($1-\beta=.80$; $\alpha=.05$) to detect a moderate effect (.3) for a repeated-measures ANOVA in support of our first hypothesis and any strong bivariate correlations similar to that found by Koster et al. (2013; $r=.6$), mentioned above, to support our second hypothesis. This is further supported by Bujang and Baharum (2016), who report that 19 participants would be a sufficient sample size to detect a correlation of .6.

Measures

Negative Affect

The short form of the Depression Anxiety Stress Scale (DASS-21; Antony et al. 1998) is a 21-item measure using a 4-point Likert scale that assesses emotional distress in clinical and non-clinical populations. The DASS-21 distinguishes between depression (“I couldn’t seem to experience any positive feeling at all”), physiological arousal (“I felt I was close to panic”) and psychological agitation (“I found it hard to wind down”). It contains three orthogonal factors (depression (DASS-D), anxiety (DASS-A) and stress (DASS-S) as well as an overall factor of psychological distress (DASS-T) (Henry and Crawford 2005). For the purpose of this study, we used a cut-off score of 14 on the depression subscale to determine eligibility for the study, which ruled out anyone in the moderate to severe range of depression. It has excellent reliability in this sample ($\alpha=.90$).

Current Perceived Distress Levels

Current perceived distress was assessed using a visual analogue scale, ranging of 0 (No Distress) to 10 (Unbearable Distress). Participants were shown a number-line and asked to rate how emotionally uncomfortable they were feeling in that moment. A similar method has been used in previous research when exploring the role of desire thinking on distress with respect to alcohol use (Caselli et al. 2013, 2016a, b).

Self-Critical Rumination

The Self-Critical Rumination Scale (SCRS; Smart et al. 2016) assesses the ruminative process associated with self-critical thoughts (“My attention is often focused on aspects of myself that I’m ashamed of”). This is a 10-item measure that uses a 4-point Likert scale, has good internal consistency in this sample ($\alpha=.82$) and correlates highly with measures of self-criticism as well as measures of rumination (Smart et al. 2016).

Metacognitions About Self-Critical Rumination

The Metacognitions about Self-Critical Rumination Questionnaire (MSCRQ; Kolubinski et al. 2017) is a 10-item measure using a 4-point Likert scale to assess the positive (MSCRQ-P; “I motivate myself to try harder by dwelling on stupid things I did in the past”) and negative (MSCRQ-N; “I have a hard time distancing myself from thoughts about not being good enough”) metacognitions associated with self-critical rumination. Both sets of metacognitions are predictive of the process of self-critical rumination, and the MSCRQ-N has a particularly strong relationship with the SCRS (Kolubinski et al. 2019). Inter-item reliability for this questionnaire was low ($\alpha = .57$).

Self-Esteem

The Rosenberg Self-Esteem Questionnaire (RSES; Rosenberg 1965) is a widely-used measurement of self-esteem. It is a 10-item measure using a 4-point Likert scale focusing on feelings of self-worth (“On the whole, I am satisfied with myself”). The RSES has demonstrated acceptable reliability in this sample ($\alpha = .66$) and validity has been established across many sample groups around the world (Robinson et al. 1991; Schmitt and Allik 2005).

Design

Participants were randomly assigned to one of three experimental attention-focus groups: Math (Experimental), and two control groups (Math (Control) and Coloring (Control)), where each group contained an equal number of participants ($N = 10$). This study utilized a 3×3 mixed-design experiment, where measurements were taken prior to the manipulation task (T1), immediately following the task (T2) and then again after debrief (T3) for each of the three manipulation groups.

Procedure

Ethics approval for the study was obtained from the London South Bank University Research Ethics Committee Board. After participants had given written informed consent, they were initially asked to describe their current level of psychological distress on a visual analogue scale, ranging from 0 to 10. They then completed the battery of self-report measures.

The Math (Experimental) group and Math (Control) group were given ten mathematics problems, each with an answer provided. Participants were asked to ‘show their work’ by writing down the process by which the answers are derived. Eight of the questions were calculable with a moderate level of numeracy using common techniques taught in secondary school. Certain failure was ensured by utilizing two

additional questions that were extremely difficult to complete, despite appearing to be straightforward.

In order to manufacture self-critical rumination, two tactics were employed. Primarily, the experimental group were told that most people can solve all ten questions in approximately 15 min and that they would be given 10 to do so, thus raising their expectations of themselves. The Math (Control) group, however, were told that these questions were next to impossible and that if they struggle, it would be advisable to skip to the next question. It was expected that failing a task in which one is expected to succeed would increase state levels of self-critical rumination.

Additionally, all participants were asked to record a short audio clip, lasting 15–20 s. Those in the Math (Experimental) group were asked to record a clip that reflected common self-critical thoughts in order to manufacture the experience of self-critical rumination (“*What’s the matter with you? Can’t you do anything right? Everyone else can do this, so why can’t you? You’re pathetic. I mean, just really worthless. It’s not even that hard. You should be able to do this, and I don’t know why you can’t*”). Meanwhile, participants in the Math (Control) group were asked to record the first paragraph from Charles Dickens’ *A Tale of Two Cities*. (“*It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness.*”). This passage was chosen because it can be challenging to read at first sight but does not contain the emotional valence of the previous paragraph. The recordings were played approximately every 2 min over headphones that they were asked to wear. In order to control for the effects of facing failure, a second control group, Coloring (Control) was employed. They were given 10 min to color in a picture with pencil crayons. They also had the recording of the *Tale of Two Cities* play over headphones every 2 min.

Immediately following the respective tasks, participants in each of the three groups were again asked to rate their level of distress on the visual analogue scale. Participants were then debriefed, the purpose of the study was explained, and participants were provided with the contact details of the university’s Mental Health and Wellbeing Team and Samaritans in case participation produced any lasting level of distress. They were then shown a short video that involved an unrelated counting task. Lastly, they were asked to rate their level of distress one final time.

Data Analysis

See Table 1 for a summary of the means, standard deviations and ranges of the various measurements. There were no reported differences between the groups on any of the measures. A series of Shapiro–Wilk tests were conducted to test the assumption of normality using SPSS (Version 21; IBM Corp 2012). These concluded that level of distress at T1 (prior to intervention) and T3 (following debrief) were not normally distributed, most likely due to floor effects, so a nonparametric method was used to determine the effect of the experimental manipulation. We chose the F1 LD F1 nonparametric procedure for longitudinal data in the nparLD package (Noguchi et al. 2012) for R (R Core Team 2013), followed by Kruskal–Wallis and

Table 1 Means, SDs, and ranges for all questionnaires

| | Means | SD | Range |
|----------------|-------|------|-------|
| 1. T1 Distress | 2.00 | 1.80 | 0–5 |
| 2. T2 Distress | 4.37 | 2.55 | 0–8 |
| 3. T3 Distress | 2.12 | 1.88 | 0–6 |
| 4. MSCRQ-P | 8.73 | 2.63 | 5–14 |
| 5. MSCRQ-N | 11.00 | 2.45 | 6–15 |
| 6. SCRS | 23.37 | 5.67 | 13–34 |
| 7. RSES | 29 | 3.53 | 22–35 |
| 8. DASS-D | 5.57 | 4.30 | 0–13 |
| 9. DASS-A | 5.97 | 4.55 | 0–18 |
| 10. DASS-S | 9.5 | 5.43 | 0–21 |

T1 Distress, Acute distress at time 1; T2 Distress, Acute distress at time 2; T3 Distress, Acute distress at time 3; MSCRQ-P, Metacognitions about Self-Critical Rumination Scale (Positive); MSCRQ-N, Metacognitions about Self-Critical Rumination Scale (Negative); SCRS, Self-Critical Rumination Scale; RSES, Rosenberg Self-Esteem Scale; DASS-D, Depression, Anxiety Stress Scale-21 (Depression); DASS-A, Depression, Anxiety Stress Scale-21 (Anxiety); DASS-S, Depression, Anxiety Stress Scale-21 (Stress); $n=20$

Tukey–Kramer–Nemenyi tests post hoc using the PMCMR package in R (Pohlert 2014) in order to test hypothesis 1.

In order to understand the relationship between self-critical rumination and levels of acute distress (hypothesis 2), correlations were calculated using the Math (Experimental) and Math (Control) groups only. It was not expected that the levels of distress for the Coloring (Control) group would be insightful at this time, but that those in the Math (Control) group would be, since individuals in that group were also involved in an impossible task. To control for the level of distress at different points in time, partial Spearman correlations were calculated, controlling for group membership and distress level at T1.

Results

Nonparametric Analysis of Variance Between Groups

The nonparametric analysis of variance indicated that there was a significant difference between groups ($F=3.88$, $df=1.79$, $p<.05$) and across time ($F=19.91$, $df=1.84$, $p<.01$). There was also a significant interaction effect between the two ($F=4.69$, $df=3.03$, $p<.01$) (see Fig. 1). Kruskal–Wallis tests were then performed on each of the three periods in time, using a Bonferroni adjustment. Results indicated that there was a significant difference between groups at T2 ($H(2)=14.427$, $p<.01$), but neither at T1 ($H(2)=3.79$, n.s.) nor T3 ($H(2)=4.66$, n.s.). Therefore, a Tukey–Kramer–Nemenyi test was performed to determine group differences only for T2. Results indicated that distress levels for the Math (Experimental) group (6.8)

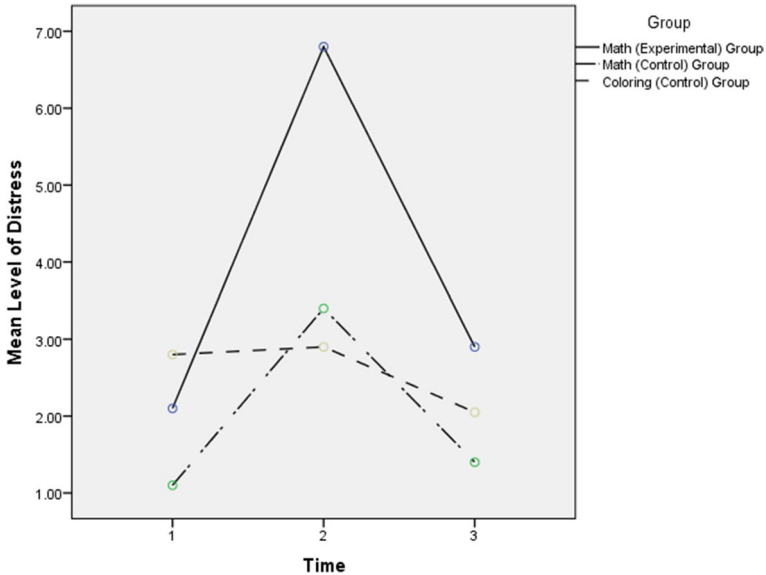


Fig. 1 Ratings of acute distress before (Time 1 [1]) and after (Time 2 [2]) manipulation and after the debrief (Time 3 [3])

were significantly higher than the Math (Control) group (3.4) and Coloring (Control) group (2.9), $p < .01$, which were not significantly different from each other.

Correlations Between Time and Measurements

Level of anxiety was moderately correlated with level of distress at T2 ($r_s = .45$, $p < .05$), but none of the other measurements were. At T3, level of distress was moderately correlated with reported levels of self-critical rumination ($r_s = .42$, $p < .05$) and strongly correlated with negative metacognitions about self-critical rumination ($r_s = .62$, $p < .01$) and self-esteem ($r_s = -.60$, $p < .01$) (see Table 2).

Discussion

The goal of this study was to explore the impact of state and trait levels of self-critical rumination on acute distress when faced with a challenging task and the results partially support the hypotheses set prior to the study. The findings show that manufactured state-level self-critical rumination had a significant impact on acute levels of distress during a challenging task, as described in our first hypothesis. Namely, participants experienced higher levels of reported distress in the group that manufactured self-critical rumination than in the groups that did not and that this distress can be better accounted for the difference in expectation rather than the experience of failure. There was also a relationship between a priori self-reported levels of trait

Table 2 Partial Spearman correlations when controlling for group and level of distress at T1

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----------------|------|--------|------|--------|-------|------|-------|-------|
| 1. T2 Distress | | | | | | | | |
| 2. T3 Distress | .18 | | | | | | | |
| 3. MSCRQ-P | .06 | .05 | | | | | | |
| 4. MSCRQ-N | .39 | .62** | .25 | | | | | |
| 5. SCRS | .34 | .41* | .21 | .71** | | | | |
| 6. RSES | -.18 | -.60** | .00 | -.71** | -.53* | | | |
| 7. DASS-D | .12 | .02 | .19 | .45* | .37 | -.14 | | |
| 8. DASS-A | .45* | .19 | .07 | .48* | .48* | -.28 | .63** | |
| 9. DASS-S | .26 | .10 | -.02 | .16 | .25 | -.10 | .54* | .77** |

* $p < .05$; ** $p < .01$; T2 Distress, Acute distress at time 2; T3 Distress, Acute distress at time 3; MSCRQ-P, Metacognitions about Self-Critical Rumination Scale (Positive); MSCRQ-N, Metacognitions about Self-Critical Rumination Scale (Negative); SCRS, Self-Critical Rumination Scale; RSES, Rosenberg Self-Esteem Scale; DASS-D, Depression, Anxiety Stress Scale-21 (Depression); DASS-A, Depression, Anxiety Stress Scale-21 (Anxiety); DASS-S, Depression, Anxiety Stress Scale-21 (Stress); $n = 20$

self-critical rumination, negative metacognitions about self-critical rumination and levels of self-esteem with levels of distress after debriefing participants on the purpose of the study. This partially supported the second part of our second hypothesis. However, that relationship was not statistically significant immediately following the task. Possible explanations for this include the possibility that the audio recording used to simulate self-critical rumination may have caused a level of distress that was disproportionate to one's everyday experience of self-critical rumination. It could also be that there is less variation across the population on levels of distress when undergoing a near-impossible task or failure. It is also possible that the sample size used in this study did not have enough statistical power to be able to detect a weak or moderate correlation. Lastly, the level of distress immediately following a task was correlated with levels of anxiety, which may be more concerned with predicted consequences of failing, as opposed to ruminating about past experiences. At this time, then, we cannot conclude that levels of self-reported trait self-critical rumination impact that distress caused by state self-critical rumination.

In any case, once participants were debriefed about the purpose of the study, and attention was diverted an unrelated topic, levels of acute distress were moderately correlated with one's self-reported level of trait self-critical rumination and strongly correlated with the negative metacognitive beliefs and levels of self-esteem. There was no reported relationship between level of affect and distress at this time. There may be a difference in the amount of time that it would take one to return to baseline, as a function of one's tendency to ruminate, however, which could be ascertained in future research.

The S-REF model is central to Metacognitive Therapy (MCT), which has been successfully applied to the treatment of depression and anxiety (Normann et al. 2014; Wells 2009) and has been proven useful to help understand the processes involved in problem drinking (Caselli and Spada 2013; Spada and Wells 2006), problem gambling (Spada et al. 2014), nicotine use (Nikčević et al. 2017),

procrastination (Fernie and Spada 2008) and depressive rumination (Papageorgiou and Wells 2001a, b). In MCT, Wells (2009) draws a distinction between two different modes of processing thoughts: object mode and metacognitive mode. In object mode, thoughts are processed in a similar fashion as sensory stimuli. Both inner and outer events are treated equally in an undifferentiated consciousness. However, in the metacognitive mode, thoughts are consciously perceived as being separate from the self-as-observer and can instead be processed by the individual to facilitate objective evaluation. Individuals in MCT are also challenged on the veracity of their positive and negative metacognitions, which activate and maintain the rumination process.

This model may be beneficial to help individuals to analyze their performance, failures and mistakes in order to move towards what Kross (2009) referred to as a *self-distanced perspective* rather than a *self-immersed perspective*. Indeed, Kross and colleagues have demonstrated that the manner in which one views oneself during introspection can have a significant impact on their ability to regulate their thoughts, feelings and behavior (Ayduk and Kross 2010; Kross et al. 2014). Similarly, Trapnell and Campbell (1999) also distinguish between rumination and reflection when engaging in introspection. When discussing introspection, however, neither of these models address the role of self-criticism or denigration that may follow a failure.

This study provides evidence to suggest that MCT might be a useful form of treatment for individuals who report experiencing high levels of self-critical rumination. The effects that were demonstrated in this study were done using a sample of individuals who were not concurrently experiencing symptoms of depression, which is often associated with the process of rumination (Nolen-Hoeksema 2004). Rather than operating in object mode with respect to self-critical thoughts, individuals could shift into metacognitive mode through techniques such as Detached Mindfulness and Situation Attention Refocusing (Gkika and Wells 2015; Wells 2000).

Study Limitations and Future Directions

Several limitations must be considered when interpreting the results of this study. First is the use of self-report measures, which are subject to response biases and demand effects. Similarly, the measure of acute distress was also self-reported using a subjective scale with unknown reliability and validity and it is difficult to compare results across participants.

Second was the low sample size used in this study, which can increase the likelihood of false positives and false negatives. Although significant results were ascertained, the stability of the positive results is tenuous. On the other hand, one of the hypotheses could not be confirmed and a sampling error may have contributed to those that were. This could also explain why some of the relationships between measures, particularly positive and negative metacognitions, were not statistically significant. Previous research has demonstrated a low-moderate correlation between the two subscales of the Metacognitions about Self-Critical Rumination Scale (Kolubinski et al. 2017). Additionally, in this sample the

inter-item reliability was lower for the MSCRQ than had been demonstrated in previous studies (Kolubinski et al. 2019, 2017).

Third, this study was concerned with the level of distress that self-critical rumination might cause, but did not ascertain the impact that it could have on performance, since it did not measure the accuracy of the participants' calculations. Future research will be required in order to determine impact, whether positive or negative. It has been shown that some individuals view their self-critical thoughts, or the process of self-critical rumination, as a way of improving performance and reducing future mistakes (Gilbert et al. 2004; Kolubinski et al. 2016). However, this intended result may not materialize and it could instead have a negative impact on one's self-efficacy (Mahoney and Avenier 1977; Stoeber et al. 2008). When asking participants to solve an impossible anagram task, for example, Sommer and Baumeister (2002) concluded that individuals with low self-esteem were less likely to persist. Similarly, when primed with words that suggested rejection, individuals with low self-esteem performed worse than those with high self-esteem.

Lastly, the use of a recording to simulate self-critical rumination in addition to the management of expectations brings the generalizability into question. Future research could compare differences between those who report high and low levels of self-critical rumination in order to better understand the role that the natural tendency to ruminate might have on distress. Similarly, it would be useful to tease out the difference in effect that the expectations and the recording had on levels of distress. Future research may wish to consider incorporating a fourth group to distinguish between the two interventions. This could be particularly useful in the study of perfectionism and contingencies of self-worth (Crocker and Wolfe 2001; Egan et al. 2011).

Conclusions

Evidence suggests that self-critical rumination might be a transdiagnostic subtype of the ruminative process, related to levels of self-esteem and feelings of shame, and separate from other established forms of rumination. This study indicates that it could lead to levels of distress following a potential failure or sub-optimal performance. Previous research has found that the strongest predictor of self-critical rumination is the presence of negative metacognitive beliefs that engaging in this process is either dangerous or uncontrollable (Kolubinski et al. 2017). This could mean that engaging in such a process is a function of the belief that doing so is dangerous or that it is impossible not to. From this perspective, Metacognitive Therapy, based on the S-REF model, could help individuals in the sub-clinical population who may be experiencing acute distress following a perceived failure.

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Compliance with Ethical Standards

Conflict of interest The authors have no conflict of interest to declare.

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