The Role of Rumination on Posttraumatic Intrusions: An Investigation Using the Trauma-film Paradigm

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ABSTRACT

Trauma-related rumination, a repetitive and recurrent thinking about the trauma and its meaning, is thought to contribute to the maintenance of posttraumatic stress disorder (PTSD) (e.g., Ehlers & Clark, 2000). The role of trauma-related rumination in PTSD seems particularly relevant to individuals with concurrent depression, for whom rumination is a common cognitive characteristic. Further, depression is theorised to inhibit optimal posttrauma adjustment, and trauma-related rumination may be one cognitive process underlying how depression maintains PTSD. However the causal effects of depression and trauma-related rumination on the symptoms of PTSD have not been established conclusively, nor has trauma-related rumination been explicitly examined as a mediator for the relationship between depression and PTSD. If trauma-related rumination does affect PTSD, interventions that decrease trauma-related rumination may benefit individuals with PTSD. Interventions that include mindfulness techniques may assist in this process but this has not been tested in controlled experimental conditions. Accordingly, using a trauma film paradigm, this thesis examined whether depression and trauma-related rumination causes the maintenance of trauma intrusions, a hallmark symptom of PTSD, and whether trauma-related rumination mediates the predicted effects of depression and/or mindfulness on trauma intrusions.

Study 1 examined whether induced low mood would maintain trauma intrusions and associated distress, and whether trauma-related rumination would mediate the relationship between induced low mood or naturally occurring depressive symptoms and trauma intrusions. No evidence was found for a causal role of temporary low mood on the intrusion maintenance; however, trauma-related rumination was found to mediate the effect of naturally occurring depressive symptoms on trauma intrusions. Study 2 built upon

the mediation finding from Study 1 by using a pre-selected sample high or low in dysphoria. However, it failed to replicate the findings of Study 1.

Studies 3 and 4 tested the causal effect of trauma-related rumination on trauma intrusions and associated distress. In addition, based on current theories and past research findings, trait rumination and existing depression were proposed to moderate the effect of induced trauma-related rumination on trauma intrusions. Study 3 results indicated that higher levels of trait rumination were associated with greater effects of trauma-related rumination on occurrences of trauma intrusions. Study 4 modified the methodology of Study 3 and found preliminary evidence that trauma-related rumination maintains intrusion-related distress, but not occurrences of intrusions. These findings provide preliminary evidence for the causal role of trauma-related rumination and the moderating role of trait rumination; however the findings were somewhat inconsistent between the two studies and several null results were observed (including the failure of current depression to moderate outcomes).

Based on these findings, Study 5 examined whether a brief mindfulness induction after trauma film exposure would reduce trauma-related rumination, and whether the reduction in trauma-related rumination would consequently decrease trauma intrusions and associated distress. The brief induction of mindfulness failed to increase state mindfulness or to reduce rumination and intrusions and associated distress relative to a relaxation control. An examination on the effects of trait mindfulness indicated that it selectively influences trauma-related rumination but not intrusive experiences. The theoretical and clinical implications of Studies 1-5 are discussed.

DECLARATION

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Rie Kubota

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STATEMENT OF CO-AUTHORSHIP

Chapter 3

Kubota, R. conceptualised and designed the study, conducted data collection, analysed the data, and drafted the initial manuscript; Nixon, R. D. V. and Chen, J. conceptualised the study, and critically reviewed and edited the manuscript; and all authors approved the final manuscript as submitted.

GLOSSARY OF ABBREVIATIONS

ACT = Acceptance and Commitment Therapy

ANOVA = Analysis of Variance

BDI-II = Beck Depression Inventory – 2nd edition

CBT = Cognitive Behaviour Therapy

CI = Confidence Interval

CPT = Cognitive Processing Therapy

DASS-D = Depression Anxiety and Stress Scale – Depression

DBT = Dialectical Behaviour Therapy

EPT = Emotional Processing Theory

IES-R = Impact of Event Scale – Revised

MAAS = Mindful Attention Awareness Scale

MBCT = Mindfulness-Based Cognitive Therapy

MBSR = Mindfulness-Based Stress Reduction

MCQ = Manipulation Check Questionnaire

MCT = Meta Cognitive Therapy

MDD = Major Depressive Disorder

NIIT = Negative Interpretation of Intrusive Thoughts

OR = Odds Ratio

PBRS = Positive Beliefs about Rumination Scale

PBRS-A = Positive Beliefs about Rumination Scale – Adapted

PCL = PTSD Checklist

PCL-5 = PTSD Checklist for DSM-5

PTCI = Posttraumatic Cognitions Inventory

PTQ = Perseverative Thinking Questionnaire

PTS = Posttraumatic Stress

PTSD = Posttraumatic Stress Disorder

RF-CBT = Rumination-Focused Cognitive Behaviour Therapy

RIQ = Response to Intrusions Questionnaire

RRS = Ruminative Response Scale

RTQ = Repetitive Thinking Questionnaire

RTQ-10 = Repetitive Thinking Questionnaire – 10-item version

RTQ-ART = Repetitive Thinking Questionnaire – Absence of Repetitive Thinking

RTQ-RNT = Repetitive Thinking Questionnaire – Repetitive Negative Thinking

TMT = Trail Making Test

CHAPTER 1 – OVERVIEW

Trauma exposure is a common experience with prevalence rates of 65% and 50% in men and women in Australia (Creamer, Burgess, & McFarlane, 2001). Following exposure to an event that involved actual or threatened death, serious injury or a threat to physical integrity of self or others, most people show some initial psychological reactions but the majority recover over time (Ehlers & Clark, 2000; McNally, Bryant, & Ehlers, 2003). Some people, however, develop posttraumatic stress disorder (PTSD) after this exposure (American Psychiatric Association, 2013). It is thus imperative to investigate the factors that impede optimal adjustment following trauma exposure and that contribute to the development and maintenance of PTSD. Of particular relevance to the current study is that depression (whether pre-existing or concurrent with the trauma) is known as one of these contributing factors (see Angelakis & Nixon, 2015, for review). However, the cognitive processes responsible for the effect of depression on PTSD symptoms are not well understood.

This thesis focuses on the role that posttrauma rumination, a cognitive characteristic of depression (Nolen-Hoeksema, 1991), plays in the psychopathology of posttraumatic stress. Rumination is commonly defined as repetitive thinking about past negative experiences and mood (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008), and posttrauma rumination is thought of as a maladaptive method of processing traumatic memories and trauma reactions, resulting in the maintenance of PTSD (e.g., Brewin, Dalgleish, & Joseph, 1996; Ehlers & Clark, 2000). Using an analogue trauma film paradigm, the present thesis has three specific objectives. First, to examine the role of rumination in the relationship between depression and trauma intrusions. Second, to test the proposed causal effect of rumination on trauma intrusions and examine possible moderators for the relationship, namely, trait rumination and existing depression. Finally, the effect of a mindfulness-based

intervention on trauma-related rumination and its relationship with trauma intrusions is examined. These specific relationships were tested in a series of studies presented in Chapters 3 to 6. Better understanding of the role of rumination in PTSD will inform future research as to how best assist victims of trauma who present with ruminative thinking.

There are broadly three theories that guide the current thesis. First, Emotional Processing Theory (EPT; Foa & Kozak, 1986) offers a useful framework in understanding how corrective new learning occurs after trauma and how successful recovery is achieved. A component of EPT suggests that depression is a factor that prevents optimal levels of emotional engagement with trauma and its reminders, and thus interferes with normal recovery processes. Second, Nolen-Hoeksema's response styles of theory of depression (1991) and associated theory (Watkins & Nolen-Hoeksema, 2014) offer an explanation for the reciprocal relationship of depression with rumination. These theories highlight that ruminative processing is a likely processing style that victims with depression adopt following trauma exposure. Third, ruminative thinking of trauma memory is speculated as a risk factor for chronic PTSD in the cognitive model of PTSD (Ehlers & Clark, 2000). The model provides possible reasons for why posttrauma rumination is maladaptive in the psychopathology of posttraumatic stress.

Chapter 2 first provides a literature review that serves as background for the thesis. The existing knowledge about the effect of depression on symptoms of PTSD is first reviewed. I will then review the relationship between depression and rumination, and the current conceptualisation of ruminative thinking in the context of PTSD and trauma intrusions. Next, the possible mechanisms of posttrauma rumination on PTSD are discussed, followed by a review of the relationship of mindfulness with trauma-related rumination. Finally, I present justification for the series of studies undertaken in this PhD that are presented in the subsequent chapters.

Chapter 3 presents an experimental study (Study 1) that examined the effect of induced low mood on trauma intrusions as well as whether trauma-related rumination is a mediator for the predicted effect of depression (low mood or naturally occurring depression) on trauma intrusions. In this study, participants received a low mood induction or control procedure. Following viewing an analogue trauma film, frequency of film-related intrusions and associated distress levels were measured within the initial experimental session and at 1-week follow-up. Between the two occasions, participants rated their levels of rumination about the film. Existing depression symptoms but not induced momentary sad mood predicted frequency of film intrusions and associated distress at 1-week follow-up. Some evidence was found that ruminative trauma processing mediated the relationship between baseline depressive symptoms and later intrusion frequency and associated distress.

Next, Chapter 4 reports a study (Study 2) that addressed a limitation of Study 1 – the fact that the majority of participants had low levels of depressive symptoms. Study 2 was a quasi-experimental study that classified participants into those with or without mild or higher levels of dysphoria. However this study failed to replicate Study 1 findings; existing depression was not found to influence trauma intrusions nor the trauma-related rumination mediated the depression-intrusions relationship. Despite these null findings, naturally occurring trauma-related rumination was prospectively related to trauma intrusions, indicating a possibility that trauma-related rumination may still play a role in the development and maintenance of trauma intrusions.

As Studies 1 and 2 offered preliminary evidence for the role of trauma-related rumination on trauma intrusions, two analogue studies (Studies 3 and 4) were conducted to investigate the causal effect of trauma-related rumination on trauma intrusions, and this is reported in Chapter 5. Based on a review of previous research, trait rumination and existing depression were identified as potential moderators of the effects of induced rumination on

trauma intrusions, and thus these were also examined. In these studies, participants completed either film-related rumination or control inductions after viewing the trauma film. The control induction involved a distraction and free-thinking task in Studies 3 and 4, respectively. Participants' frequency of film-related intrusions and associated distress levels were assessed within the initial experimental session, during 1-week after film and at 1-week follow-up. Induced rumination resulted in greater intrusion-related distress in Study 4. Some evidence was found for the moderating role of trait rumination in Study 3 but not existing depressive symptoms. The findings from the two studies provide preliminary support for the theorised role of trauma-related rumination in maintaining distressing intrusive experiences and for the speculated moderation of general ruminative tendency.

The findings of Study 4 tentatively suggested that trauma-related rumination may be a causal factor for the maintenance of posttraumatic stress symptoms, thus trauma-related rumination was considered a possible target for facilitating posttrauma recovery. Accordingly, the final study (Study 5) presented in Chapter 6 tested whether brief mindfulness training would reduce trauma-related rumination and trauma intrusions, and whether trauma-related rumination would mediate the mindfulness-intrusions relationship. Again after viewing the trauma film, randomly assigned participants completed a short audio-cued mindfulness or relaxation exercise. They were instructed to practice and apply the respective techniques to manage any unwanted thoughts including film-related rumination both in-session and during a 1-week period after the film. Levels of film-related rumination during these times were measured. Frequency of film intrusions and intrusion-related distress were assessed at baseline, after the exercise and at 1-week follow-up. The predicted effects of mindfulness training on intrusions or rumination were not found, nor were film-related rumination observed to function as a mediator. However it should be noted that the brief mindfulness training was unsuccessful in increasing levels of mindfulness. As

expected, trait mindfulness was consistently correlated negatively with film-related rumination, but on the other hand, it did not correlate with intrusion variables.

Finally, Chapter 7 discusses the findings of all five studies presented in this thesis. The findings are integrated and the theoretical and clinical implications of the findings are discussed. The limitations of the methodology employed are considered, and directions for future research are discussed with the aims of further increasing our understanding of the potentially important role of trauma-related rumination in PTSD and how to best intervene with the rumination in the context of posttraumatic stress.

CHAPTER 2 – LITERATURE REVIEW

Effect of Depression on PTSD

Depression and PTSD/Trauma Intrusions

PTSD is often comorbid with clinical depression with 50% of PTSD sufferers on average having Major Depressive Disorder (e.g., Blanchard, Buckley, Hickling, & Taylor, 1998; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). A large body of research has documented that depression increases PTSD symptomatology. First, prior or concurrent depression predicts the development and maintenance of PTSD (Breslau, Davis, Peterson, & Schultz, 1997; Ozer, Best, Lipsey, & Weiss, 2003; Shalev et al., 1998). Second, comorbid depression or negative affect is associated with greater PTSD symptom severity (Nixon, Resick, & Nishith, 2004). Finally, low depression or positive emotions contribute to better posttrauma adjustment (Bonanno, 2004; Dickstein, Suvak, Litz, & Adler, 2010; Fredrickson, Tugade, Waugh, & Larkin, 2003). Therefore, depression (prior or concurrent) appears to contribute to the development and maintenance of PTSD.

Of direct relevance to the present thesis is that in both clinical and nonclinical samples, depression appears to be associated with intrusive memories, a hallmark symptom of PTSD (American Psychiatric Association, 2013). Intrusions of traumatic content are common experiences in sufferers of depression. Brewin, Hunter, Carroll, and Tata (1996) interviewed patients with depression about their intrusive memories of past negative life events, and found that 87% of participants reported experiencing one or more intrusive memories during the previous week. In this group, childhood physical or sexual assaults were associated with high levels of intrusions, but not other types of negative life experiences (e.g., illness and death, financial issues, relationship problems), suggesting that intrusions frequently consist of traumatic content in people with depression. Importantly, this study found some preliminary suggestion that among those with intrusive memories of

childhood assault and abuse, severity of depression was correlated with frequency of intrusions. Similar observations have been made in nonclinical research using of a film of analogue traumatic content (i.e., a scene of invasive medical treatment following a motor vehicle accident) whereby participants with higher levels of existing depression showed greater frequency of distressing intrusive memories of the film in the week following the film, $r = .31$ (Laposa & Alden, 2008). In line with this, a meta-analysis of 16 trauma film studies found that lower levels of baseline depressive symptoms predicted an absence of film intrusions with OR = 1.62 (I. A. Clark, Mackay, & Holmes, 2014). Thus, positive associations between depression and trauma intrusions appear to exist.

Research has hinted at the potential causal role that depression may play in promoting intrusive cognition. In Sutherland, Newman, and Rachman (1982), healthy participants whose mood was lowered with a mood induction procedure were found to experience greater difficulty removing distressing intrusive thoughts from their mind (e.g., thoughts about a death of family member) relative to neutral thoughts than those who received an induction of positive mood. Similarly, following a sad mood induction, participants reported more intrusive thoughts about a personal negative experience than those who received a positive mood induction (Reynolds & Salkovskis, 1992; Snyder & White, 1982). The effect of induced low mood has also been found in relation to intrusions of an analogue traumatic memory. Wilksch (2011) had participants watch a fictional film clip depicting scenes of physical and sexual assaults and then randomly allocated them to either sad mood or neutral mood control condition. Following the mood induction procedure, film-related intrusions in the sad mood group were greater than controls immediately after the manipulation (Hedges $g = 0.68$), during the week after the film ($g = 0.48$; albeit a nonsignificant trend, $p = .07$), and at 1-week follow-up ($g = 0.66$), suggesting a possible causal role of short-term sad mood in the maintenance of trauma intrusions. Therefore there

is preliminary evidence that depression/low mood might play a causal role in the development and maintenance of intrusive memories of traumatic or stressful contents. The theorised pathways and possible mechanisms underlying the depressed mood–intrusion relationship are now discussed.

How Might Depression Maintain PTSD?

The most explicit theoretical account for how low or depressed mood facilitates PTSD/trauma intrusions comes from an aspect of Foa's Emotional Processing Theory (EPT; Foa & Kozak, 1986; Rauch & Foa, 2006), and therefore this model is elaborated in this section. Other models of PTSD (and fear) that provide indirect explanations for the role of depression on PTSD/trauma intrusions are also incorporated where appropriate. The central proposition of EPT is that emotionally threatening information is processed in a different manner in anxious individuals compared with their non-anxious counterparts as a result of a pathological fear structure stored in memory (Foa & Kozak, 1986). Foa and colleagues' model was heavily influenced by Lang (1977)'s conceptualisation of fear. According to Lang (1977), fear is represented as a network in memory that includes three types of elements: information about a stimulus that elicits fear (i.e., stimulus element), information about cognitive, behavioural, and physiological responses to the stimulus (i.e., response element), and information that defines the meaning of the stimulus (i.e., meaning element). When something in the environment matches with an element, the element is activated in the mind. The activation is then spread throughout the network, and consequently evokes fear responses.

Elaborating upon Lang (1977)'s notion of fear, Foa and Kozak (1986) propose that the fear network in anxiety disorders is characterised by an excessive response element to cues (e.g., excessive physiological and emotional arousal) and incorrect connections between stimulus elements and meaning elements (i.e., association between harmless stimuli

and the meaning of danger). Moreover, the fear network may cause subsequent maladaptive behaviour such as avoidance and negative cognitions (i.e., response element), resulting in the maintenance of the pathological network. Consequently, new corrective learning is prevented and PTSD is maintained (Foa & Kozak, 1986). As an example, a woman who was assaulted at night in a carpark may experience increased heart beat (response element) whenever she goes to a carpark at night. She would associate carpark at night (stimulus element) with assault and as being dangerous (meaning element), but in reality being at a carpark at night is not necessarily more dangerous than other situations. In addition, the pathological fear network may cause subsequent maladaptive behaviour such as avoiding going out by car at night (response element). Hence, little opportunities for corrective learning are provided, thereby resulting in the maintenance of PTSD.

To achieve good posttrauma adjustment or recovery from PTSD, EPT argues that the alteration of the pathological fear structure is required, and the alteration needs optimal levels of activation of the fear structure (Foa, Huppert, & Cahill, 2006; Foa & Kozak, 1986; Rauch & Foa, 2006). Such activation of fear response occurs when victims of trauma engage with the trauma memory or reminder at an appropriate level of emotional engagement (e.g., actively thinking about the trauma, repeated systematic therapeutic exposure). This level of activation then permits victims to become more aware of the erroneous connection between the stimulus element and meaning element, and to notice that they are able to manage strong affect and that the trauma is no longer an actual danger. This decreases maladaptive coping behaviours, further promoting new corrective learning. Therefore, optimal emotional engagement with trauma-related information is critical for successful posttrauma adjustment or recovery from PTSD.

Depression is one factor proposed to reduce victims' ability for optimal levels of activation of the fear structure due to either too much or too little engagement with trauma-

related stimuli (i.e., *overengagement* or *underengagement*) (Foa & Kozak, 1986), and these pathways are now described. Overengagement may occur in individuals with depression due to increased sensitivity to fear or reduced distress intolerance. Specifically, depression is associated with heightened self-perceptions of ineffectiveness and helplessness and the tendency to attribute failures to personal causes and success to other factors (e.g., Abramson, Seligman, & Teasdale, 1978; Beck, 1967; Foa & Kozak, 1986; Seligman, Abramson, Semmel, & Von Baeyer, 1979), and these depressive beliefs and attributional styles are argued to lead to decreased confidence to cope with fear (Foa & Kozak, 1986). This reduced perceived self-efficacy in coping ability could lead individuals with depression to feel overwhelmed and out of control when faced with reminders of trauma (Foa & Kozak, 1986; Hembree, Marshall, Fitzgibbons, & Foa, 2001), and become very sensitive to perceived threats and reduce their ability to tolerate distress. For example, victims with depression might be more likely to interpret intrusive trauma re-experiences as more negative and catastrophic (e.g., "I cannot handle intrusions because I am a lousy coper", "I have intrusions as something is wrong with me") than those without depression. Such interpretations may lead to excessive reactions (e.g., breathlessness, panic), resulting in over-activation of the fear network. Consistent with this, lower distress tolerance is associated with greater severity of PTSD symptoms (*r*s ranging from -.38 to -.47) including the re-experiencing symptoms (*r*s ranging from -.30 to -.38) among victims of trauma (Kraemer, Luberto, & McLeish, 2013; Marshall‐Berenz, Vujanovic, Bonn‐Miller, Bernstein, & Zvolensky, 2010; Potter, Vujanovic, Marshall-Berenz, Bernstein, & Bonn-Miller, 2011; Vujanovic, Bonn-Miller, Potter, Marshall-Berenz, & Zvolensky, 2011), and deficits in distress tolerance have been shown to be associated with poorer response to treatment in PTSD sufferers (Cloitre & Koenen, 2001). Hence, people with depression may be vulnerable to problematic overengagement with trauma memories and reminders.

However, for some individuals, depression is associated with excessively *diminished* reactivity to fear. The diminished reactivity can block engagement with important aspects of the trauma and associated emotions, leading to under-activation of the fear network (Foa & Kozak, 1986; Hembree et al., 2001; Jaycox & Foa, 1996). The reduced ability to feel emotion associated with trauma has been shown to longitudinally predict later PTSD (Feeny, Zoellner, Fitzgibbons, & Foa, 2000), and the lack of fear expression during exposure treatment for PTSD was associated with attenuated treatment success (Foa, Riggs, Massie, & Yarczower, 1995). The role of diminished emotional reactivity to fear appears well-explained by Craske and colleagues' proposition for a role of emotional variability of fear emotion in corrective learning. They observed in individuals highly fearful of public speaking that those who showed greater variability in their fear levels during exposure (i.e., giving speeches to an experimenter) showed greater reduction in fear at 1-week post-exposure (Culver, Stoyanova, & Craske, 2012). Culver et al. (2012) thus suggested the following. First, the greater emotional variability in the face of fear may reflect fluctuations in individuals' expectancies of the negative event. Thus, the greater fluctuations increase a chance for the expectations of fear to be violated, making disconfirmation of fear-related beliefs (i.e., inhibitory learning) more likely to occur. Second, emotional variability reflects easily retrievable internal cues of fear, and increased retrieval permits a greater variety of internal contexts to become associated with extinction learning. Therefore, in a recent proposition, Craske and colleagues argue that variability, expectancy violation and retrieval cues comprise some of the keys to successful exposure therapy (see Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014, for detailed discussions). As one of the symptoms of depression is emotional numbness or a restricted range of affect (American Psychiatric Association, 2013), depression may decrease appropriate emotional variability and reactivity to fear, resulting in underengagement with trauma-related information.

In a related vein, although not outlined in Foa and colleague's theory, the proposed role of diminished reactivity to fear appears similar to an aspect of the cognitive-motivational model of anxiety (Mogg & Bradley, 1998). Specifically, this model holds that from an evolutionary perspective, anxious individuals are motivated to attend to potential threats to deal with dangers. In contrast, people with depression, a disorder characterized by an amotivational state, need to conserve energy and as a result inhibit their readiness to attend to threats. Therefore, PTSD suffers with depression may not be able to engage in the trauma memories and reminders as actively or adaptively as those without depression, thus exhibiting underengagement.

In summary, research to-date has shown that depression is a risk factor for the persistence of PTSD symptoms, potentially through preventing optimal levels of emotional engagement required for good posttrauma adjustment. Several cognitive and emotional mechanisms have been proposed to underlie how depression leads to over- or underengagement such as negative beliefs and attributional styles, reduced emotional variability and reactivity to fear, and reduced motivation. However, to date underlying cognitive *processes* have not been extensively studied, and rumination seems to be one possible process. The following sections review the possible role of rumination by describing its relationship with depression and then with PTSD.

Depression and Rumination

Rumination in Depression

In general, rumination has been defined as "the act of thinking carefully and for a long period about something" (Cambridge dictionaries online, 2015). In psychology, however, a wide variety of definitions exist depending on the area of psychology (see Nolen-Hoeksema et al., 2008; J. M. Smith & Alloy, 2009; Watkins, 2008, for reviews). In one of the most influential conceptualisations, rumination is classified into two types,

namely, reflective pondering and brooding (Martin & Tesser, 1996; Trapnell & Campbell, 1999). Whereas reflective pondering is relatively adaptive as it is seen as a method likely to lead to finding solutions to a troubling situation (Martin & Tesser, 1996), brooding is considered maladaptive due to a continual focus on negative or emotional aspects of the situation without focusing on features of the situation or behaviours that are amenable to change (Joormann, Dkane, & Gotlib, 2006).

In the field of clinical psychology, the most widely studied conceptualisation of rumination appears the one proposed by the response styles theory of depression (Nolen-Hoeksema, 1991). Specifically, the theory defines rumination as "behaviours and thoughts that passively focus one's attention on one's depressive symptoms and on the implications of these symptoms" (Nolen-Hoeksema, 1998, p. 239). Common themes in cognition in clinical samples were found to involve worthlessness, failure, incompetence and hopelessness (Greenberg & Beck, 1989; Teasdale, 1983), which are known as common thoughts and beliefs in the negative cognitive triad central to depression (Beck, 1967, 1976). Therefore, depression may make people to think about the situation in a negative and emotional manner, and as a result they are unable to reach resolution, thereby repeating negative thoughts. Thus it is not surprising that brooding rumination, rather than reflective pondering, has been found to be a cognitive process particularly closely associated with depression (see Ehring & Watkins, 2008; Nolen-Hoeksema et al., 2008, for reviews).

The main proposition of the response styles theory is that people who engage in ruminative responses to their low mood will maintain that low mood or even deteriorate further, compared to those who distract their thoughts from such mood state (Nolen-Hoeksema, 1991, 1998; Nolen-Hoeksema, Morrow, & Fredrickson, 1993). Empirically, the effect of ruminative style on the development and exacerbation of depressive symptoms has been established by a large number of cross-sectional and longitudinal studies with follow-

up periods ranging from a few days to 1 year (e.g., Nolen-Hoeksema, 2000; Nolen-Hoeksema, Larson, & Grayson, 1999; Segerstrom, Tsao, Alden, & Craske, 2000; Wenzlaff & Luxton, 2003). For example, in a meta-analysis in the area of self-focused attention (Mor & Winquist, 2002), ruminative self-focus was found to be more strongly associated with negative affect including depression than non-ruminative self-focus, and the effect size for ruminative self-focus on negative affect were found to be large in correlational ($n = 8$) and experimental studies ($n = 23$) (ds = 1.08 and 0.76, respectively). Thus, rumination seems to increase depression symptomatology.

Several pathways for how rumination may influence depression have been suggested. First, rumination may sustain one's attention to negative mood (e.g., an individual might ask "why am I feeling down?"), thereby increasing the chance of reaching negative conclusions about the causes and consequences of mood (e.g., that there is something inherently wrong about the person and this means they will never be free of depression), resulting in the deterioration of mood (Nolen-Hoeksema, 1991; Teasdale, 1985). Second, depressogenic attributions are another plausible pathway. Research has shown that people with depression who received a rumination induction were more likely to interpret past events negatively, to have more pessimistic expectations of the future, or have more hopelessness attitudes than those who underwent a distraction induction (Lavender & Watkins, 2004; Lyubomirsky & Nolen-Hoeksema, 1995; Needles & Abramson, 1990; Pyszczynski, Holt, & Greenberg, 1987). Finally, rumination may increase access to negative autobiographical memories. In Lyubomirsky, Caldwell, and Nolen-Hoeksema (1998), induced rumination in individuals with dysphoria was shown to increase the retrieval of negative memories and enhance one's perception of the frequency of negative events in their lives relative to those with dysphoria who underwent a distraction procedure and non-

dysphoric controls. Thus, ruminative thinking may increase depressive symptoms by affecting attention, attributions and memory retrieval.

Effect of Depression on Rumination

However, the relationship between rumination and depression appears to be reciprocal; depression may also increase ruminative thinking for the following three reasons. First, neuropsychologically, individuals with dysphoria have been found to have lower levels of activation in the anterior cingulate cortex, an area that is associated with attentional control (Elliott et al., 1997; George et al., 1997). Consistent with this, individuals with dysphoria show difficulty disengaging their attention from negative stimuli (Joormann & Gotlib, 2007; Koster, De Raedt, Goeleven, Franck, & Crombez, 2005) and difficulty controlling negative thoughts (Hattori & Kawaguchi, 2010; Wenzlaff, Wegner, & Roper, 1988). These neuropsychological deficits and cognitive difficulties associated with depression might create difficulties removing negative thoughts from the mind, and thus lead to increased ruminative thinking.

Second, ruminative thinking may also be triggered by the experience of depressed mood and used as an attempt to suppress intense negative emotion. For example, after patients with depression received a low mood induction, their levels of ruminative thinking were found to be correlated with the use of thought suppression, rs ranging from .33 to .42, indicating that rumination may be a strategy to suppress depressed mood (Liverant, Kamholz, Sloan, & Brown, 2010). The effect of depression on rumination was also implied in a naturalistic study of a nonclinical sample where increases in negative mood over time were accompanied by a similar increase in rumination (Moberly & Watkins, 2008). Further, in a meta-analysis examining the relationship of depression with various types of emotional regulation strategies in both clinical and nonclinical samples, rumination was found to be strongly correlated with levels of depression, $r = .55$, and this correlation was greater than

correlations of depression with other regulation strategies such as avoidance, problem solving, suppression, and reappraisal (Aldao, Nolen-Hoeksema, & Schweizer, 2010). These correlational findings suggest that ruminative thinking may increase in the context of low mood, possibly as an emotional regulation strategy. However, as discussed earlier, ruminative thinking may further facilitate depressed mood, and therefore is not an effective strategy to regulate depression.

Third, people may employ rumination not only to regulate depressed mood but also because they believe it may increase their insight into their problems and be a way to solve them (Lyubomirsky & Nolen-Hoeksema, 1993; Papageorgiou & Wells, 2003). It follows that rumination can persist in the face of unresolved issues, and one cue that can prompt people of the existence of such issues is again depressed mood. According to the mood-as-input model of pathological repetitive thinking (Meeten & Davey, 2011), people are believed to use depressed mood as evidence that the problem has not been solved, and therefore they continue to ruminate in order to reach resolution. Hawksley and Davey (2010) first manipulated mood (negative or positive) and then a "stop rule" (i.e., whether to stop or continue with thinking about past depression) in unselected participants. During a rumination interview, participants were asked to think back to and respond to questions regarding a past depressing experience. At this time those in the "as many as you can" group were instructed to participate in the interview and respond to questions until they had completed exploring their depression, whereas those in the other condition were asked to remain only for so long as they felt like continuing. Persistence at the interview was found to be greatest in the low mood group who adopted an "as many as you can" stop rule, suggesting that induced transient low mood during a ruminative mode of thinking caused the maintenance of rumination about negative experiences.

Furthermore, rumination as a consequence of having depression only leads to another chain of rumination. The reciprocal depression-rumination relationship is theorised in the recent habit-goal model of depressive rumination (see Watkins & Nolen-Hoeksema, 2014, for details), and this is summarised as follows. First, rumination is thought to be triggered by the identification of an unresolved goal as a result of increased priming and accessibility of goal-relevant information. Second, the perseverance in rumination causes low mood and persists in the context of the negative nature of thought contents. Third, low mood functions as an automatic cue for ruminative thinking, and then the tendency for depressive rumination becomes a habit, making it easier to be triggered upon the experience of low mood. Therefore, ruminative tendency maintains and exacerbates depressed mood, which in turn may trigger rumination as an (unsuccessful) attempt to regulate depressed mood. The predictions of this model are gaining empirical support (see Watkins & Nolen-Hoeksema, 2014, for review).

Stress-Reactive Rumination and Depression

As reviewed above, rumination has been researched extensively as a response to depressed mood or as a correlate of depression, and in the context of depression, rumination is referred as depressive rumination. However, rumination can also occur as a response to stressful life events, and this type of rumination has been termed as stress-reactive rumination. An extension of the depressive rumination construct postulated by Nolen-Hoeksema (1991), stress-reactive rumination has been defined as one's tendency to dwell on negative inferences following stressful life events and is believed to have an exacerbating effect on depression (Alloy et al., 2000; Robinson & Alloy, 2003). Consistent with this proposal, cross-sectional and longitudinal studies demonstrate that high levels of rumination following stressful events is associated with increased risk for depressed mood (Michl, McLaughlin, Shepherd, & Nolen-Hoeksema, 2013; Nolen-Hoeksema, Parker, & Larson,

1994). Considering the reciprocal depression-rumination relationship described earlier, depressed mood following rumination about the stressful experience may facilitate further ruminative thinking. Furthermore, in the context of a traumatic event, a significantly stressful experience, rumination may also increase posttraumatic stress symptoms including trauma intrusions. In the next section, following a description of the distinction between rumination and intrusion, the effect of rumination on PTSD/trauma intrusions is discussed.

Effect of Rumination on PTSD/Trauma Intrusions

Distinction between Intrusion and Rumination

At this point it is important to make a distinction between trauma intrusion and trauma-related rumination. Intrusive memories have been defined as involuntary and spontaneous memory recollections relating to events (e.g., trauma) that are typically experienced as visual images, and which are normally brief in duration (e.g., Bourne, Mackay, & Holmes, 2013; Halligan, Clark, & Ehlers, 2002; Holmes & Bourne, 2008; Holmes, Brewin, & Hennessy, 2004; Michael, Ehlers, Halligan, & Clark, 2005). In contrast, rumination is the deliberate and repetitive recollection of an event (e.g., trauma) that takes the form of a long chain of thoughts (Holmes & Bourne, 2008; Michael, Halligan, Clark, & Ehlers, 2007). Nonetheless rumination can become intrusive and unwanted (D. A. Clark & Rhyno, 2005; Michael et al., 2007), and posttrauma rumination is a powerful trigger for intrusions of a trauma scene (Birrer, Michael, & Munsch, 2007). Reciprocally, intrusions can be a catalyst for rumination and unsurprisingly, trauma-related rumination and trauma intrusions correlate with each other (Birrer et al., 2007; Ehring et al., 2011; Michael et al., 2007; Wadsworth et al., 2004). Despite this, clinical studies indicate that they are phenomenologically distinct cognitive processes (Evans, Ehlers, Mezey, & Clark, 2007; Speckens, Ehlers, Hackmann, Ruths, & Clark, 2007), and individuals are able to clearly differentiate between intrusive thoughts and rumination when asked (Birrer et al., 2007).

Consequently researchers in the trauma field have highlighted the importance of considering rumination and intrusions as separate constructs and investigating them accordingly (Ehlers & Clark, 2000; Ehlers & Steil, 1995; Holmes & Bourne, 2008; Joseph, Williams, & Yule, 1997), and the distinction between the two has recently been made clearer in the DSM-5 revision (American Psychiatric Association, 2013; Friedman, Resick, Bryant, & Brewin, 2011).

Effect of Rumination on PTSD

It is thought trauma-related rumination in PTSD sufferers reflects a way of making sense of the causes and consequences of the trauma (Ehlers & Clark, 2000; Ehlers & Steil, 1995; Joseph, Williams, & Yule, 1995; Michael et al., 2007; Watkins, 2009). However, a number of studies have shown that trauma-related rumination is unhelpful. This has been seen cross-sectionally where it is associated with greater PTSD severity (e.g., Clohessy & Ehlers, 1999; Ehlers & Steil, 1995; Evans et al., 2007; Michael et al., 2007; Steil & Ehlers, 2000) and longitudinally rumination has been shown to be a strong predictor of persistent PTSD from 3 months to 3 years posttrauma (e.g., Clohessy & Ehlers, 1999; Ehlers, Mayou, & Bryant, 1998; Ehring, Ehlers, & Glucksman, 2008; Ehring, Frank, & Ehlers, 2008; Kleim, Ehlers, & Glucksman, 2007; Mayou, Bryant, & Ehlers, 2001; Mayou, Ehlers, & Bryant, 2002; Murray, Ehlers, & Mayou, 2002; Steil & Ehlers, 2000). Further, persistent trauma-related rumination appears more prevalent in individuals suffering from PTSD than those exposed to trauma but without the disorder (Ehlers et al., 1998; Michael et al., 2007). Thus, rumination appears to be a maladaptive way of thinking about trauma, contributing to the development and maintenance of PTSD.

Theories have offered reasons for why rumination affects PTSD symptomatology. One relatively straightforward mechanism is that rumination provides internal retrieval cues for memories of a traumatic event, and therefore increases intrusive recall of aspects of the

event (Brewin & Holmes, 2003; Ehlers & Clark, 2000). As reported earlier, there is empirical support for this proposition (Birrer et al., 2007). Other likely mechanisms, namely cognitive avoidance, problematic appraisals, and reduced inhibitory ability are now described.

How Might Rumination Maintain PTSD?

   Cognitive avoidance function. The cognitive model of PTSD (Ehlers & Clark, 2000; Ehlers & Steil, 1995) speculates that rumination functions as cognitive avoidance; that is, rumination involves thinking about issues related to the trauma rather than actively thinking about the traumatic experience as it exactly happened. Cognitive avoidance is a known strategy that allows individuals to suppress fearful mental images and associated unwanted reactions (Borkovec & Lyonfields, 1993). However, in the long run avoidance makes the distressing images more likely to return to the mind (Freeston, Dugas, & Ladouceur, 1996). Cross-sectional correlations between unwanted intrusions and avoidance (cognitive or behavioural) have been found to range from moderate to strong in size (e.g., *r*s ranging between .42 and .72; Creamer, Burgess, & Pattison, 1992; Hodgkinson & Joseph, 1995; Horowitz, Wilner, & Alvarez, 1979). Prospectively, levels of thought suppression/avoidance predict severity of PTSD symptoms or intrusive experiences (Creamer et al., 1992; Davis & Clark, 1998; Nixon, Nehmy, & Seymour, 2007; Perry, Difede, Musngi, Frances, & Jacobsberg, 1992). Hence, if trauma-related rumination does hold an avoidance function, it would lead to increased PTSD symptomatology.

   Indirect evidence for the avoidance function of rumination comes from the established role of *worry* in a long history of anxiety research. Worry is another form of repetitive negative thinking that is thought to play the same function as rumination in psychopathology, with the key difference lying only within its content (i.e., future-oriented

in worry; past-oriented in rumination[1]) (Ehring & Watkins, 2008; J. M. Smith & Alloy, 2009; Watkins, 2008). Specifically, worry is believed to let people inhibit fear provoking imagery by engaging in verbal thought, thereby avoiding emotional distress and somatic arousal (Borkovec & Inz, 1990; Borkovec, Ray, & Stober, 1998). It is thought that the avoidance function of worry contributes to the incomplete emotional processing and maintenance of anxiety symptoms (Borkovec & Inz, 1990). In the context of trauma, avoidance has been found to fully explain the relationship between worry and PTSD symptoms in nonclinical trauma victims (Tull, Hahn, Evans, Salters-Pedneault, & Gratz, 2011). Therefore, worry functions as cognitive avoidance that results in greater PTSD symptom severity.

With regards to rumination, in the depression literature, the close association between rumination and measures of cognitive and behavioural avoidance has been consistently found (Martell, Addis, & Jacobson, 2001; Moulds, Kandris, Starr, & Wong, 2007; Stroebe et al., 2007). The rumination-avoidance association seems also be the case in PTSD. Specifically, ruminative thinking in relation to trauma is argued to be an attempt to avoid the experience of negative emotion following trauma (Ehring & Ehlers, 2014). Hence, typical ruminative thoughts about trauma were found to involve "why" and "what if" type questions, which would represent avoidant thought contents (Ehlers & Clark, 2000). The function of avoidance underlying rumination has been indirectly supported by an eye-tracking study in the context of bereavement where relative to low ruminators, high ruminators showed shorter gaze times for loss-related stimuli (i.e., a picture of the deceased loved one) than neutral or negative stimuli unrelated to the loss, suggesting the relationship between rumination and avoidance (Eisma et al., 2014). Hence, rumination in the context of stressful/traumatic experiences appears to be one form of cognitive avoidance.

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[1] As pointed out by Ehring and Watkins (2008), rumination as defined by Ehlers and Clark (2000) seems to include thoughts about the future as well as the past.

Like worry, the avoidance function of rumination is argued to hinder processing of the underlying emotional content (Ehlers et al., 1998; Ehring, Fuchs, & Klasener, 2009; Michael et al., 2007; Teasdale, 1999). Consistent with this, the occurrence of avoidance type thoughts (e.g., "why" and "what if" type questions) was found to predict PTSD severity in trauma survivors cross-sectionally at an interview conducted at 3 months to 5 years posttrauma and then longitudinally at 6 months after the interview, rs = .54 and .57, respectively (Michael et al., 2007). Therefore there is preliminary evidence that trauma-related rumination may act as a form of cognitive avoidance, resulting in the symptom maintenance in PTSD.

Maintenance of problematic appraisals. Another pathway from rumination to PTSD is through problematic appraisals of the trauma and its meaning. It is established in the depression literature that rumination maintains and strengthens negative appraisals and pessimistic thoughts (see Nolen-Hoeksema et al., 2008, for review). Similarly, in the context of trauma, rumination is argued to strengthen problematic appraisals of trauma and its meaning through repeated exposure to negative thoughts (Ehlers & Clark, 2000). These problematic appraisals reduce opportunities for corrective learning about the fact that threat no longer exists (Dunmore, Clark, & Ehlers, 1999; Ehlers & Clark, 2000; Resick & Schnicke, 1992), thus prolonging a sense of current threat and subsequently PTSD symptoms (Ehlers & Clark, 2000). This cognitive model of PTSD provides examples of the types of problematic appraisals seen in sufferers including overgeneralisation, exaggeration of probability, unrealistic beliefs and biased interpretations of symptoms, as well as misinterpretations of other people's reactions to them following the trauma (Ehlers & Clark, 2000). The effects of trauma-related problematic appraisals on PTSD development, maintenance, or symptom exacerbation have been well documented (e.g., Dunmore, Clark, & Ehlers, 2001; Ehlers et al., 1998; Engelhard, van den Hout, & Arntz, 2001; Mikulincer &

Solomon, 1988; Moser, Hajcak, Simons, & Foa, 2007; Nixon & Bryant, 2003; Warda & Bryant, 1998). Not surprisingly, *decreases* in negative appraisals (e.g., self-blame, guilt) have been found to be associated with or as a mechanism for PTSD symptom reduction following successful trauma-focused CBT treatment (Kleim et al., 2013; Resick, Nishith, Weaver, Astin, & Feuer, 2002). Hence, if rumination does maintain negative appraisals, it would then explain why it leads to increased PTSD symptomatology.

Preliminary evidence for the mechanism of rumination in facilitating problematic appraisals and influencing on PTSD comes from a recent large-scale longitudinal study (Spinhoven, Penninx, Krempeniou, van Hemert, & Elzinga, 2015). Over two thousand people in a community with or without depression and/or anxiety disorder completed baseline questionnaires including general ruminative tendency, and then at 4-year follow-up they were assessed for any traumatic experiences, PTSD diagnostic status, as well as current appraisals of the trauma event. It was found that in individuals who reported trauma exposure ($n = 359$ out of $N = 2,402$ who completed follow-up), those who had developed PTSD ($n = 52$) had higher levels of baseline trait rumination than those without PTSD. Importantly, the relationship between trait rumination and PTSD was found to be mediated by problematic appraisals of the trauma experience. Although levels of *trauma-related* rumination were not assessed, given that ruminative tendency is a relatively stable characteristic (Nolen-Hoeksema et al., 1993), this finding provides indirect evidence that problematic appraisals concerning trauma may be a pathway from trauma-related rumination to PTSD.

Reduced inhibitory control. Finally, although not explicitly illustrated in models of PTSD, reduced inhibitory control capacity appears to be another pathway from rumination to PTSD. Inhibitory control, defined as an ability to actively inhibit unwanted information (e.g., distressing trauma memories), represents a component of executive function, and

executive function plays a role in regulating our behaviours in order to attain desirable outcomes (Banich, 2009; McCabe, Roediger, McDaniel, Balota, & Hambrick, 2010). In the context of traumatic stress, minimising the experience of intrusive memories would be desirable for victims, and components of executive functioning may determine the degree of success in inhibiting intrusive memories. Deficits in executive capacity has been reported to be associated with PTSD symptoms, with a large meta-analysis demonstrating that individuals with PTSD have impaired executive functioning relative to trauma-exposed non-PTSD individuals, with the standardised mean difference ranging between 0.50 and 0.75 (Polak, Witteveen, Reitsma, & Olff, 2012).

Although the study of the various subcomponents of executive functioning that might relate to trauma intrusions is limited to date, inhibitory control has emerged as one likely candidate. For example Catarino, Kupper, Werner-Seidler, Dalgleish, and Anderson (2015) had trauma-exposed individuals with or without PTSD complete a think or no-think task involving aversive pictures, and measured their ability to suppress retrieval of the picture images upon reminder presentations. It was found that those with PTSD showed poorer suppression ability than those without PTSD, and that greater symptom severity was associated with lower suppression ability. These findings suggest a relationship between reduced inhibitory control and PTSD. Similarly, pre-trauma impairments in attention regulation are known as a risk factor for the development of PTSD and are correlated with symptom severity, and some evidence exists for a relationship between PTSD and dysfunction within the dorsal prefrontal networks, an area responsible for attentional regulation (see Aupperle, Melrose, Stein, & Paulus, 2012, for review). In a related vein, greater attentional control was found to predict greater improvement in mood during trauma recall (Bardeen & Read, 2010). The role of inhibitory control is further supported by the fact that an attentional modification program has been found beneficial in treating PTSD

(Kuckertz et al., 2014). Therefore, PTSD symptoms in general and more specifically trauma intrusions seem to be associated with difficulties inhibiting unwanted memories of trauma.

Rumination itself, on the other hand, also reflects underlying reduced inhibitory control. Neuropsychological and neuroanatomical evidence supports this proposition. Rumination has been found to be associated with brain regions (prefrontal areas and cingulate cortex) responsible for the process of inhibiting unwanted thoughts (Belzung, Willner, & Philippot, 2015). Consistent with this, rumination has been observed to be maintained by difficulties disengaging attention (Joormann & D'Avanzato, 2010; Joormann & Siemer, 2011), particularly from negative self-referent information (Koster, De Lissnyder, Derakshan, & De Raedt, 2011). Importantly, ruminative process seems to impair inhibitory control, probably because rumination depletes cognitive resources (Watkins & Brown, 2002). Interestingly, it seems that rumination needs to be paired with depression to have the effect on inhibitory control. For example, induced rumination was found to lead to poorer performance on an attentional switching task relative to induced distraction in people with depression but not in non-depressed counterparts (Watkins & Brown, 2002) and in people with dysphoric mood but not in those without dysphoric mood (Philippot & Brutoux, 2008). It might be that because depression and rumination have been found to be associated with different components of inhibition capacity - depression with reduced interference control, and rumination with difficulty removing no longer relevant negative materials from working memory (Zetsche, D'Avanzato, & Joormann, 2012) - deficits in both of these domains might be needed for it to result in inhibitory control impairment. Relevant to the current thesis, when trauma victims with depression start to ruminate, their inhibitory control ability may be compromised. Consequently, they might experience difficulties inhibiting unwanted trauma memories, thereby resulting in increased intrusive symptoms. Thus, the reduced

inhibitory control appears to a pathway from trauma-related rumination to PTSD/trauma intrusions in victims with depression.

As reviewed in the current section, a large body of literature provides evidence for the contribution of rumination to PTSD. Plausible pathways from rumination to PTSD that were detailed included: increased access to trauma memory, cognitive avoidance, problematic trauma-related appraisals, and reduced inhibitory control ability. The role of rumination has also been investigated experimentally using an analogue trauma, and this is now reviewed.

Analogue Trauma Research on Intrusion and Rumination

Analogue Trauma Research as a Means to Investigate PTSD Processes

Analogue experimental trauma research offers an ethical way of investigating mechanisms underlying PTSD symptom development and maintenance while enabling a degree of methodological rigour. Experimental research typically uses distressing graphical images or film clips and manipulates variables that potentially influence posttraumatic stress reactions (Holmes & Bourne, 2008). The variables that have been investigated using an experimental method include, for example, thought suppression (e.g., Nixon, Cain, Nehmy, & Seymour, 2009), cognitive load (e.g., Nixon et al., 2007), a visuospatial task (e.g., Holmes, James, Coode-Bate, & Deeprose, 2009), coping strategies (e.g., Laposa & Alden, 2006), worry (e.g., Wells & Papageorgiou, 1995), rumination (e.g., Ehring, Szeimies, & Schaffrick, 2009) and low mood (e.g., Wilksch, 2011). The film clips used range from graphic scenes of fictional sexual and physical assaults (e.g., Nixon et al., 2009; Wilksch & Nixon, 2010), road traffic accidents and their aftermath (e.g., Brewin & Saunders, 2001; Stuart, Holmes, & Brewin, 2006), people dying in an office fire (Davies & Clark, 1998) to patients dying in a hospital emergency department (e.g., Laposa & Alden, 2006; Regambal & Alden, 2009). In these studies, intrusive memories from the films are often assessed as the main outcome

variable. Analogue trauma research is considered a useful method because not only does it allow an investigation of causal effects of contributing factors on PTSD through experimental manipulation, it overcomes the issue of unreliable memory recall that may occur in clinical PTSD research due to the retrospective nature of data collection in some studies (Holmes & Bourne, 2008).

Intrusion and Rumination Findings from Analogue Trauma Research

In terms of findings for the effect of rumination on intrusions from analogue trauma film research, levels of film-related rumination (Regambal & Alden, 2009) and ruminative responses to intrusions (Laposa & Rector, 2012) have been found to be concurrently correlated with the number of intrusive memories of a trauma film in the week post-film, rs ranging from .31 to .33. Similar findings have been observed in research that investigated the effects of worry on the intrusion development after viewing a distressing film (Butler, Wells, & Dewick, 1995; Wells & Papageorgiou, 1995). For example, Wells and Papageorgiou (1995) found that worrying about a film and its implications (that was experimentally induced) for a period of 4 minutes after film exposure led to more intrusions of film scenes in the next 3 days than a settle-down control, $d = 1.85$. Results from these studies provide indirect evidence for a likely effect of trauma-related rumination on intrusive memories of trauma.

However, results from studies that employed a direct manipulation of rumination following a trauma film are somewhat mixed. To date, only four studies have specifically investigated the effect of experimentally induced rumination on intrusions related to a trauma film. Zetsche, Ehring, and Ehlers (2009) randomly allocated university student participants to a rumination, memory integration, or distraction condition after they had watched graphic scenes of road traffic accidents and their aftermath. The respective tasks in each group involved (a) thinking about the film by a guided thinking task using rumination

sentences that were self-selected to increase personal relevance (the rumination condition), (b) thinking about the likely order of events shown in the film and distinguishing the scenes from their own experience (the integration condition), or (c) completing a verbal distraction task to control for concentration and verbal activity (the distraction control condition). It was found that participants in the rumination group did not experience greater numbers of intrusions than those in either of the other two conditions immediately after manipulation, nor at a post-reminder presentation or in a 7-day daily diary (all η^2s < .03). However, the degree of naturally occurring state/film-related rumination across all conditions was positively associated with the number of intrusive memories following the experimental manipulation (rs = .41 and .25 immediately after manipulation and at post-reminder, respectively). Although the findings lent some support for the predictive ability of trauma-related rumination to account for later intrusions, any causal relationship was not established.

Ehring, Szeimies, et al. (2009) also had university students watch a film depicting situations in the aftermath of road traffic accidents, and then randomly assigned them to either an abstract thinking condition (i.e., rumination), a concrete thinking condition (e.g., "what are different reasons for accidents?"), or a distraction control condition. The number of intrusive memories of the film was measured post-manipulation, after presentation of trauma reminders, and also on the 3rd day after the film. Again null findings were observed with the number of intrusions in the rumination group not differing from either of the other groups at any time point (all ds < 0.27 based on the descriptives reported). Interestingly, however, those in the distraction condition showed *more* frequent intrusions than those in the concrete thinking condition at the post-reminder assessment period, with the authors suggesting that distraction possibly inhibited further post-event processing.

To overcome a possible limitation of the previous research in relation to the effect of induced rumination, two studies have extended the duration of manipulation beyond the

experimental session. In an unpublished doctoral thesis (Warnock, 2012), following

watching a film depicting a real life footage of road traffic accidents, participants in the

experimental condition were instructed to complete a 10-minute thinking exercise within the

session as well as daily over 6 days following the initial session. During each manipulation

period, participants listened to pre-audio recorded rumination sentences and were required to

dwell on each sentence and its implications. Control participants underwent a distraction

procedure whereby they engaged in a word game. Again, the study had largely null findings,

with little difference in the number of intrusive memories of the film as measured within the

initial session or over the 1-week manipulation period. Similar to past studies that found

correlations between state rumination and analogue trauma film intrusions (Laposa & Rector,

2012; Regambal & Alden, 2009; Zetsche et al., 2009), levels of trait ruminative tendency

were found to predict the number of intrusions across the entire sample over 1 week (η^2

$= .07$), but not within the initial session ($r = .04$), with the author suggesting a possible

immediate effect of the experimental manipulation in the session.

In contrast, the effect of induced rumination on trauma intrusions following a trauma

film was found in the case of trait ruminators. In Ball and Brewin (2012), healthy but

habitual ruminators who were selected based on their scores on a rumination questionnaire

watched a film that contained real-life footage of road traffic accidents, and then were

randomly assigned to film-related or non-film-related rumination or no-task control group.

In the rumination conditions, participants were presented with prompt questions that were

either related to the film (e.g., "why are there so many reckless and careless drivers causing

accidents like that?") or non-related questions (i.e., questions about the UK financial crisis

occurring at the time of experiment). They also completed a 5-minute daily rumination task

over the following week. The study found that the rumination conditions combined resulted

in more intrusive memories of the film recorded in a daily intrusion diary than the control

group ($d = 0.59$), but interestingly the two rumination conditions had a comparable effect to each other. Further, no evidence was found for a group difference in distress associated with intrusions, with the authors speculating that determinants of intrusion frequency and associated distress might be different. The combination of findings from the above analogue research suggests that it may be that a rumination induction has an impact only in those with existing trait ruminative tendency, although in the case of Ball and Brewin (2012), trauma/film-specific rumination did not increase intrusions more than general rumination instructions. The level of film-related rumination engaged by the general rumination group was unreported.

Despite these largely null findings in trauma film studies, a study utilising a real-life negative experience as an index event showed the predicted effect of rumination in unselected samples. In Santa Maria, Reichert, Hummel, and Ehring (2012), participants who reported having experienced a negative life event (e.g., death of a loved one, relationship breakup, traffic accident) that resulted in moderate levels of distress underwent a symptom provocation task whereby they wrote about the event followed by induced abstract thinking (i.e., rumination) or concrete thinking. The number of intrusions of the event was assessed within the initial session (at pre-manipulation, post-manipulation, and end of the session) and also 36 hours after the session (at 12 hours and 36 hours post-provocation task). It was found that those in the abstract (rumination) condition reported less reduction of intrusive memories of the index experience within the experimental session and also after the session relative to their concrete counterpart, η_p^2s = .11 and .09, respectively. A similar finding was observed by Ehring, Fuchs, et al. (2009) in that participants who reported their own experiences of a distressing life event (e.g., relationship breakup, death of a loved one, serious family problems) experienced more intrusive memories of the event after the rumination manipulation than those who completed general quiz questions (i.e., distraction),

$\eta_p^2 = .21$, and a similar trend was found after a symptom provocation script imagery task, $\eta_p^2 = .06$ (although differences between conditions were not observed for *distress* associated with intrusions). Therefore, it may be that rumination has an impact on later intrusions only in relation to personal real-life experiences rather than analogue experiences (i.e., viewing a trauma film), but this is yet to be conclusively established due to the limited number of studies of experimental rumination induction conducted to date. Nevertheless negative life experiences are not necessarily "traumatic" (Ehring, Fuchs, et al., 2009; Santa Maria et al., 2012), and thus more direct examination on the effect of rumination in relation to traumatic experiences would require the use of the trauma film paradigm.

In summary, a large number of correlational studies with clinical and nonclinical samples have consistently found that trauma-related rumination is related to PTSD symptoms including trauma intrusions, but evidence for the causal role of trauma-related rumination is limited. If trauma-related rumination does cause (and maintains) PTSD/trauma intrusions, trauma-related rumination may emerge as an important target for intervention in PTSD suffers. Although speculative at this stage, one likely useful intervention (among others) might be a mindfulness-based one. The next section first reviews relevant literature on why mindfulness may reduce trauma-related rumination, followed by the effect of mindfulness on treating PTSD, and then the role of trauma-related rumination in the mindfulness-PTSD relationship.

<div align="center">**Effect of Mindfulness on Rumination and PTSD**</div>

Why Rumination May be Reduced by Mindfulness

Whereas varying definitions for mindfulness exist in the psychology literature, one of the most widely adopted conceptualisation is "paying attention in a particular way: on purpose, in the present moment, and *nonjudgmentally*" (Kabat-Zinn, 1994, p. 4). More recently, mindfulness was argued to consist of two components; self-regulation of attention

on one's present experiences and an acceptance-based attitude toward the experience (Bishop et al., 2004). These properties of mindfulness appear opposite to those of trauma-related rumination, in which a focus is on the *past* trauma and reflects struggles to engage with trauma memories in an accepting manner[2]. Thus, it is not surprising that trait mindfulness and rumination have been found to be inversely correlated (*r*s ranging from -.42 to -.47; Keune, Bostanov, Kotchoubey, & Hautzinger, 2012). Hence increased mindfulness may result in a corresponding reduction of rumination, and thus mindfulness-based interventions seem potentially useful in reducing trauma-related rumination. This is expanded upon next.

Conceptually, mindfulness should be useful in reducing trauma-related rumination by addressing avoidance and problems with inhibitory control (and possibly through other mechanisms). In relation to avoidance, the practice of mindfulness highlights the importance of nonjudgmentally accepting thoughts and feelings, which should lead to greater tolerance of distressing memories and associated emotions. As a result, trauma-related rumination should decrease, as too the need to avoid trauma memories. Consistent with this, albeit correlational, levels of mindfulness were negatively associated with PTSD avoidance symptoms in university students who reported an experience of Criterion A trauma (Thompson & Waltz, 2010). In addition, in an unselected nonclinical sample, a 15-minute focused breathing induction (the first step of mindfulness meditation) was found to increase willingness to view additional aversive picture images relative to uncontrolled attention and worry controls (Arch & Craske, 2006), implying that mindfulness decreases avoidance of feared stimuli. These findings would imply that increased mindfulness capacity may be

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[2] Acceptance in the context of mindfulness has been defined as "seeing things as they actually are in the present" (Kabat-Zinn, 2005, p. 38). Hence, it does not mean that injustice e.g., in the context of a traumatic event, should be tolerated or that an individuals' principles or values should be abandoned. Instead, it means a willingness to see things as they are (Kabat-Zinn, 2005).

associated with less avoidance of trauma-related information and associated distress, and this may result in decreased need to ruminate about trauma and its meaning.

In terms of inhibitory control, the mindfulness attitude of paying attention to the present moment is proposed to increase the skill of attentional control and is thought to facilitate disengagement of attention from unwanted memories (Teasdale, Segal, & Williams, 1995). In this sense, mindfulness should counter difficulty in inhibitory control seen in PTSD sufferers with depression. Consistent with this proposal, levels of acting with awareness were found to be positively correlated with inhibitory control in a university student sample assessed using a computerised task of active inhibition (Lee & Chao, 2012). Similarly, higher trait attention awareness (a component of mindfulness) was found to predict better inhibitory control indexed by greater accuracy on a computerised executive control task in adolescents (Oberle, Schonert-Reichl, Lawlor, & Thomson, 2011). The causal effect of mindfulness on improving attentional control has been implied in a study where a nonclinical community sample that completed a 10-day intensive workshop of mindfulness meditation showed an improvement on a task of attention switching (i.e., the ability to intentionally switch one's attentional focus between stimuli) at post-workshop, compared with a waitlist control group (Chambers, Lo, & Allen, 2008). Although not conducted with traumatic stimuli, these findings support the possibility that an increased mindfulness attitude may lead to improved ability to inhibit unwanted trauma memories and associated emotion, and therefore reduced trauma-related rumination.

Whereas direct examinations on whether a mindfulness-based intervention does reduce trauma-related rumination is lacking, some evidence exists for the effect of mindfulness on alleviating depressive or non-trauma specific rumination and worry. In an unselected sample, university students were asked to observe their breath (i.e., mindful breathing exercise, which is a component of mindfulness-based programs) for 18 minutes,

and also report when prompted whether they lost contact with their breath, as well as indicate their levels of rumination during the exercise. The results found negative correlations between mindfulness and rumination, $r = -.30$ (Burg & Michalak, 2010), suggesting that increased mindfulness is paired with decreases in rumination. Similarly, women who had completed treatment for cancer were randomly allocated to a Mindfulness-Based Stress Reduction (MBSR) program decreased rumination relative to waitlisted participants, and changes in rumination following the intervention were negatively correlated with mindful attention changes, $r = -.34$ (Campbell, Labelle, Bacon, Faris, & Carlson, 2012). In another study, a sample of older adults with mild cognitive impairments who had clinical levels of worry, participation in a MBSR program was found to decrease the severity of worry at post program, $d = 0.86$. Improvement was maintained at 3-month follow-up although not completely maintained at 6 months (Lenze et al., 2014). Again, although not tested for trauma-related rumination, the above findings suggest that increased mindfulness through intervention has promise for reducing trauma-related ruminative thinking.

In summary, theories and past research hint that mindfulness-based interventions might be useful in reducing trauma-related rumination. If trauma-related rumination does maintain PTSD/trauma intrusions as discussed earlier, mindfulness would reduce PTSD symptoms/trauma intrusions through lessening trauma-related rumination. The next section reviews the current literature on the relationship between mindfulness and PTSD, and then proposes that the reduction of trauma-related rumination could be an important mediating process through which mindfulness-based interventions may work on treating PTSD symptoms.

Effect of Mindfulness on Treating PTSD

Mindfulness-based interventions are considered useful in treating a variety of psychopathologies as an increased mindful attitude can offer opportunities for corrective learning through exposure, which then promotes cognitive changes and the use of adaptive coping strategies (Baer, 2003). Accumulating research has demonstrated the efficacy of mindfulness-type interventions on psychopathology using, for example, Acceptance and Commitment Therapy (ACT), Dialectical Behaviour Therapy (DBT), Mindfulness-Based Stress Reduction (MBSR), and Mindfulness-Based Cognitive Therapy (MBCT) (see Hofmann, Sawyer, Witt, & Oh, 2010; Keng, Smoski, & Robins, 2011; Vøllestad, Nielsen, & Nielsen, 2012, for reviews). However, relative to anxiety and depression, the utility of mindfulness-based therapies for PTSD is understudied and there is not yet particularly rigorous empirical support (e.g., coming from randomised controlled trials) for its use with PTSD. Nonetheless relevant preliminary cross-sectional findings and some intervention studies (mainly uncontrolled) are reported below.

Cross-sectionally, one's degree of mindfulness has been found to be negatively associated with the severity of PTSD symptoms including intrusive re-experiencing. For example, higher levels of mindfulness were related to fewer PTSD symptoms in a high-stress occupation (firefighters), $r = -.40$ (B. W. Smith et al., 2011). Several studies found negative associations of aspects of mindfulness with PTSD symptoms. In a sample of trauma survivors, levels of acceptance of negative emotions and levels of experiential avoidance were correlated with symptom severity, rs = -.48 and .49, respectively (Ehring & Quack, 2010). Similarly, in individuals who were exposed to broadly defined trauma, non-judgmental acceptance was negatively correlated with overall posttraumatic stress symptoms as well as with each symptom cluster, all standardised betas > -.16, and acting with awareness was negatively associated with re-experiencing symptoms, standardised beta = -.14 (Vujanovic, Youngwirth, Johnson, & Zvolensky, 2009). Comparable findings have been

reported in similar samples of mixed trauma victims whereby levels of mindful attention and awareness were negatively correlated with the severity of posttraumatic stress symptoms, $r = -.47$ (Bernstein, Tanay, & Vujanovic, 2011). Further, victims with a diagnosis of PTSD were found to have lower levels of mindfulness than those without PTSD (Basharpoor, Shafiei, & Daneshvar, 2015). Thus, mindfulness and PTSD symptoms/trauma intrusions seem to be inversely related with each other, but whether a causal relationship exists is unknown from these studies.

Only a limited number of mindfulness-based intervention studies have been conducted in the context of posttraumatic stress (see Banks, Newman, & Saleem, 2015, for recent review). For example, in an uncontrolled pilot study, victims of a hurricane disaster who took part in a half-day workshop followed by 8 weeks of meditation homework reported a reduction of PTSD symptoms at posttreatment with an effect size of $d = 0.38$ (Waelde et al., 2008). In another uncontrolled study of MBSR, victims of childhood sexual abuse reported reduced severity of PTSD symptoms immediately after the 8-week course ($d = 1.2$) and at 24-week follow-up ($d = 0.8$) (Kimbrough, Magyari, Langenberg, Chesney, & Berman, 2010). However, the findings from these studies are compromised due to the lack of a control group. In a nonrandomised pilot study of an 8-week MBCT group program that involved comparison groups (i.e., psychoeducation, imagery rehearsal therapy), veterans with PTSD in the MBCT group showed greater decreases in symptoms and related unhelpful cognitions at posttreatment than those in the control groups (A. P. King et al., 2013). Interestingly, the MBCT was found to mainly reduce the avoidance cluster of symptoms. In contrast, in a randomised pilot trial, veterans with PTSD who completed a MBSR program in addition to usual treatment (e.g., medication, CBT, supportive therapy) did not show greater symptom reduction at posttreatment or at 4-month follow-up relative to treatment-as-usual controls, although more participants in the MBSR group achieved clinically

meaningful change at 4-month follow-up than controls when *both* PTSD symptoms and health-related quality of life were indexed together (27.3% vs. 0%), although this was not observed at posttreatment nor for when PTSD symptoms alone were examined (Kearney, McDermott, Malte, Martinez, & Simpson, 2013). Overall, due to the lack of methodological rigor in the limited number of past studies and possible publication bias in this field (Banks et al., 2015), clear evidence for whether mindfulness-based interventions directly reduce PTSD symptoms is lacking.

The effect of mindfulness training has also been found in relation to *distress* associated with intrusions. Conceptually, acceptance, a main aspect of mindfulness, has been argued to protect individuals from experiencing emotional distress including intrusion-associated distress as mindfulness decreases avoidance and maladaptive coping of negative thoughts and emotions (Shipherd & Salters-Pedneault, 2008). Consistent with this, in a nonclinical experimental setting, participants who were given a 5-minute acceptance metaphor were found to reduce their levels of distress from intrusive thoughts of a past upsetting experience at post manipulation, whereas no such reduction was observed in free-thinking controls and an increase was found in the thought suppression condition (Marcks & Woods, 2005). A similar finding was observed for another component of mindfulness, namely acting with awareness, whereby a greater ability to act with awareness predicted persistence on a task that required distress tolerance, $r = .23$, although this was not the case for other mindfulness facets of nonjudgment or nonreactivity (Feldman, Dunn, Stemke, Bell, & Greeson, 2014). These effects of key facets of mindfulness reducing intrusion-related distress and increased distress tolerance are important because, as discussed earlier, distress associated with intrusive experiences is reflective of more severe PTSD (Steil & Ehlers, 2000) and distress tolerance is negatively related to overall PTSD symptoms (e.g., Kraemer et al., 2013; Marshall‑Berenz et al., 2010).

In summary, although direct evidence has not been found to date from randomised clinical trial designs, several studies have shown preliminary evidence that mindfulness-type interventions or brief training of mindfulness may be able to decrease PTSD symptomatology including distressing intrusive re-experiencing. However, despite the conceptual rationale, empirical evidence for the process of change following mindfulness interventions has not been demonstrated, and this is also the case for trauma-related rumination. Relevant literature that suggests a possible mediating role of trauma-related rumination in the mindfulness-PTSD relationship is reviewed next.

Rumination as a Possible Mediator

Theoretically, the potential utility of mindfulness-based interventions in treating PTSD is based on its likely effect on reducing rumination and worry as well as other forms of experiential avoidance (i.e., attempts to avoid internal experiences such as memories, thoughts and emotions). This effect is thought to occur through increasing present-moment awareness and a sense of connection with own current thinking and feeling (Walser & Westrup, 2007). Although these proposed processes of mindfulness have not been explicitly studied to date, the mediating process of decreased trauma-related rumination has been implied from several studies that examined the mindfulness-rumination-psychopathology relationship with both healthy participants and clinical samples (other than PTSD) (see Wolkin, 2015, for review). These studies comprise (1) correlational studies of the relationship of trait mindfulness and rumination with psychopathology, (2) intervention (controlled or uncontrolled) trials of mindfulness on concurrent rumination and psychopathology, and (3) studies (controlled trials or correlational) that explicitly examined rumination as a mediator. These studies are reported below.

Correlational findings imply that mindfulness has the opposite relationship with psychopathology to rumination. In a cross-sectional correlational study with nonclinical

adolescents, levels of dispositional mindfulness were found to be associated with reduced effects of typical daily hassles to this age group (e.g., issues with friends, low academic results) on symptoms of depression, anxiety and stress (Marks, Sobanski, & Hine, 2010). In this study, higher trait rumination was found to magnify the effects of hassles on the symptoms, demonstrating an opposite effect that mindfulness has on the development of psychopathology. In another study with nonclinical adolescents, after participants completed a baseline measure of dispositional mindfulness, levels of rumination, low mood and stress were recorded daily for 1 week. The results found that the effect of stress increasing low mood was greater for individuals with low baseline mindfulness than those with high mindfulness (Ciesla, Reilly, Dickson, Emanuel, & Updegraff, 2012). Importantly, this study also found a mediated moderation whereby the effect of the baseline mindfulness $\times$ stress interaction on sad mood was mediated by daily state rumination. Interestingly, these effects of mindfulness were only found for nonjudgment and nonreactivity facets of mindfulness, but not for acting with awareness. Overall, higher mindfulness capacity might protect individuals from developing psychopathology following stress, and points to the positive consequences of reducing levels of rumination about stressful events.

Intervention studies have examined concurrent changes in rumination and psychopathology. For example, in a self-selected community sample, completion of an 8-week MBSR program was successful in reducing rumination and depressive symptoms, although this finding is limited due to a lack of a control group (Deyo, Wilson, Ong, & Koopman, 2009). In another study of the MBSR program involving a waitlist control group (following a quasi-experimental allocation), veterans and nonveterans with a lifetime mood disorder (and other diagnosis in some cases, primarily anxiety disorder) reduced rumination following the completion of the program relative to controls (an effect size of $d = 1.47$), and the reduction in rumination accounted for reductions in depressive and anxious symptoms

(Ramel, Goldin, Carmona, & McQuaid, 2004). Further, higher levels of rumination at the end of a MBCT program for individuals with previous depression were found to predict depression relapse at 12 months after treatment (Michalak, Holz, & Teismann, 2011), implying that a reduction of rumination might be an important mechanism through which mindfulness maintains remission from depression. These findings suggest that mindfulness-based interventions can increase mindfulness and this is associated with a reduction in rumination and psychopathology.

Several studies have explicitly examined decreases in rumination as a mediator for how mindfulness-based interventions reduce psychopathology. In a study of a university student sample, participants who were randomly allocated to a shortened (1-month) MBSR program as well as those allocated to a physical relaxation training achieved comparably large effect-size reduction on a measure of general psychological distress (the Brief Symptom Inventory) with effect sizes of ds = 1.36 and 0.91 for the MBSR group and relaxation group, respectively. However, it was only the change in the MBSR group that was (partially) mediated by reduced rumination, suggesting that the process of reduced rumination was specific to the mindfulness intervention (Jain et al., 2007). Again in a community sample, reductions in anxiety, depression and stress following a MBCT program have been found to be (partially) mediated by reduced rumination (Heeren & Philippot, 2011). However, as in these two studies rumination and symptoms were measured at the same time point, whether reduction of rumination preceded reduction of symptoms is unknown. Only one study appears to have tested a proposed sequential order of the mindfulness-rumination-psychopathology relationship. This study comprised a sample of remitted outpatients with previous depression and found that the degree of rumination at the end of an 8-week mindfulness-based treatment (MBSR or MBCT) mediated the effect of that frequency of engaging in formal mindfulness practice (e.g., body scan, sitting

meditation) during this period had on reducing depressive symptoms at 2 weeks posttreatment (Hawley et al., 2014). It however should be noted that this finding was correlational and not based on a randomised trial. These results imply that reduction of rumination is likely to be one of the processes of change in mindfulness-type interventions responsible for improvements in psychopathology.

Despite the strong theoretical rationale for the potential beneficial effects of mindfulness in treating PTSD and accumulating evidence for its effectiveness in the areas of anxiety, depression and other types of psychopathology, to date this research remains in its infancy. Whereas the exact mechanisms underlying the possible benefit of mindfulness on reducing posttraumatic stress symptoms have not been examined extensively, reduction in trauma-related rumination appears one likely mechanism. However there have been a limited number of empirical studies that have examined whether mindfulness-based approaches decrease rumination and consequent symptoms of psychopathology. In addition, no study has explicitly investigated the possible mediating effects of rumination in the context of traumatic stress.

Summary

In conclusion, depression is thought to contribute to the maintenance of PTSD through preventing optimal engagement with trauma memories, and the effect of existing depression on PTSD has been established in clinical correlational research. However, experimental evidence for the causal effect of depression on PTSD is relatively scarce. Furthermore, the exact nature and relationship of the cognitive processes underlying the depression-PTSD association remains relatively unknown. Based on aspects of Emotional Processing Theory (EPT; Foa & Kozak, 1986), response styles theory of depression (Nolen-Hoeksema, 1991) and the cognitive model of PTSD (Ehlers & Clark, 2000), I propose that one likely pathway lies through trauma-related rumination. Trauma-related rumination has

been speculated as a maladaptive coping strategy that might function as cognitive avoidance, serve to maintain problematic appraisals of trauma and its meaning, decrease inhibitory control ability, and increase access to trauma memories. Again, relative to the large number of clinical studies that have been mainly correlational in design, the causal role of trauma-related rumination on PTSD has not been conclusively demonstrated in controlled experiments. If trauma-related rumination does affect PTSD, interventions that decrease rumination may emerge as potentially useful methods for treating PTSD. Mindfulness techniques represent one such method, but the research evidence to its efficacy is lacking.

In the following chapters, a series of analogue trauma film studies aim to address the gaps in our understanding that have been identified throughout this chapter. First, little evidence exists for a causal role of depression on PTSD symptoms. In addition, research has focussed broadly on rumination as it relates to overall PTSD symptoms, not intrusive symptoms specifically, despite intrusions being a hallmark feature of PTSD (and particularly distressing to sufferers). Second, trauma-related rumination has not been explicitly examined as a mediator for the effects of depression on PTSD/trauma intrusions. Third, the causal effect of trauma-related rumination on PTSD/trauma intrusions has not been established due to mixed research findings in prior studies. The contribution of *trait* rumination to these inconsistent results has been speculated, but has not been directly tested. Fourth, whether mindfulness-based interventions would reduce trauma-related rumination and consequently PTSD symptoms has not been established, and an analogue trauma study will be presented that provides the first step to examining this question. The next chapter presents Study 1 that examined the causal role of depression on trauma intrusions and the mediating role of trauma-related rumination.

CHAPTER 3 – STUDY 1: EFFECT OF DEPRESSION AND MEDIATION OF RUMINATION[3]

Introduction

Posttraumatic stress disorder (PTSD) is often comorbid with clinical depression with average reported prevalence rates of approximately 50% for Major Depressive Disorder (e.g., Blanchard et al., 1998; Kessler et al., 1995). According to emotional processing theory, depression contributes to suboptimal recovery from PTSD by reducing one's capacity for habituation of anxiety to the trauma memory and cues, resulting in less successful new (adaptive) learning (Foa & Kozak, 1986). The theory further posits several reasons for the negative impact of depression, including: excessively diminished reactivity *or* increased responsiveness to fear, reduced distress intolerance, heightened self-perceptions of ineffectiveness or helplessness, and unhelpful beliefs about ability to cope with fear (Foa & Kozak, 1986). In clinical research, prior depression has been shown to increase the risk of developing PTSD upon trauma exposure (Breslau et al., 1997; Breslau, Davis, Peterson, & Schultz, 2000; Shalev et al., 1998) and a trend for those with comorbid depression to be more likely to retain their PTSD diagnosis over time (Shalev et al., 1998). Comorbid depression cases are also associated with greater PTSD symptom severity (Nixon et al., 2004). In relation to intrusive distressing recollection of trauma, a the hallmark symptom of PTSD (American Psychiatric Association, 2013), severity of depression has been shown to positively correlate with frequency of intrusions (e.g., Brewin, Hunter, et al., 1996; Kuyken & Brewin, 1994). However, little is known about the mechanisms by which depression

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might lead to the persistence of PTSD, or of relevance to the present study, distressing posttrauma intrusions.

According to information processing theories of PTSD, the persistence of intrusive re-experiencing (and other symptoms) occurs as a result of dysfunctional processing of the traumatic event and/or its consequences (e.g., Brewin, Dalgleish, et al., 1996; Ehlers & Clark, 2000; Foa & Kozak, 1986). Further, the theories share a view that certain cognitive styles make processing more dysfunctional. Such styles may reflect strategies employed by victims of a traumatic event to attempt to reduce intrusive re-experiencing and associated emotional distress, and may represent an emotion regulation strategy (Ehlers & Steil, 1995). Accordingly, because depression maintains posttrauma intrusions, as argued below, it is reasonable to expect that certain cognitive coping strategies employed by individuals with depression enhance dysfunctional information processing of the trauma memory, thereby resulting in persistent trauma intrusions.

One candidate dysfunctional cognitive strategy that may explain how depression affects posttrauma intrusion is rumination, commonly defined as repetitive thinking about past negative experiences and negative mood (Nolen-Hoeksema, 1991; Nolen-Hoeksema et al., 2008). Trauma-related rumination in PTSD sufferers is a common cognitive strategy in response to and to make sense of the causes and consequences of the trauma (Ehlers & Clark, 2000), and levels of trauma-related rumination are thought of as a marker of PTSD symptom severity (Ehlers & Steil, 1995). However, the degree to which it is maladaptive differs depending on the way individuals ruminate (Watkins, 2008). Rumination is commonly classified into two types depending on its processes and consequences, namely, reflective pondering and brooding. While reflective pondering is relatively adaptive as it is seen as a method likely to lead to finding solutions to a troubling situation (Martin & Tesser, 1996), brooding is considered maladaptive due to a continual focus on *negative or emotional*

aspects of the situation without focusing on features of the situation or behaviours that are amenable to change (Joormann et al., 2006). Of these types, it is the brooding rumination that characterises cognitive response to negative events typically employed by people with depression (see Ehring & Watkins, 2008; Nolen-Hoeksema et al., 2008, for reviews). It thus follows that depression may be a risk factor for persistence of PTSD via facilitation of maladaptive rumination, assuming that this type of rumination *does* have a detrimental effect on posttrauma adjustment.

Theoretically, the harmful effect of rumination on PTSD/intrusions has been speculated by the cognitive model of PTSD (Ehlers & Clark, 2000; Ehlers & Steil, 1995). First, rumination serves as a form of cognitive avoidance, interfering with the formation of a more complete trauma memory. Dwelling on negative issues related to the trauma but not thinking actively about the traumatic experience itself hinders the emotional processing of the trauma (Ehring, Fuchs, et al., 2009; Foa & Kozak, 1986). This proposal is in line with a finding that occurrence of "why" and "what if" type questions by trauma survivors predicted later PTSD severity (Michael et al., 2007). Second, rumination strengthens problematic appraisals of trauma and its meaning, and prevents them from being replaced with more adaptive appraisals. This suggestion corresponds with empirical findings that rumination is associated with more negative appraisals of situations, and a tendency to attend to and remember negative information rather than positive information (see Nolen-Hoeksema et al., 2008, for review). Finally, rumination provides internal retrieval cues for memories of a traumatic event, which in turn increases intrusions. This proposal is in agreement with a finding that in PTSD sufferers rumination was a strong trigger for intrusions of a trauma scene (Birrer et al., 2007).

In line with the cognitive model (Ehlers & Clark, 2000), clinical studies have shown that frequency of trauma-related rumination was cross-sectionally correlated with PTSD

symptom severity (Evans et al., 2007; Steil & Ehlers, 2000). Further, prospective research of trauma survivors consistently found that frequency of rumination was a predictor of PTSD symptom severity with medium to large effect sizes (e.g., Ehlers et al., 1998; Murray et al., 2002). In contrast, direct manipulations of rumination yielded somewhat mixed findings. In Ball and Brewin (2012), moderate-high trait ruminators who were instructed to ruminate in a maladaptive manner after seeing a film of road traffic accidents later reported a greater number of film-related intrusive memories than no-task controls, suggesting a causal effect of rumination on intrusive memories. However, other studies (Ehring, Szeimies, et al., 2009; Zetsche et al., 2009) found with *unselected* participants that ruminating about an analogue traumatic film clip in the same manner subsequently produced comparable numbers of film-related intrusions as comparison participants.

As speculated by Ball and Brewin (2012), the inconsistent findings might reflect that only individuals with existing ruminative tendency have an ability to engage in posttrauma ruminative thinking on command in a way that produces greater posttrauma intrusions. Therefore, people with trait ruminative thinking style may be at higher risk of developing intrusions upon trauma exposure than non-habitual ruminators. As trait ruminative tendency is known to contribute to greater depression severity (e.g., Nolen-Hoeksema et al., 2008), high levels of depression can be seen as a risk factor for the maintenance of posttrauma intrusions through its easily-activated ruminative mode of thinking. From this perspective, the mechanism for the depression-intrusion relationship can be seen as being the relatively easily-triggered rumination after trauma exposure maintaining posttraumatic intrusions in individuals with depression (who are likely to already be habitual ruminators).

Independent of trait depression and ruminative tendency, the mood-as-input model of pathological repetitive thinking (Meeten & Davey, 2011) offers an explanation of how *temporary* low mood also causes rumination. Experimental methods of mood induction have

been widely used to test a causal effect of emotions on cognitions (Eich, Ng, Macaulay, Percy, & Grebneva, 2007). Hawksley and Davey (2010) manipulated mood (negative or positive) and stop rule ("as many as can" or "feel like continuing") in unselected participants. During a rumination interview, participants were asked to think back to and respond to questions regarding a past depressing experience. At this time those in the "as many as can" group were instructed to participate in the interview until they had completed exploring their depression, while those in the other condition were asked to remain so long as they felt like continuing. The result found that persistence at the interview was greatest in the low mood group adopting "as many as can" stop rule, suggesting that induced transient low mood during ruminative mode of processing caused the maintenance of rumination about negative experiences. This has not been tested in the context of trauma memory.

The effect of temporary low mood has also been found in relation to posttrauma intrusions. Wilksch (2011) had participants to watch an analogue trauma film clip and then randomly allocated them to either sad mood or control condition. In this sample, film-related intrusions in the sad mood condition reduced at a slower rate over a week compared to controls, suggesting a causal role of induced momentary sad mood in the maintenance of distressing trauma intrusions.

Taken together, depression and low mood appear to be risk factors for the persistence of distressing trauma intrusions, and as argued, trauma-related rumination is likely to play an important role in this relationship. As discussed earlier, emotional processing theory (Foa & Kozak, 1986) posits a role for depression to interfere with habituation of anxiety in response to trauma memory and cues but the reasons for this do not explicitly include the role of rumination. While Ehlers and Clark (2000) outline the role of rumination in the persistence of PTSD, how this might be influenced by low mood or depressed symptoms is not explained.

Utilising a film clip of fictional traumatic contents, the current study sought to test the effect of induced low mood and baseline depressive symptoms on trauma intrusions and the mediating role of trauma-related rumination in the relationship between low mood/baseline depressive symptoms and trauma intrusions. We employed two induced low mood groups that were compared to the control group; in one group low mood was induced before viewing the film because past research have shown that depression prior to trauma exposure is a risk factor for the development of PTSD (e.g., Breslau et al., 2000), implying a possibility that low mood during trauma exposure prevents optimal processing; the other group received the induction after viewing the film given comorbid depression may contribute to the maintenance of PTSD (Shalev et al., 1998), implying low mood may affect posttrauma processing. Participants' frequency of film-related intrusions and associated distress levels were measured during 5-minute monitoring tasks within the experimental session as well as at 1-week follow-up. Levels of film-related rumination were measured during the 1-week interval. In line with past research (e.g., Ball & Brewin, 2012; Ehring, Szeimies, et al., 2009), both intrusion frequency and intrusion-related distress were measured. While frequency of intrusions is commonly examined in analogue trauma intrusions research (Holmes & Bourne, 2008), some researchers suggest that it is particularly those intrusions that are experienced as distressing that contribute to the persistence of PTSD (Steil & Ehlers, 2000). Participants' levels of trait ruminative tendency were also measured given its close relationship with depression (e.g., Nolen-Hoeksema et al., 2008) and with ruminative response to analogue trauma (Ball & Brewin, 2012).

We had three main hypotheses. First, we predicted that participants with higher baseline depressive symptom levels would report more frequent intrusions of the trauma film and greater associated distress at 1-week follow-up than those with lower levels of depressive symptoms. Second, participants who underwent a low mood induction (before or

after the film) would experience slower reductions in their intrusions and associated distress over a week interval than the control participants. Third, we predicted that trauma-related rumination would mediate the relationship between baseline depression/induced sad mood and trauma intrusions and associated distress such that greater baseline depression symptoms/induced sad mood would lead to greater trauma-related rumination during the week following viewing the trauma film, which in turn would lead to more frequent and more distressing trauma intrusions at 1-week follow-up. We also expected that induced low mood (before or after the film) would increase levels of trauma-related rumination over a 1-week interval, and that baseline levels of depression would be positively correlated with levels of trauma-related rumination, and general (trait) ruminative style.

Method

Participants

Participants were 90 university students. Individuals who reported having a formal diagnosis of a mental health disorder (e.g., PTSD, depression, anxiety) were excluded. The sample was predominantly female (67.8%) with a M_{age} of 23.93 ($SD = 6.86$). Participants received course credits or financial reimbursement ($AUD20).

Materials

Trauma film. Participants viewed an 8-minute clip from the fictional French film Irreversible, which contained graphic scenes of physical and sexual violence. Previous experimental studies (e.g., Nixon et al., 2007; Wilksch, 2011) had used the same film to successfully induce intrusive experiences, with trauma films an established method of studying intrusive phenomenon (Holmes & Bourne, 2008).

Mood induction. In the sad mood conditions, participants wrote down details about a time in their life when they had felt sad, and then listened to orchestral music of a classical

genre ("Russia under the Mongolian Yoke" from "Alexander Nevsky" by Sergei Prokofiev) while they continued to think about the event that they had just written. The music piece has been shown effective in inducing sad mood (Werner-Seidler & Moulds, 2011). This procedure which combined both sad mood-suggestive music and the autobiographical recall of a sad-mood evoking event has been used successfully to induce transient low mood (e.g., Eich et al., 2007; Werner-Seidler & Moulds, 2011). The Control group was utilised to mitigate the possible effect of time and cognitive load associated with the mood induction procedure on processing of film-related memory. Specifically, participants in the Control condition went through the same procedure as the sad mood groups but listened to another piece from "Alexander Nevsky" by Sergei Prokofiev, and wrote about preparing and eating their typical dinner. The music piece was found to be neutral, relative to the sad music, as assessed by mood ratings (M. L. Moulds, personal communication, September 30, 2013). Participants reported how much they felt sad on a rating scale ranging from 1 (*not at all sad*) to 10 (*extremely sad*) after the low mood induction or control task.

Measures

Film-related intrusions. Intrusive memory from the film clip was measured in 5-minute intrusion monitoring tasks. Participants were asked to think about anything they wished but to indicate each time they had a spontaneous visual image from the film by raising their finger. The frequency of the intrusions was recorded by the researcher. The 5-minute monitoring intervals were conducted after the trauma film (T1), after the mood manipulation (or filler task) (T2) and at 1-week follow-up (T3). Participants also rated how distressed they felt from the memories using a single item scale (where 1 = *not at all* to 10 = *extremely distressed*).

Trait rumination and film-related rumination. The Perseverative Thinking Questionnaire (PTQ; Ehring, 2007) was administered at baseline to measure participants'

trait levels of maladaptive rumination. Participants rated each of 15 items on a scale ranging from 0 (*never*) to 4 (*almost always*). The PTQ has good internal consistency with Cronbach's α ranging between .94 and .95 depending on samples (Ehring et al., 2011). In the present study, Cronbach's α = .96.

The modified State version of the Perseverative Thinking Questionnaire (PTQ-S) was used to measure the levels of maladaptive rumination indexed to the film-related memory. Internal consistency (Cronbach's α) is reported to be .89 (Zetsche et al., 2009). In the present study, Cronbach's αs = .96 (Day 3) and .97 (Day 7).

Baseline depression symptoms. The Depression subscale of the Depression Anxiety Stress Scale (DASS-D; Lovibond & Lovibond, 1995), comprising 14 items, was used to measure an individual's baseline depression symptoms. Participants responded according to how much the statement applied to them over the past week using a 4-point severity scale. The DASS-D possesses excellent internal consistency with Cronbach's α = .96 (T. A. Brown, Chorpita, Korotitsch, & Barlow, 1997). In the present study, Cronbach's α = .94.

Prior trauma. The following well-established measures relating to prior trauma were administered at baseline in the event that these variables needed to be controlled in subsequent analyses. The PTSD Checklist (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993) is a 17-item self-report checklist of PTSD symptoms. Participants who reported that they had been exposed to "trauma" answered how often they had been bothered by each symptom in the previous month on a 5-point severity scale. The Posttraumatic Cognitions Inventory (PTCI; Foa, Ehlers, Clark, Tolin, & Orsillo, 1999) is a 36-item instrument used to assess participants' baseline trauma-related thoughts and appraisals, specifically, negative cognitions about the self, negative cognitions about the world, and self-blame. Participants rated each item on a 7-point scale ranging from 1 (*totally disagree*) to 7 (*totally agree*).

Procedure

Figure 1 exhibits a flow diagram summarising experimental method and procedures. Following completion of the baseline questionnaires (PCL, PTCI, DASS-D and PTQ) and mood rating, participants were randomly allocated to either the sad mood induced before the film (Sad Before Film or SBF), sad mood induced after the film (Sad After Film or SAF) or Control condition. Before viewing the film participants in the SBF condition received sad mood induction, after which they re-rated their mood and were then shown the film. The SAF and Control groups did not go through the mood induction/control procedure at this stage. Following the film, all participants indicated how unpleasant and distressing the film was, how much attention they paid to the film, and rated their current mood. All participants then completed an intrusion monitoring task and rated their intrusion-related distress (T1). Next, the SAF and Control groups received the sad mood induction or control tasks, while the SBF group completed a filler task utilising the control procedure. All participants again completed the intrusion monitoring task and rated their intrusion-related distress (T2). Participants completed the PTQ-S on the 3rd and 7th day following the experimental session. At 1-week follow-up, participants completed the final intrusion monitoring task and distress rating (T3).
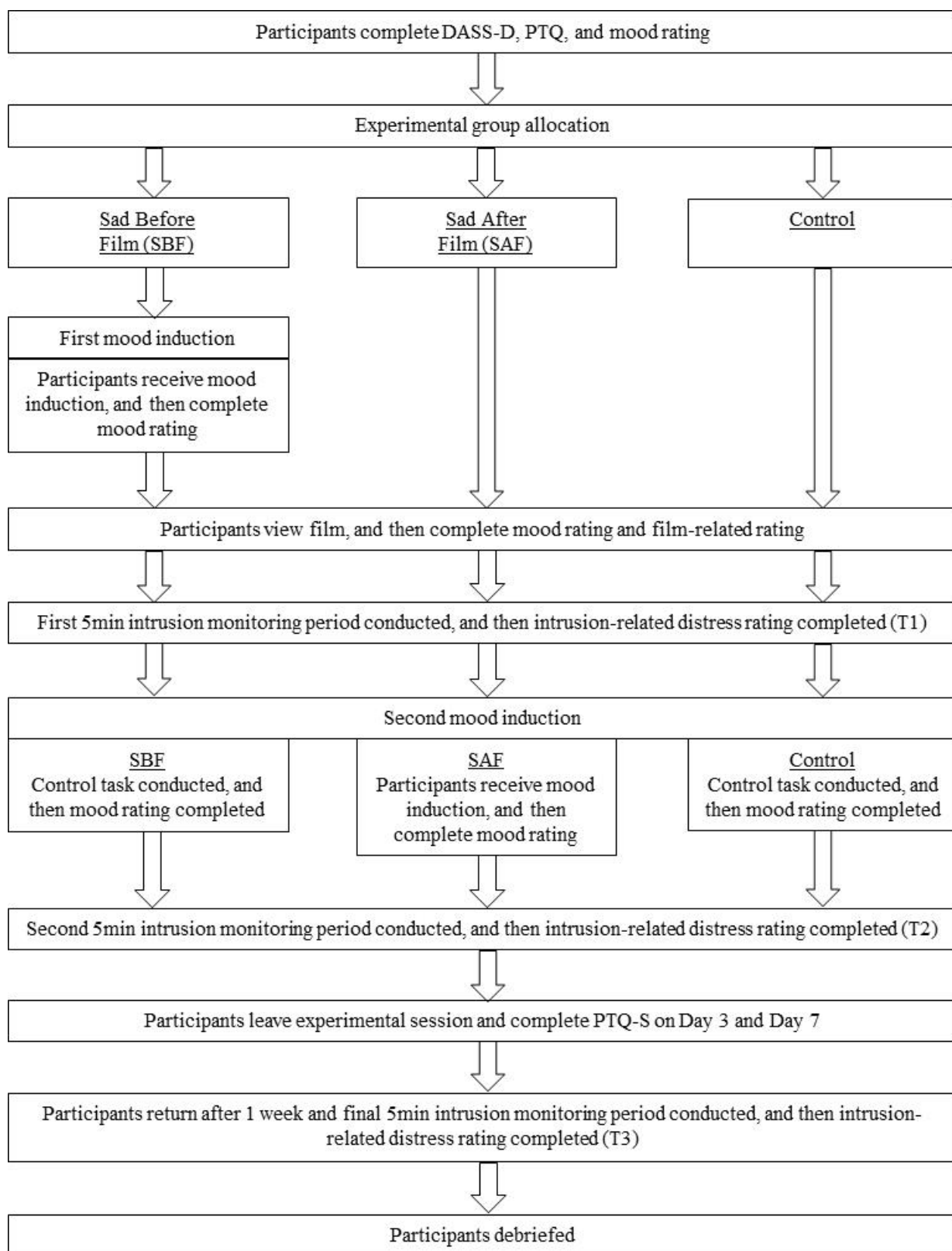
Figure 1. Flow diagram summarising the experimental procedure. PCL = PTSD Checklist; PTCI = Posttraumatic Cognitions Inventory; DASS-D = Depression Anxiety Stress Scale – Depression; PTQ(-S) = Perseverative Thinking Questionnaire (– State version).

Results

Preliminary Analysis

A total of 81 participants completed both the initial and follow-up sessions with 26, 26 and 29 in the SBF, SAF and Control groups, respectively. Nine participants were not included in analyses (either did not watch entire film clip or did not complete follow-up). The groups did not significantly differ in age, $F(2, 78) = 0.82$, $p = .45$, $\eta_p^2 = .02$, gender compositions, $\chi^2(2, N = 81) = .31$, $p = .86$, $\varphi_c = .06$, unpleasantness of the film, $F(2, 78) = 0.76$, $p = .47$, $\eta_p^2 = .02$, perceived distressing levels of the film, $F(2, 78) = 0.42$, $p = .66$, $\eta_p^2 = .01$, and levels of attention paid to the film, $F(2, 78) = 0.89$, $p = .42$, $\eta_p^2 = .02$. The groups were not significantly different on the DASS-D, $F(2, 78) = 1.20$, $p = .31$, $\eta_p^2 = .03$, and PTQ, $F(2, 78) = 1.40$, $p = .25$, $\eta_p^2 = .04$. The groups did not significantly vary on whether they reported any experience of prior trauma, $\chi^2(2, N = 81) = .48$, $p = .79$, $\varphi_c = .07$, PCL, $F(2, 57) = 1.43$, $p = .25$, $\eta_p^2 = .05$, and PTCI, $F(2, 57) = 0.09$, $p = .92$, $\eta_p^2 = .003$. Descriptive data is reported in Table 1. The PCL and PTCI did not significantly correlate with the dependent variables of interest consistently across time and were not considered further (see Table 2 for correlations).

Table 1

Demographic Characteristics, Film Ratings, and Baseline Questionnaire Scores by Group

	Sad Before Film (*n* = 26)		Sad After Film (*n* = 26)		Control (*n* = 29)	
	M (or *n*)	*SD* (or %)	*M* (or *n*)	*SD* (or %)	*M* (or *n*)	*SD* (or %)
Demographics						
Age	25.15	8.11	23.25	4.93	23.10	5.78
Female	17	65%	18	69%	18	62%
Film ratings						
Distress	7.81	1.36	8.27	1.80	7.93	2.33
Unpleasantness	8.50	1.45	9.00	1.20	8.83	1.73
Attention	7.81	1.20	7.62	1.53	8.10	1.37
Baseline questionnaire						
DASS-D	4.54	4.98	5.35	6.60	7.28	8.14
PTQ	25.46	10.77	22.15	13.92	28.03	13.97
	(*n* = 20)		(*n* = 18)		(*n* = 22)	
PCL	29.65	12.59	24.50	10.17	30.45	12.28
PTCI	82.85	27.94	80.28	37.00	84.82	37.82

Note. DASS-D = Depression Anxiety Stress Scale – Depression; PTQ = Perseverative Thinking Questionnaire; PCL = PTSD Checklist; PTCI = Posttraumatic Cognitions Inventory.

Table 2

Correlations between Baseline PTSD Symptoms and Trauma-related Beliefs, and Intrusion and Rumination Variables

	PCL	PTCI
	r	*r*
T1 (immediately after film)		
Intrusion frequency	.09	.21
Intrusion-related distress	.26*	.18
T2 (following mood induction for SAF/filler task for SBF and Control)		
Intrusion frequency	.09	.24
Intrusion-related distress	.28*	.30*
1-week interval		
PTQ-S (Day 3)	.17	.23
PTQ-S (Day 7)	.02	.12
T3 (follow-up)		
Intrusion frequency	.15	.20
Intrusion-related distress	.21	.14

Note. $N = 60$. PCL = PTSD Checklist; PTCI = Posttraumatic Cognitions Inventory; PTQ-S = Perseverative Thinking Questionnaire – State version.

*$p < .05$.

Mood Manipulation Check

Table 3 summarises the descriptive data for sad mood ratings by group and time. At baseline, a one-way ANOVA showed the groups were not significantly different from each other in their sadness ratings, $F(2, 78) = 0.43$, $p = .65$, $\eta_p^2 = .11$. Manipulation checks were conducted separately for the two sad groups due to the different timings of mood induction for the groups. For the SBF group, the increase in sadness scores following induction was significant, $t(25) = 6.35$, $p < .001$, with a mean difference of 2.04 (CI$_{95}$ [1.38, 2.70]), $d = 1.82$. For the SAF group, the change in sadness scores from pre- to post-manipulation was compared against the Control condition with a mixed ANOVA, which revealed a significant group × time interaction on sadness ratings, $F(1, 53) = 4.97$, $p = .03$, $\eta_p^2 = .09$. At post-manipulation, the SAF group rated significantly higher on the sad mood rating than the Control group, $t(53) = 3.19$, $p < .01$, with a mean difference of 2.04 (CI$_{95}$ [0.76, 3.32]), $d = 0.86$. Thus, the sad mood manipulation appeared to have been effective.

Table 3

Sad Mood Ratings by Group and Time

	Sad Before Film (*n* = 26)		Sad After Film (*n* = 26)		Control (*n* = 29)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Baseline	2.27	1.37	2.69	1.81	2.45	1.72
First mood induction	4.31	1.85	-	-	-	-
Post-film	5.00	2.28	5.15	2.57	4.69	2.98
Second mood induction	3.27	1.87	5.38	2.32	3.34	2.41
Follow-up	1.73	0.87	2.08	1.67	2.28	1.87

Main Results

  Effects of induced sad mood. Table 4 summarises the descriptive data for intrusion frequency, intrusion-related distress and film-related rumination (PTQ-S) over the course of the experiment.

Table 4

Intrusion and Rumination Variables by Group and Time

	Sad Before Film (*n* = 26)		Sad After Film (*n* = 26)		Control (*n* = 29)	
	M (SD)	CI$_{95}$	*M (SD)*	CI$_{95}$	*M (SD)*	CI$_{95}$
T1 (immediately after film)						
Intrusion frequency	8.04 (7.30)	[5.45, 10.63]	10.88 (5.29)	[8.29, 13.48]	9.90 (7.08)	[7.44, 12.35]
Intrusion-related distress	4.54 (2.50)	[3.56, 5.52]	5.23 (2.39)	[4.25, 6.22]	5.17 (2.65)	[4.24, 6.10]
T2 (following mood induction for SAF/filler task for SBF and Control)						
Intrusion frequency	4.27 (4.63)	[2.13, 6.41]	6.08 (4.77)	[3.94, 8.22]	5.93 (6.65)	[3.91, 7.96]
Intrusion-related distress	2.89 (1.73)	[2.03, 3.74]	3.69 (2.49)	[2.83, 4.55]	3.38 (2.29)	[2.57, 4.19]
1-week interval						
PTQ-S (Day 3)	13.73 (10.85)	[8.80, 18.66]	15.96 (12.54)	[11.03, 20.89]	18.85 (14.09)	[14.18, 23.52]
PTQ-S (Day 7)	8.81 (10.25)	[4.36, 13.26]	7.65 (11.75)	[3.20, 12.11]	12.37 (12.04)	[8.15, 16.58]
T3 (follow-up)						
Intrusion frequency	1.69 (2.17)	[0.56, 2.88]	2.77 (2.37)	[1.58, 3.96]	3.00 (4.06)	[1.88, 4.12]
Intrusion-related distress	1.96 (1.18)	[1.35, 2.58]	2.04 (1.34)	[1.42, 2.66]	2.38 (2.03)	[1.80, 2.96]

Note. PTQ-S = Perseverative Thinking Questionnaire – State version.

Three (Group [SBF, SAF, Control]) $\times$ 3 (Time [T1, T2, T3]) mixed ANOVAs were conducted to examine reduction of intrusions and associated distress over the 1-week interval. Contrary to prediction, the reduction in intrusion frequency in the two sad conditions over time was not significantly slower compared to the Control condition, $F(3.34, 130.06) = 0.56$, $p = .66$, $\eta_p^2 = .01$. This null result remained unchanged when the two sad groups (no significant difference between them, $F(1.59, 76.66) = 0.97$, $p = .37$, $\eta_p^2 = .02$) were collapsed together to be compared with the Control group, $F(1.64, 129.34) = 0.07$, $p = .90$, $\eta_p^2 = .001$. The same pattern of findings across the three groups was observed when intrusion-related distress was examined, $F(3.59, 139.81) = 0.66$, $p = .60$, $\eta_p^2 = .02$. Again, this remained unchanged when the two combined sad groups (which were not significantly different from each other, $F(1.88, 93.82) = 1.13$, $p = .33$, $\eta_p^2 = .02$) were compared against the Control group, $F(1.77, 139.96) = 0.22$, $p = .78$, $\eta_p^2 = .003$.

In terms of induced mood impacting on trauma-related rumination (PTQ-S), a one-way ANOVA did not reveal significant group differences, $F(2, 78) = 1.14$, $p = .33$, $\eta_p^2 = .01$, and $F(2, 78) = 1.29$, $p = .28$, $\eta_p^2 = .01$ for Day 3 and Day 7, respectively. The results remained unchanged when two sad mood groups (which did not significantly differ from one another, $F(1, 50) = 0.47$, $p = .50$, $\eta_p^2 = .01$, and $F(1, 50) = 0.14$, $p = .71$, $\eta_p^2 = .003$ for Day 3 and Day 7, respectively) were collapsed together to be compared to the Control group, $F(1, 79) = 1.89$, $p = .17$, $\eta_p^2 = .02$, and $F(1, 79) = 2.48$, $p = .12$, $\eta_p^2 = .03$ for Day 3 and Day 7, respectively. Thus, the hypothesis that experimentally induced sad mood would result in greater levels of maladaptive trauma-related rumination and slower reduction of trauma intrusions and associated distress was not supported.

Correlations between baseline depression, trait rumination, trauma-related rumination, and trauma intrusion frequency and associated distress. Prior to testing of the mediating role of trauma-related rumination, correlation analyses were conducted to

examine relationships between baseline depression (DASS-D), baseline ruminative tendency (PTQ), trauma-related rumination (PTQ-S) measured on Day 3 and Day 7, and intrusion frequency and associated distress at the 1-week follow-up (see Table 5 for descriptive statistics and intercorrelations between variables).

Table 5

Descriptive Statistics and Intercorrelations for Baseline Depression, Trait Rumination, and Film-related Rumination and Intrusion Variables

			1	2	3	4	5
	M	*SD*	*r*	*r*	*r*	*r*	*r*
1. DASS-D	5.78	6.78	-				
2. PTQ	25.32	13.08	.55**	-			
3. PTQ-S (Day 3)	16.28	12.65	.29**	.47**	-		
4. PTQ-S (Day 7)	9.71	11.44	.22	.41**	.79**	-	
5. Intrusion frequency (T3)	2.51	3.05	.33**	.22*	.47**	.32**	-
6. Intrusion-related distress (T3)	2.14	1.57	.23*	.13	.53**	.51**	.46**

Note. *N* = 81. DASS-D = Depression Anxiety Stress Scale – Depression; PTQ = Perseverative Thinking Questionnaire; PTQ-S = Perseverative Thinking Questionnaire – State version.

p < .05, **p* < .01.

As predicted, depression symptom levels were positively correlated with trauma-related rumination measured on Day 3, frequency of trauma intrusions and associated distress, with the exception that the correlation between depression and trauma-related rumination measured on Day 7 did not reach significance. Consequently, the main analysis of the mediating role of trauma-related rumination for the effect of baseline depression on intrusion frequency and associated distress was conducted using the PTQ-S from Day 3 but not Day 7. Trait rumination (PTQ) was positively correlated with depression, trauma-related rumination measured on Day 3 and Day 7, and frequency of intrusions at follow-up, but not with intrusion-related distress. Therefore, the mediation analyses were repeated controlling for trait rumination when intrusion frequency, but not associated distress, was examined as an outcome variable.

Mediating role of trauma-related rumination in depression-intrusions. The SPSS macro PROCESS (Hayes, 2013) was used to test the mediating role of trauma-related rumination. Specifically, PROCESS produced estimates of the direct and indirect effects of depression (DASS-D) on intrusion frequency and associated distress through trauma-related rumination (PTQ-S) on Day 3. Figure 2 illustrates those pathways with statistical tests of unstandardized regression coefficients (*b*). The bias-corrected bootstrapped confidence intervals were based on 5000 samples.
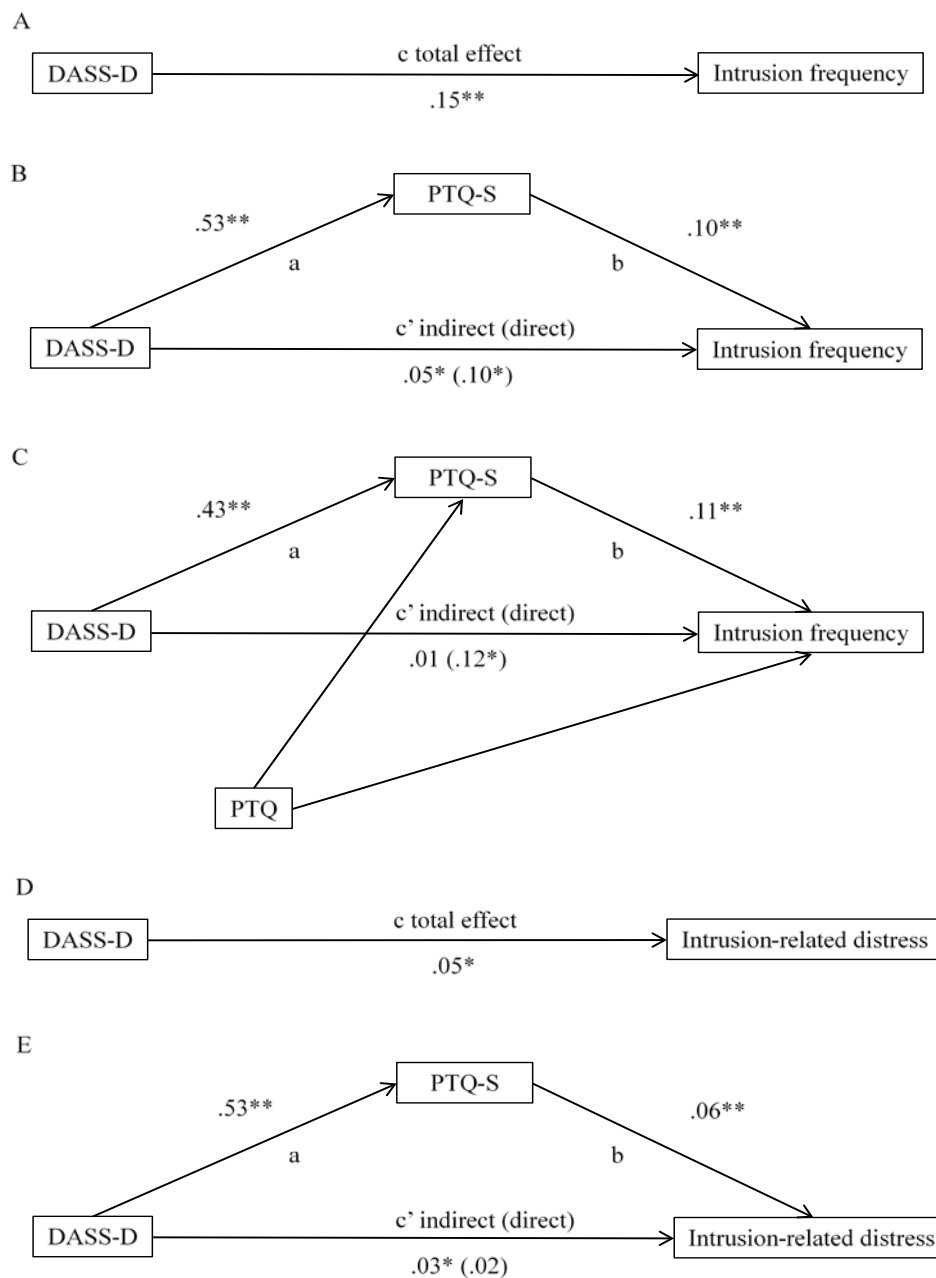
Figure 2. Trauma-related rumination (PTQ-S) as a mediator in the relationship between baseline depression (DASS-D) and trauma intrusion frequency and associated distress, with trait ruminative tendency (PTQ) as a covariate on intrusion frequency. Path values are unstandardized regression coefficients and the associated confidence intervals are shown below. Please see the text for *t*-test values that correspond to these regression coefficients. (A) Depression significantly predicted intrusion frequency ($b = .15$, CI_{95} [.05, .24]). (B) Trauma-related rumination significantly mediated the effect of depression on intrusion frequency ($b = .05$, CI_{95} [.01, .12]). The direct effect of depression on intrusion frequency was also significant ($b = .10$, CI_{95} [.004, .19]. (C) When controlled the effect of trait rumination was controlled, trauma-related rumination no longer significantly mediated the effect of depression on intrusion frequency ($b = .01$, CI_{95} [-.04, .07]). (D) Depression significantly predicted intrusion-related distress ($b = .05$, CI_{95} [.003, .10]). (E) Trauma-related rumination significantly mediated the effect of depression on intrusion-related distress ($b = .03$, CI_{95} [.01, .07]). The direct effect of depression on intrusion-related distress was not significant ($b = .02$, CI_{95} [-.03, .07]).
$N = 81$. *$p < .05$, **$p < .01$.

Trauma-related rumination significantly mediated the effect of depression on intrusion frequency (Figure 2B). That is, the effect of depression was significantly reduced after accounting for trauma-related rumination. This indirect effect represents a medium effect, κ^2 = .12, CI$_{95}$ [.03, .24], and explained a 35% of the total effect of depression on intrusion frequency (Figure 2A). Independent of the mechanism of trauma-related rumination, depression remained a significant predictor for intrusion frequency, $t(80)$ = 2.07, p = .04. Therefore, trauma-related rumination partially mediated the effect of depression on intrusion frequency. In the final model for mediation, 25.7% of the variance in intrusion frequency was accounted for using the predictors of trauma-related rumination and depression, $F(2, 78)$ = 13.47, $p < .001$. However, as shown in Figure 2C, when trait rumination was controlled, trauma-related rumination no longer significantly mediated the relationship between depression and intrusion frequency.

When intrusion-related distress was examined as an outcome variable, trauma-related rumination again significantly mediated the effect of depression (Figure 2E). That is, the effect of depression was significantly reduced after accounting for trauma-related rumination, which reduced the direct effect of depression to nonsignificance, $t(80)$ = 0.02, p = .38. This indirect effect represents a medium effect, κ^2 = .15, CI$_{95}$ [.04, .29], and explained 62% of the total effect of depression on intrusion-related distress (Figure 2D). In the final model for mediation, 28.3% of the variance in intrusion-related distress was accounted for by trauma-related rumination and depression, $F(2, 78)$ = 15.41, $p < .001$.

Discussion

This study investigated the effect of depression on trauma intrusions and the role of rumination in the depression-intrusion relationship. As predicted, existing depressive symptoms predicted frequency of trauma intrusions and associated distress following analogue trauma exposure, and trauma-related rumination mediated the depression-

intrusion relationship. Not surprisingly, trait ruminative style predicted levels of trauma-related rumination; when trait rumination was controlled, it rendered the mediating role of trauma-related rumination on intrusion frequency to nonsignificance. However, trauma-related rumination was a mediator of intrusion-related *distress*. Contrary to expectations, experimentally-induced low mood did not predict trauma-related rumination nor trauma intrusions.

The finding that higher baseline depression symptoms predicted greater numbers of film-related intrusions and associated distress parallels clinical findings that have observed strong relationships between depression and frequency of trauma intrusions (e.g., Brewin, Hunter, et al., 1996) and previous research demonstrating that prior or comorbid depression increases the risk of developing or maintaining PTSD (e.g., Breslau et al., 2000; Shalev et al., 1998). The current findings also lend support to some aspects of emotional processing theory (Foa & Kozak, 1986), which proposes that depression contributes to the maintenance of posttraumatic stress symptoms. In contrast, in our study experimentally-induced low mood (either prior to or just after the trauma film) did not result in intrusion persistence. This is inconsistent with Wilksch (2011) despite the fact that the current study induced sad mood with the same methods and to a comparable extent (i.e., obtaining a medium effect size). Together, the current finding suggests that in an experimental setting it is not transient low mood, but naturally occurring depressive symptoms that would prevent habituation of anxiety to trauma memory and cues and thus impede optimal posttrauma adjustment.

Greater levels of trauma-related rumination were also predicted by higher baseline depression symptom levels. The current finding adds further support for the well-established association between depression and rumination (Ehring & Watkins, 2008; Nolen-Hoeksema et al., 2008) in that people with higher depression symptom levels are

more likely to employ brooding thinking following a negative event than individuals with lower levels of depression. On the other hand, and inconsistent with Hawksley and Davey (2010), temporary low mood was not related to ongoing rumination in the current sample. There are four possible explanations for this: (1) the smaller effect ($d = 0.86$ between the SAF and Control groups) of mood induction than that achieved by Hawksley and Davey (2010) ($d = 1.31$); (2) because the effect of sad mood is only relevant when the contents of memory are personal depressive events rather fictional trauma stimuli; (3) because the present study did not have an explicit instruction for participants to *continue* rumination over the course of follow-up; or (4) because low mood and rumination were not simultaneously induced as done in Hawksley and Davey (2010).

As expected, some evidence was obtained for the relationship between trauma-related rumination and intrusions, that is, levels of rumination during the first three days of the film predicted higher numbers of intrusions and corresponding distress levels at the 1-week follow-up with a medium effect size. This is consistent with clinical longitudinal research of the effect of ruminative processing on later PTSD symptom severity (e.g., Ehlers et al., 1998; Murray et al., 2002) and experimental research of the effect of induced rumination on subsequent greater intrusions (Ball & Brewin, 2012). It is inconsistent with other studies that did not observe this relationship (Ehring, Szeimies, et al., 2009; Zetsche et al., 2009). Interestingly, the present study found the effect of trauma-related rumination in an unselected sample unlike the habitual ruminator sample in Ball and Brewin (2012). Due to the different methodology among these studies and current study, it is difficult to pinpoint possible causes for the discrepancy.

However, the impact of trauma-related rumination on intrusions (both frequency and associated distress) was not observed in later part of the 1-week interval. In fact, only $n = 7\text{-}21$ (depending on the day) out of $N = 81$ participants reported ruminative thought

about the film during Day 4 to Day 7 (as compared to $n = 21\text{-}52$ during Day 1 to Day 3), indicating that the analogue trauma stimulus was not strong enough to induce rumination for the entire week in the majority participants. This is somewhat expected given the analogue nature of the trauma stimulus. Despite this, intrusive memories returned to participants when they returned for the 1-week follow-up session, which might have functioned as a reminder of the film. It is important to note that rumination in the days following the film predicted the number of intrusions and related distress even after 1 week had elapsed. Clinically, this would imply that there may be an important window for early intervention to address rumination (e.g., within 3 days of trauma exposure in the present study) that might assist in preventing later suboptimal habituation of anxiety to trauma memory and reminders. Clearly future research would need to formally test this with participants who are dysphoric or clinically depressed, and following real trauma.

As expected, some evidence was found that trauma-related rumination is one mechanism by which depression contributes to the levels of trauma intrusions and associated distress. Thus, it is possible that for actual trauma survivors with depression, trauma-related rumination may increase the risk of chronic PTSD. However, the mediating role of trauma-related rumination on intrusion frequency was rendered nonsignificant when trait rumination was controlled. This is in contrast to a nonsignificant relationship between trait rumination and intrusion-related distress. Hence, trait ruminative tendency may determine the degree of rumination following trauma exposure which in turn increases intrusions, but the distress caused by intrusions seems somewhat independent of trait rumination processes. Despite this, however, trait rumination was found to positively correlate with depression and trauma-related rumination, and rumination is thought to increase depression symptoms (e.g., Nolen-Hoeksema et al., 2008). Therefore, the role of

trait ruminative tendency in PTSD symptomatology in comorbid depression should continue to be examined.

Further, it was interesting that while there was a partial mediating role of trauma-related rumination when frequency of intrusions was examined, a full mediation was observed with the associated distress accompanying such intrusions. That is, compared to people with lower levels of depression, while individuals with higher levels of depression might experience more frequent trauma intrusions independent of the mechanism of trauma-related rumination, they may experience greater distress from those intrusions through ruminative processing of trauma. Given that it seems it is the distress provoked by trauma intrusions that plays a key role in predicting the maintenance of PTSD, not intrusion frequency per se (Steil & Ehlers, 2000), trauma-related rumination appears to be an important target for intervention for PTSD with comorbid depression.

Overall, the current pattern of results appear to suggest that it was not temporarily induced low mood but naturally occurring symptoms of depression (which was associated with trait ruminative tendency) that contributed to trauma-related rumination, resulting in the trauma intrusions and associated distress. Accordingly, emotional processing theory (Foa & Kozak, 1986) would benefit from explicitly considering rumination to be a critical factor in the process of adjustment following trauma. Ehlers and Clark (2000) have already proposed rumination to be a dysfunctional cognitive strategy that leads to the persistence of PTSD, and have suggested specific unhelpful characteristics of rumination (i.e., avoidance, enhancing negative appraisals, and providing increased access to trauma memory). An empirical examination of these proposed functions of trauma-related rumination in trauma victims with high levels of depression would assist in developing a more sophisticated explanation of how pre-existing psychopathology or processes such as depression and rumination drive the maintenance of intrusions following trauma exposure.

Several limitations are acknowledged. First, while analogue trauma films are useful in providing the means of studying the impact of cognitive processes such as rumination on intrusions (Holmes & Bourne, 2008), watching a trauma film is a voluntary exercise, and not the same as experiencing a real-life event. Second, the filler task used following the mood induction for the SBF group might have functioned as a distraction, impacting on cognitive processing of trauma, which might in turn have affected later intrusions and rumination. Although it should be noted this group demonstrated a similar pattern of findings as the SAF condition (which was not given the filler task). Third, the majority of participants (approximately 80%) reported levels of depressive symptoms within normal limits at baseline, which might be due to the participation criteria that excluded people with a formal diagnosis of depression. Whether stronger effects of a mood induction and consequently a greater mediating role of rumination would have been observed in participants with higher levels of depressed symptoms remain to be seen.

The current study found that existing depressive symptoms, but not momentary low mood, contributes to the experience of distressing analogue trauma intrusions, and provides preliminary evidence for the mediating role of rumination in the depression-intrusion association. Future research needs to examine the exact mechanisms through which posttrauma rumination contributes to anxiety to trauma memory and reminders, as this would in turn inform how to best assist optimal recovery following trauma, which is particularly relevant in PTSD sufferers with comorbid depression.

CHAPTER 4 – STUDY 2: EFFECT OF DEPRESSION AND MEDIATION OF RUMINATION IN HIGH DYSPHORIA[4]

Introduction

The main aim of Study 2 was to further examine the effect of depression on trauma intrusions and the mediation of trauma-related rumination in the depression-intrusion relationship by addressing some of the limitations of Study 1. As discussed earlier, one of the main limitations was that the majority participants were classified within the normal range of depressive symptoms. Consequently, the present study employed a quasi-experimental design whereby participants who were exhibiting higher levels of depressive symptoms at baseline were compared to those with lower depression. Further, as Study 1 found that the majority participants did not have any intrusions from the film clip during the latter half of the 1-week interval, the current study employed a shorter interval of 3 days between the initial session and follow-up session.

There were two main hypotheses. First, that participants in the high dysphoria group would report more frequent intrusions of the trauma film and greater associated distress as well as greater levels of film-related rumination and film-related posttraumatic stress symptoms than those with low dysphoria. Second, that rumination about the trauma film during the 3-day interval would mediate the effect of pre-film dysphoric status on intrusion frequency and associated distress at 3-day follow-up; specifically, that the high dysphoria group would ruminate more about the trauma film and this would result in increased occurrences of film intrusions and greater associated distress relative to the low dysphoria group.

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[4] Parts of this chapter were presented by the author at 8th International Congress of Cognitive Psychotherapy, June, 2014, Hong Kong.

Method

The methodology was identical to Study 1 unless otherwise stated.

Participants

Participants were 49 female university students who did not report a current formal diagnosis of a mental health disorder. The present study only included female participants to achieve a greater impact of analogue trauma induction as Study 1 found that female participants were more distressed by the stimulus film and had greater intrusion-associated distress than male participants (see Table A1 in Appendix A for details). Participants had a M_{age} of 22.18 ($SD = 9.00$) and received course credits or financial reimbursement ($AUD20).

Participants were categorised into two groups based on their scores on the DASS-D. Participants who scored 10 or higher, exhibiting mild or more severe levels of depressive symptoms according to the DASS-D classification (Lovibond & Lovibond, 1995) were categorised into the high dysphoria group, and other participants (i.e., those who scored within the normal symptom range) formed the low dysphoria group. Although there appears no precedent published literature for classifying individuals as high versus low dysphoria based on the DASS-D, a cut-off score of 10 has been used in unpublished research (M. L. Moulds, personal communication, August 15, 2013). In order to recruit relatively comparable number of participants for each group, pre-screening of participants took place through an online survey study[5] once the maximum number of participants in the low dysphoria group ($n = 30$) has been recruited. Specifically, online survey participants who had met the classification for high dysphoria and had agreed to be contacted for further experimental study received an email invitation to participate in

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[5] In addition to the DASS-D, the online survey comprised measures of PTSD symptoms and trauma-related unhelpful beliefs as well as trait rumination. See Appendix B for details of the survey and its findings.

experiment. Among pre-screened participants, those who no longer met the high dysphoria criteria upon arrival at laboratory (*n* = 5) were reclassified into the low dysphoria group. The reclassification was implemented because these pre-selected participants attended the experiment after more than 1 week had elapsed since their completion of the online DASS-D; accordingly it was felt the new DASS-D score better reflected their dysphoria status at the experimental session.

Measures

 Intrusion frequency. During the intrusion monitoring tasks, participants were asked to press a button to report every occurrence of intrusions, and this was recorded via Neurobehavioral Systems Presentation software (www.neurobs.com).

 Intrusion-associated distress. A rating scale ranging from 0 (*not at all*) to 10 (*exteremely*) was used instead of the 1 to 10 point scale used in Study 1 in order to allow an easier comparison with similar past research (e.g., Ball & Brewin, 2012; Ehring, Szeimies, et al., 2009).

 Trait and state rumination. In addition to the PTQ and PTQ-S, the Repetitive Thinking Questionnaire (RTQ; McEvoy, Mahoney, & Moulds, 2010) and its state version (RTQ-S) were used as measures of trait rumination and levels of film-related rumination, respectively. The RTQ comprises Repetitive Negative Thinking (RTQ-RNT; 27 items) and Absence of Repetitive Thinking (RTQ-ART; 4 items) subscales. Participants rated each item on a scale ranging from 1 (*not at all*) to 5 (*very true*) in reference to their experience following a recent personally distressing event. Internal consistency of the RTQ has been reported with Cronbach's αs = .88 and .62 for the RNT and ART subscales, respectively (McEvoy et al., 2010), and the current study had αs = .94 and .67 for the respective subscales. The PTQ-S and RTQ-S were completed daily during the 3-day interval. Additionally, the PTQ-S was completed at the initial session in relation to a 5 min free-

thinking period that was incorporated to allow any naturally occurring film-related

rumination within the experimental session.

PTS symptoms. Participants' posttraumatic stress (PTS) symptoms during the 3

days after the film were measured using the Impact of Event Scale – Revised (IES-R;

Weiss & Marmar, 1997). The IES-R is a 22-item self-report scale that measures PTS

symptoms consisting of intrusions, avoidance and hyperarousal subscales on a 5-point

severity scale. The mean scores are reported. Internal consistency has been reported with

Cronbach's αs = .87-.92, .84-.86 and .79-.90 for intrusions, avoidance and hyperarousal

subscales, respectively (Weiss & Marmar, 1997), and the current study had Cronbach's αs

= .84-.90, .82-.88 and .82-.89 for the respective subscales.

Procedure

Figure 3 shows a summary of the experimental procedure.
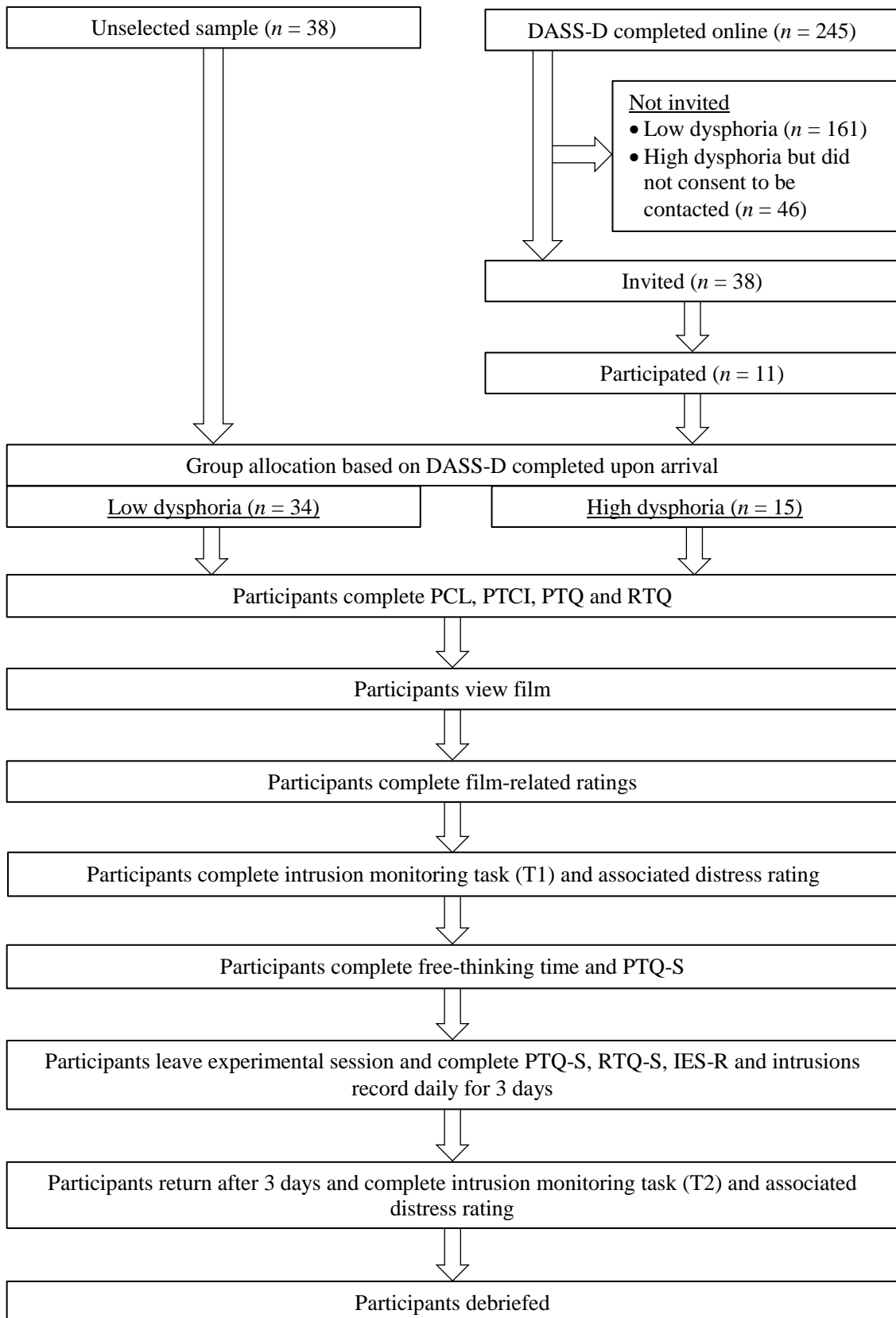
Figure 3. Flow diagram summarising the experimental procedure. DASS-D = Depression Anxiety Stress Scale – Depression; PCL = PTSD Checklist; PTCI = Posttraumatic Cognitions Inventory; PTQ(-S) = Perseverative Thinking Questionnaire (– State version); RTQ(-S) = Repetitive Thinking Questionnaire (– State version); IES-R = Impact of Event Scale – Revised.

Results

Preliminary Analysis

A total of 44 individuals completed the study with 13 and 31 in the high and low dysphoria groups, respectively[6]. Five participants were excluded from analyses as they either failed to watch the entire film clip ($n = 3$) or were lost to follow-up ($n = 2$). Participants' age, baseline questionnaires and moods and film ratings by group and relevant statistics are exhibited in Table 6. Based on DASS-D scores, the average of the high dysphoria group placed them in the moderate range on depression severity, whereas the low dysphoria group fell within normal limits of depressive symptoms. Unsurprisingly the high dysphoria group reported higher trait rumination as measured with the PTQ than the low dysphoria group. In contrast, the groups were comparable on another measure of trait rumination (RTQ).

The high dysphoria group was somewhat younger than their counterparts in the low dysphoria group, but the difference was not statistically significant, $p = .07$. In terms of past trauma, a somewhat greater proportion of participants in the high dysphoria group (77%, $n = 10$) reported an experience of previous trauma than the low dysphoria group (48%, $n = 15$), although the difference did not reach significance, $\chi^2(1, N = 31) = 3.04$, $p = .08$, $\varphi_c = .26$. Among those with prior trauma, the high dysphoria group had greater PTSD symptom severity (PCL) and trauma-related unhelpful cognitions (PTCI) than the low dysphoria group. The groups were comparable on distress from the film, ratings of unpleasantness of the film, and attention paid to the film.

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[6] The analyses were repeated by treating invited participants who changed their classification upon arrival at laboratory ($n = 5$) as individuals with high dysphoria as it was possible that these participants might still be more prone to rumination and intrusions than people who consistently screened low dysphoric. However, this did not alter the overall findings.

Table 6

Age, Baseline Questionnaire Scores, and Moods and Film Ratings by Group

	High dysphoria (*n* = 13)		Low dysphoria (*n* = 31)		Statistic		
	M	*SD*	*M*	*SD*	*t*	*df*	*d*
Age	18.00	6.01	23.45	9.67	1.88	42	0.62
Baseline questionnaire							
DASS-D	17.54	7.99	3.84	2.79	6.03**	13.25	2.81
PTQ	38.46	10.60	27.10	11.43	3.07*	42	1.01
RTQ-RNT	78.00	24.40	73.03	23.19	0.64	42	0.21
RTQ-ART	7.77	3.35	8.42	3.05	0.60	42	0.21
PCL	40.20	15.31	25.80	10.48	2.80*	23	1.14
PTCI	120.80	45.48	81.80	40.66	2.24*	23	0.92
Film ratings							
Distressing	8.62	1.26	9.16	0.90	1.62	42	0.53
Unpleasantness	9.46	1.13	9.58	0.92	0.37	42	0.13
Attention	8.46	1.13	8.23	1.50	0.51	42	0.16

Note. DASS-D = Depression Anxiety Stress Scale – Depression; PTQ = Perseverative Thinking Questionnaire; RTQ-RNT = Repetitive Thinking Questionnaire – Repetitive Negative Thinking; RTQ-ART = Repetitive Thinking Questionnaire – Absence of Repetitive Thinking; PCL = PTSD Checklist; PTCI = Posttraumatic Cognitions Inventory.

*p < .05, **p < .01.

The PCL and PTCI did not consistently correlate with outcome variables of interest (see Table 7 for correlations), and thus were not controlled in subsequent analyses.

Table 7

Correlations of Baseline PTSD Symptoms and Trauma-related Beliefs with Intrusion,

Symptom and Rumination Variables

	PCL	PTCI
	r	r
Intrusion frequency		
Initial session (T1)	-.25	-.26
Three days (average)	-.10	-.16
Follow-up (T2)	-.03	-.05
Intrusion-related distress		
Initial session (T1)	-.32	-.31
Three days (average highest distress)	-.06	-.15
Follow-up (T2)	-.04	-.13
Film-related rumination		
PTQ-S (initial session)	-.05	-.02
PTQ-S (3-day average)	.19	.16
RTQ-RNT-S (3-day average)	.28	.22
RTQ-ART-S (3-day average)	-.11	-.12
PTS symptoms		
IES-R (3-day average)	.15	.11

Note. $N = 25$. PCL = PTSD Checklist; PTCI = Posttraumatic Cognitions Inventory;
PTQ-S = Perseverative Thinking Questionnaire – State version; RTQ-RNT-S =
Repetitive Thinking Questionnaire – Repetitive Negative Thinking – State version;
RTQ-ART-S = Repetitive Thinking Questionnaire – Absence of Repetitive Thinking –
State version; IES-R = Impact of Event Scale – Revised.

Main Results

Effects of dysphoria group. Table 8 reports the descriptive statistics for intrusion

frequency and associated distress, PTS symptoms, and film-related rumination over the

course of the experiment. Two (group: high dysphoria, low dysphoria) $\times$ 2 (time: initial

session, follow-up) mixed ANOVAs were conducted to examine whether the rate of

reduction in intrusion frequency and associated distress differed depending on dysphoria group status. Contrary to prediction, the groups were found to be comparable in their rate of reduction (i.e., nonsignificant interaction) in intrusion frequency, $F(1, 42) = 0.73$, $p = .40$, $\eta_p^2 = .02$, and in associated distress, $F(1, 42) = 0.33$, $p = .57$, $\eta_p^2 = 0.01$. Similarly, no group difference was found on PTS symptoms on the average IES-R scores over the 3 days after film, $t(41) = 0.73$, $p = .47$, $d = 0.24$. No group difference was found on any measures of film-related rumination, all ps $> .65$, ds < 0.15. Overall, no evidence was found for an effect of depression on intrusions, overall PTS symptoms, or trauma-related rumination.

Table 8

Intrusion and Rumination Variables and PTS Symptoms by Group and Time

	High dysphoria ($n = 13$)		Low dysphoria ($n = 31$)	
	M (*SD*)	CI$_{95}$	*M* (*SD*)	CI$_{95}$
	T1 (initial session)			
Intrusion frequency	9.92 (5.91)	[6.35, 13.49]	11.84 (7.77)	[8.99, 14.69]
Intrusion-related distress	6.08 (1.81)	[4.99, 7.17]	6.94 (2.57)	[5.99, 7.88]
Film-related rumination (PTQ-S)	24.69 (12.48)	[17.15, 32.23]	28.68 (14.83)	[23.24, 34.12]
	3-day average			
Film-related rumination				
PTQ-S	15.82 (14.76)	[6.90, 24.74]	15.57 (12.21)	[11.09, 20.04]
RTQ-RNT	50.80 (20.89)	[38.17, 63.42]	48.04 (16.88)	[41.85, 54.23]
RTQ-ARN	11.14 (3.79)	[8.85, 13.43]	10.70 (3.57)	[9.40, 12.01]
PTS symptoms (IES-R)	0.97 (0.82)	[0.62, 1.31]	0.82 (0.52)	[0.59, 1.05]
	T2 (follow-up)			
Intrusion frequency	4.00 (3.24)	[2.04, 5.96]	4.43 (4.95)	[2.61, 6.24]
Intrusion-related distress	2.08 (2.02)	[0.86, 3.30]	2.45 (2.51)	[1.53, 3.37]

Note. PTQ-S = Perseverative Thinking Questionnaire – State version; RTQ-RNT-S = Repetitive Thinking Questionnaire – Repetitive Negative Thinking – State version; RTQ-ART-S = Repetitive Thinking Questionnaire – Absence of Repetitive Thinking – State version; IES-R = Impact of Event Scale – Revised.

Mediation of film-related rumination. The mediating role of film-related rumination was tested using the SPSS macro PROCESS (Hayes, 2013). Table 9 shows estimates of the direct effects of dysphoria group status (X) on intrusion frequency and associated distress at 3-day follow-up (Y) and of the indirect pathway through film-related rumination during the 3-day interval (*M*) with bias-corrected bootstrapped 95% confidence intervals based on 5000 samples.

Table 9

Estimates for Mediating Effect of Film-related Rumination (PTQ and RTQ) between Dysphoria Status Group and Intrusion Outcomes

| | Mediator (M) | | | Outcomes (Y) | | | | | |
| | Film-related rumination | | | Intrusion frequency | | | Intrusion-related distress | | |
Predictors	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*
X (Group)	0.26	4.81	.96	-0.47	1.37	.73	-0.40	0.63	.53
M (PTQ-S)	-	-	-	0.16	0.06	.01	0.09	0.03	.01
Constant	15.57	2.26	< .001	1.92	0.88	.03	1.03	0.59	.09
	$R^2 < .001$			$R^2 = .22$			$R^2 = .25$		
	$F(1, 42) = 0.002, p = .96$			$F(2, 41) = 4.23, p = .02$			$F(2, 41) = 3.93, p = .03$		
X (Group)	2.76	6.77	.69	-0.73	1.38	.60	-0.55	0.65	.40
M (RTQ-RNT-S)	-	-	-	0.11	0.04	.01	0.07	0.03	.02
Constant	48.04	3.08	< .001	-0.74	1.87	.70	-0.65	1.20	.59
	$R^2 = .01$			$R^2 = .19$			$R^2 = .25$		
	$F(1, 42) = 0.17, p = .69$			$F(2, 41) = 3.41, p = .04$			$F(2, 41) = 3.27, p = .05$		
X (Group)	0.44	1.27	.73	-0.30	1.28	.81	-0.24	0.63	.71
M (RTQ-ART-S)	-	-	-	-0.29	0.18	.11	-0.31	0.09	.001
Constant	10.70	0.65	< .001	7.51	2.49	.01	5.80	1.23	< .001
	$R^2 = .003$			$R^2 = .06$			$R^2 = .22$		
	$F(1, 42) = 0.12, p = .73$			$F(2, 41) = 1.44, p = .25$			$F(2, 41) = 4.23, p = .02$		

Note. *N* = 44. *Coeff.* = Unstandardised coefficients; PTQ-S = Perseverative Thinking Questionnaire – State version; RTQ-RNT-S = Repetitive Thinking Questionnaire – Repetitive Negative Thinking – State version; RTQ-ART = Repetitive Thinking Questionnaire – Absence of Repetitive Thinking – State version.

Simple mediation analyses found no evidence that the dysphoria group status indirectly influenced intrusion variables through film-related rumination with all bootstrapped 95% confidence intervals including zero. Nor did group status predict intrusion variables independent of its effect on film-related rumination.

Correlations between existing depression, trait rumination, trauma-related rumination, PTS symptoms and intrusion frequency and associated distress. As no group difference was found on any of the symptom variables (and because mediation findings were nonsignificant), whether depressive symptoms predicted later symptoms and the mediating role of film-related rumination was tested (collapsing across groups). Intercorrelations among baseline depression, trait rumination, trauma film-related rumination, and intrusion variables were also examined. See Table 10 for descriptive statistics and the correlational matrix.

Table 10

Descriptive Statistics and Intercorrelations for Existing Depression, Trait Rumination, and Film-related Rumination, PTS Symptoms and Intrusion Variables

		M	SD	1 r	2 r	3 r	4 r	5 r	6 r	7 r	8 r	9 r
1.	DASS-D	7.89	7.95	-								
2.	PTQ	30.45	12.25	.57**	-							
3.	RTQ-RNT	74.50	23.38	.09	.53**	-						
4.	RTQ-ART	8.23	3.12	.06	-.12	-.25	-					
5.	PTQ-S (3-day average)	15.64	12.84	.09	.36*	.48**	-.06	-				
6.	RTQ-RNT-S (3-day average)	48.85	17.95	.15	.33*	.47**	-.06	.96**	-			
7.	RTQ-ART-S (3-day average)	10.83	3.60	.03	-.07	-.14	.23	-.51**	-.48**	-		
8.	IES-R (3-day average)	0.86	0.62	.23	.20	.39**	-.03	.91**	.90**	-.47**	-	
9.	Intrusion frequency (T2)	4.30	4.48	-.12	.12	.27	.16	.46**	.43**	-.23	.23	-
10.	Intrusion-related distress (T2)	2.34	2.36	.08	.01	.09	.14	.50**	.48**	-.48**	.56**	.62**

Note. N = 44. DASS-D = Depression Anxiety Stress Scale – Depression; PTQ(-S) = Perseverative Thinking Questionnaire (– State version); RTQ-RNT(-S) = Repetitive Thinking Questionnaire – Repetitive Negative Thinking (– State version); RTQ-ART(-S) = Repetitive Thinking Questionnaire – Absence of Repetitive Thinking (– State version); IES-R = Impact of Event Scale – Revised.

*p < .05, **p < .01.

Contrary to prediction, existing depression was not found to be significantly correlated with later film intrusion variables or film-related rumination, although some weak correlations were observed with film-related rumination and PTS symptoms. Film-related rumination was not found to mediate the relationship between existing depression and intrusion variables (all bootstrapped 95% confidence intervals included zero). In contrast to existing depression, trait rumination was relatively consistently correlated with film-related rumination and also with PTS symptoms (albeit some nonsignificance) during the 3-day period. Film-related rumination was also consistently correlated with intrusion frequency and associated distress at 3-day follow-up, but no consistent correlations were observed for trait rumination with intrusion variables at follow-up.

Discussion

The present study used a sample presenting with high or low dysphoria to further examine whether depression would predict later trauma intrusions and posttraumatic stress symptoms, and to investigate the hypothesised mediating role of trauma-related rumination in the depression-intrusion relationship. Contrary to prediction, dysphoria group status did not predict later intrusion frequency and associated distress or posttraumatic stress symptoms related to the trauma film, and the null effects were the same for trauma-related rumination. The null findings remained unchanged when the effect of depressive symptom levels irrespective of group was examined. Consequently, no evidence for the mediation of trauma-related rumination was found. These findings are now discussed.

The null effects of baseline depression (dysphoria group status or symptom levels) on intrusions, and only an weak effect on overall posttraumatic stress symptoms in relation to the trauma film was inconsistent with Study 1 findings and clinical findings (e.g., Breslau et al., 2000; Brewin, Hunter, et al., 1996), and does not provide support for the aspects of emotional processing theory (Foa & Kozak, 1986) regarding the proposed role

of depression preventing optimal posttrauma adjustment. Further, existing depression was not strongly and consistently related to trauma-related rumination. Again, this is inconsistent with Study 1 findings. Therefore, the current findings indicate that depression is not a strong predictor for posttrauma intrusions and rumination, or that the effects of depression on posttraumatic stress reactions of symptoms and rumination are not always replicable in nonclinical samples.

On the other hand, the method of participant selection may have played a role in the current largely null findings. That is, the use of the DASS-D which indexed participants' symptoms over the immediate past week might be in some cases vulnerable to temporary fluctuation of depressive symptoms. Therefore, it is possible this method of recruitment in a nonclinical sample did not reliably differentiate between individuals with more stable symptoms of depression and those who were experiencing transient depressive states. Some evidence for this is that the anticipated group difference in trait rumination (which is a close correlate characteristic of depression) was not consistent across measures, with nonsignificant and small effect size differences observed on the RTQ. Additional evidence is that nearly half (5 out of 11) of invited participants reclassified themselves as low dysphoria when they arrived at experimental session. Although speculative, it might be that those who were experiencing more stable depression chose not to consent or participate due to experiencing depressive symptoms, and therefore those who did participate might have comprised those with more intermittent or transient depressive symptoms.

The observed correlations of trait rumination with later film-related rumination are unsurprising as ruminative tendency is considered a relatively stable characteristic (Nolen-Hoeksema et al., 1993). Despite this, inconsistencies were observed between the effects of these variables in predicting later symptoms; trait rumination did not consistently predict

intrusion variables but film-related rumination did, and film-related rumination was strongly correlated with symptoms (concurrently) but trait rumination correlated with symptoms only weakly or moderately. This indicates that although general ruminative tendency predicts the extent to which individuals ruminate about trauma, in this study it did not completely translate into how much they experience trauma intrusions and posttraumatic stress overall symptoms. The differential effects of depression, trait rumination and trauma-related rumination affecting intrusions and symptoms imply that determinants of their effects on PTSD might differ between these variables.

Although not a main focus of the current study, the prospective correlations of film-related rumination during the 3-day period with intrusions at follow-up support aspects of the cognitive model of PTSD (Ehlers & Clark, 2000) in relation to the speculated role of trauma-related rumination in maintaining symptoms. This finding also adds to past correlational findings between rumination and intrusions in analogue trauma film research (Laposa & Rector, 2012; Regambal & Alden, 2009) as well as the findings of Study 1. Accordingly, the next chapter examines the causal effect of trauma-related rumination on trauma intrusions as this has not yet been established in the literature (as was discussed in Chapter 2).

The present findings need be interpreted with caution as there were several limitations. First, despite significant efforts to improve recruitment, the sample of individuals with high dysphoria was only modest, and this and the accompanying power issues preclude strong conclusions about the largely null findings. However inspection of the key variables of interest (intrusions, intrusion-caused distress) and their accompanying confidence intervals does not suggest meaningful effect sizes between the groups were undetected; if anything, the low dysphoria group appeared to report somewhat more intrusions and greater associated distress than the high dysphoria group in a nonsignificant

but relatively consistent manner. Future research should aim to recruit a larger sample that presents with high dysphoria, although this can be difficult at university settings where the vast majority of student participants have lower levels of depression. Second, the interval of 3 days between the film and the follow-up session might not have provided enough time for film memory was to be optimally processed and habituated. If this was the case, a longer interval (e.g., 1 week as in Study 1) may allow any consequences of maladaptive processing (i.e., intrusions maintenance) to more clearly emerge, thereby increasing the chance of observing the predicted group differences on rumination and intrusions. It is also acknowledged that trauma film research typically uses 1-week interval (Holmes & Bourne, 2008) rather than a shorter interval. Finally, the analogue nature of trauma limiting the generalisability of the findings was discussed in Study 1 and nevertheless the findings might not be generalisable to male gender.

In summary, the present study did not find the effect of depression on trauma intrusions nor trauma-related rumination as a mediator of this relationship. Despite the null findings, however, film-related rumination was prospectively related to intrusion frequency and associated distress relatively consistently, implying a possibility that trauma-related rumination may still have a role in the development of intrusions and their maintenance. As the causal role of trauma-related rumination has not been clearly established in past research, this was investigated in Study 3.

CHAPTER 5 – STUDIES 3 AND 4: EFFECT OF RUMINATION AND MODERATION OF TRAIT RUMINATION AND DEPRESSION[7]

Introduction

Commonly defined as repetitive thinking about past negative experiences and negative mood (Nolen-Hoeksema, 1991; Nolen-Hoeksema et al., 2008), rumination in relation to trauma is thought of as a cognitive process that can prevent optimal adjustment following traumatic experiences (e.g., Brewin, Dalgleish, et al., 1996; Ehlers & Clark, 2000). Cognitive models of posttraumatic stress disorder (PTSD) (Ehlers & Clark, 2000; Ehlers & Steil, 1995) assume that trauma-related rumination contributes to the maintenance of PTSD as it may function as cognitive avoidance, facilitate maladaptive appraisals, and increase access to distressing trauma memories. There is support for elements of this proposition, with clinical findings showing that trauma-related rumination correlates with severity of PTSD symptoms cross-sectionally and prospectively (e.g., Ehlers et al., 1998; Michael et al., 2007).

The role of trauma-related rumination on posttraumatic stress symptoms has been investigated in experimental research. These experimental studies commonly instruct nonclinical participants to watch a film with traumatic content before manipulating post-film cognitive processing. Participants' symptoms are then assessed including the hallmark PTSD symptom of intrusive experiences (Holmes & Bourne, 2008). Earlier research has also found that experimentally induced worry leads to the development of intrusive experiences of analogue trauma (Butler et al., 1995; Wells & Papageorgiou, 1995). Given that worry shares many similarities to rumination, with a key difference being worry is

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[7] This chapter is currently under review for publication; Kubota, R. & Nixon, R. D. V. An analogue investigation into the effect of trauma-related rumination on trauma intrusions and moderations of trait rumination and depression. Additionally, parts of this chapter were presented by the author at 18th Australasian Conference on Traumatic Stress, September, 2014, Melbourne, Australia, and at 31st Annual Meeting of International Society for Traumatic Stress Studies, November, 2015, New Orleans, USA.

oriented to feared future outcomes (Ehring & Watkins, 2008; J. M. Smith & Alloy, 2009) and given that rumination can include thoughts not only about the past but also future (Ehlers & Clark, 2000; Ehring & Watkins, 2008), results from these studies could be considered indirect evidence for the possible causal effect of rumination on trauma intrusions.

However, direct manipulations of trauma-related rumination have yielded inconsistent results. In several studies participants have been shown trauma films depicting real life footage of road traffic accidents and randomly allocated to either a rumination condition or control, and reported intrusions either within the initial experimental session (Ehring, Szeimies, et al., 2009; Zetsche et al., 2009) or for 1 week after the film (Ball & Brewin, 2012; Warnock, 2012). With the exception of Ball and Brewin (2012), these studies found no group differences on intrusive experiences. Ball and Brewin (2012) included trauma-specific rumination and general rumination groups (i.e., rumination relating to the film or financial crisis, respectively) and found that the rumination groups combined together had a greater number of intrusions than the no-task control, whereas film-specific rumination did not lead to more intrusions than general rumination. In a similar study using a distressing personal experience as an index memory, a rumination induction resulted in more intrusions of the experience in comparison with a distraction control immediately after the experimental manipulation, but a meaningful effect was not seen after a symptom provocation task (Ehring, Fuchs, et al., 2009). These mixed findings suggest a need for replication before the causal role of trauma-related rumination on intrusion symptoms can be established. In addition, the pattern of past results suggests that trait rumination and existing depression might be responsible for some of the discrepant findings, and these are discussed below.

First, the distinction between general ruminative styles (trait rumination) versus situation specific rumination may account for some of these findings. To date the only study that has documented an effect of experimentally induced rumination used a sample that was already identified as moderate in levels of trait rumination (Ball & Brewin, 2012). Ruminative tendency is considered a relatively stable characteristic that can be triggered by a stressful experience (see J. M. Smith & Alloy, 2009, for review) and has been shown to correlate with naturally occurring trauma film-related rumination and film intrusions (Kubota, Nixon, & Chen, 2015). Therefore upon experimental instruction to ruminate, habitual ruminators might more easily engage in maladaptive rumination than their less ruminative counterparts, maximising the likelihood of effects on intrusive experiences.

Second, levels of existing depression may also moderate the effects of induced trauma-related rumination on trauma intrusions. An established correlate of rumination (see Watkins, 2008, for review), depression is proposed to interfere with optimal emotional processing of trauma memory, leading to the maintenance of PTSD (Foa & Kozak, 1986). Consistent with this proposition, individuals with PTSD and comorbid Major Depressive Disorder were found to have greater severity of PTSD symptoms than PTSD suffers without depression (Nixon et al., 2004), having depression prior to trauma exposure increases risk of developing PTSD (Shalev et al., 1998) and in analogue film research, existing depression was found to correlate with film intrusions (Kubota et al., 2015). Furthermore, low mood and negative thought contents are proposed to contribute to the persistence of ruminative thinking (Meeten & Davey, 2011; Watkins & Nolen-Hoeksema, 2014). Taken together, individuals with higher levels of depression may be more likely to employ ruminative thinking upon trauma exposure relative to those with low levels of depression, and in turn this should result in greater severity of trauma intrusions.

In addition to intrusion symptoms, rumination has also been proposed to influence other posttraumatic stress symptoms and correlates. Again, somewhat inconsistent findings exist in analogue trauma rumination studies. Whereas induced trauma-related rumination resulted in the maintenance of physiological arousal (Ehring, Szeimies, et al., 2009), negative affect (Ehring, Fuchs, et al., 2009; Ehring, Szeimies, et al., 2009), sad mood (Zetsche et al., 2009) and anxious mood (albeit only a nonsignificant trend) (Warnock, 2012), several null findings within these studies were also reported (e.g., the influence of rumination on fearful mood was not observed by Zetsche et al., 2009; Warnock, 2012 failed to observe an impact on low mood; Ehring, Fuchs et al., 2009 did not find an influence on physiological arousal). These mixed findings are inconsistent with models of depression (e.g., response styles theory of depression) and with clinical findings that indicate rumination increases depression (e.g., Nolen-Hoeksema & Morrow, 1991; Nolen-Hoeksema et al., 1994). They are also in contrast to cognitive models of PTSD that propose trauma-related rumination can function as a reminder of trauma, thereby increasing anxiety and arousal (Ehlers & Clark, 2000). Again, studies with clinical samples have shown that rumination predicts later anxiety symptoms (Michl et al., 2013; Nolen-Hoeksema, 2000). Accordingly, the causal role of trauma-related rumination on these symptoms and correlates needs further investigation.

Using a trauma film design, we conducted two experiments to test the effects of trauma-related rumination on trauma intrusions and related symptoms, with a specific interest as to whether general ruminative tendency and existing depression would moderate the rumination-intrusion relationship. We had three key predictions. First, participants in the rumination condition would have a greater frequency of intrusions and associated distress as well as greater severity of other symptoms relative to controls. Second, participants' trait rumination and existing depressive symptoms would moderate the effect

of the experimental manipulation on intrusion frequency and associated distress;

specifically, the effect of induced rumination would be stronger for those with higher

levels of trait rumination and existing depression. Third, film-related rumination would

mediate the effect of induced rumination on intrusion frequency and associated distress for

participants with higher trait rumination and existing depression.

Study 3

Method

Participants

Participants were 60 female university students with a M_{age} of 20.70 ($SD = 5.34$)

who received course credits or financial reimbursement ($AUD25) for participation. We

only used female participants to ensure there was not a confound of gender on the results

due to the type of film stimulus used. Participants were screened to ensure they did not

have a current formal diagnosis of a mental health disorder.

Materials

Analogue trauma film. The film clip contained an 8-minute compilation of

fictional scenes of sexual and physical assaults that were extracted from the film

Irreversible. The film clip has been successful in inducing intrusive experiences (e.g.,

Nixon et al., 2007).

Experimental manipulation. A short transcript and sentences used by Ehring,

Szeimies, et al. (2009) were adapted for the rumination or distraction inductions. The

stimuli were translated to English and were slightly modified to match the film contents.

See Appendix C1 for the transcript and sentences.

Film-reminders. Exposure to film-reminders was used, which allowed the

measurement of intrusive re-experiencing triggered by external reminders. In line with

Ehring, Szeimies, et al. (2009), five still pictures (10 s each) and three sounds (20 s each) were used as reminders. The pictures were taken from scenes of the film that participants have not viewed. Three sounds were selected out of 13 sounds of similar contents downloaded from YouTube that were rated by a separate sample ($N = 6$) as the strongest reminders with Ms between 3.50 and 4.33 on a 1 (*not at all*) to 5 (*extremely*) scale. The stimuli were presented with 10 s intervals with a black screen.

Measures

  Trait and state rumination. Trait rumination was measured with the Repetitive Thinking Questionnaire (RTQ; McEvoy et al., 2010) and Perseverative Thinking Questionnaire (PTQ; Ehring, 2007). The RTQ comprises Repetitive Negative Thinking (RTQ-RNT; 27 items) and Absence of Repetitive Thinking (RTQ-ART; 4 items) subscales. Participants rated each item on a scale ranging from 1 (*not at all*) to 5 (*very true*). Internal consistency has been reported with Cronbach's αs = .88 and .62 for RNT and ART subscales, respectively (Mahoney, McEvoy, & Moulds, 2012), and the current study had αs = .91 and .61 for the respective subscales. The PTQ is a 15-item questionnaire measuring one's trait levels of maladaptive rumination on a scale ranging from 0 (*never*) to 4 (*almost always*). Internal consistency of the PTQ has been reported with Cronbach's αs = .94-.95 (Ehring et al., 2011). In the present study, α = .95. State versions of these scales (RTQ-S and PTQ-S) were used to measure levels of film-related rumination.

  Manipulation check. The Manipulation Check Questionnaire (MCQ; Ehring, Szeimies, et al., 2009) and the PTQ-S were administered for manipulation check purposes.

  Existing depression. The 14-item Depression subscale of the Depression Anxiety Stress Scale (DASS-D; Lovibond & Lovibond, 1995) was used to measure participants' existing depression symptoms. Participants responded according to how much the

statement applied to them over the past week using a 4-point severity scale. The DASS-D possesses excellent internal consistency with Cronbach's $\alpha = .96$ (T. A. Brown et al., 1997). In the present study, $\alpha = .88$.

Intrusions. Participants' intrusive experiences at laboratory were assessed during 2-minute heart-rate assessment periods and 5-minute intrusion monitoring tasks. After each 2-minute period, the Intrusions Questionnaire was administered to document the number of intrusions and associated distress on a scale that ranged from 0 (*not at all distressing*) to 10 (*extremely distressing*). During the 5-minute periods, participants were asked to press a button to report every occurrence of intrusions, and this was recorded via Neurobehavioral Systems Presentation software (www.neurobs.com). Participants then completed the 0-10 scale associated distress rating. Intrusions during the 1-week period were recorded using a daily diary.

Mood. Participants' state moods (anxious, sad and happy) were measured using rating scales ranged from 0 (*not at all*) to 10 (*extremely*).

Arousal. Heart-rate was measured as an index of participants' arousal levels. Participants wore a Polar RS800CX Wearlink heart-rate monitor band (Polar Electro; Kempele, Finland) around their chest, and their interbeat intervals were recorded continuously during the experimental session. The device has been shown to reliably assess interbeat intervals (D. L. King et al., 2013). Recorded heart-rate data were subsequently transmitted to the Polar Protrainer version 5 software, which produced heart-rate interbeat in intervals of 5 s. Using the software error correction facility, artefacts in the data (5%) due to measurement errors were easily detected, removed and interpolated prior to analysis.

PTS symptoms. Participants' posttraumatic stress (PTS) symptoms during the week after film were measured using the Impact of Event Scale-Revised (IES-R; Weiss &

Marmar, 1997). The IES-R is a 22-item self-report scale consisting of intrusions, avoidance and hyperarousal symptom subscales assessed on a 5-point severity scale. Internal consistency has been reported with Cronbach's αs = .87-.92, .84-.86 and .79-.90 for intrusions, avoidance and hyperarousal subscales, respectively (Weiss & Marmar, 1997), and the current study had αs = .83, .82 and .77 for the respective subscales.

Prior trauma. The following well-established measures related to prior trauma were administered in the event that these variables needed to be controlled when examining the effect of experimental manipulation. The PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013) is a 20-item self-report measure of PTSD symptoms measured on a 5-point severity scale. The Posttraumatic Cognitions Inventory (PTCI; Foa et al., 1999) is a 36-item questionnaire used to assess participants' baseline trauma-related negative thoughts and appraisals on a 1 (*totally disagree*) to 7 (*totally agree*) scale.

Procedure

Figure 4 summarises the procedure.

Participants complete DASS-D, PCL-5, PTCI, RTQ and PTQ and baseline heart-rate assessment

⇩

Participants view film

⇩

Participants complete heart-rate/ intrusion assessment (T1a), Intrusions Questionnaire and mood and film ratings

⇩

Participants complete intrusion monitoring task (T1b) and intrusion-related distress rating

⇩

Experimental group allocation

⇩   ⇩

Rumination	Distraction

Participants complete respective tasks

⇩

Participants complete heart-rate/ intrusion assessment (T2a), Intrusions Questionnaire, mood ratings, MCQ and PTQ-S

⇩

Participants complete intrusion monitoring task (T2b) and intrusion-related distress rating

⇩

Participants view and hear film-reminders

⇩

Participants complete heart-rate/ intrusion assessment (T3a), Intrusions Questionnaire and mood ratings

⇩

Participants complete intrusion monitoring task (T3b) and intrusion-related distress rating

⇩

Participants leave experimental session and complete daily intrusions record for 7 days as well as RTQ-S and PTQ-S on Day 3 and Day 7

⇩

Participants return after 1 week and complete intrusion monitoring task, intrusion-related distress rating and IES-R

Figure 4. Flow diagram summarising the experimental procedure. DASS-D = Depression Anxiety Stress Scale – Depression; PCL-5 = PTSD Checklist for DSM-5; PTCI = Posttraumatic Cognitions Inventory; RTQ(-S) = Repetitive Thinking Questionnaire (– State version); PTQ(-S) = Perseverative Thinking Questionnaire (– State version); MCQ = Manipulation Check Questionnaire; IES-R = Impact of Event Scale-Revised.

<p style="text-align:center">Results</p>

Manipulation Check and Covariates

A total of 57 participants watched the entire film clip. The groups were comparable on age, baseline questionnaires and film ratings (see Table 11; correlations are reported in Table D1 in Appendix D).

Table 11

Age, Baseline Questionnaire Scores, Pre-film Mood and Heart-rate and Film Ratings by Group

	Rumination (n = 28)		Distraction (n = 29)		Statistic		
	M	SD	M	SD	t	df	d
Age	19.79	3.63	21.66	6.73	1.30	55	0.34
Baseline questionnaire							
DASS-D	6.39	6.18	6.34	4.57	0.03	49.66	0.01
RTQ-RNT	69.98	17.85	72.16	20.87	0.42	55	0.11
RTQ-ART	7.93	2.48	8.31	3.27	0.50	55	0.13
PTQ	29.89	12.27	29.93	12.30	0.01	55	< 0.01
PCL-5	13.91	13.90	13.88	16.90	0.01	36	< 0.01
PTCI	80.81	28.11	84.71	40.37	0.35	36	0.11
Pre-film mood							
Anxious	3.43	2.28	3.83	2.48	0.63	55	0.17
Sad	2.14	2.17	2.17	2.09	0.05	55	0.01
Happy	5.86	1.48	5.97	1.94	0.24	55	0.06
Pre-film heart-rate	76.23	9.33	75.84	11.83	0.14	51	0.04
Film ratings							
Distress	8.18	1.66	8.31	2.19	0.26	55	0.07
Unpleasantness	9.14	1.41	8.79	1.92	0.78	55	0.21
Attention	8.00	1.49	8.31	1.83	0.70	55	0.19

Note. DASS-D = Depression Anxiety Stress Scale – Depression; RTQ-RNT = Repetitive Thinking Questionnaire – Repetitive Negative Thinking; RTQ-ART = Repetitive Thinking Questionnaire – Absence of Repetitive Thinking; PTQ = Perseverative Thinking Questionnaire; PCL-5 = PTSD Checklist for DSM-5; PTCI = Posttraumatic Cognitions Inventory.
Degrees of freedom vary due to not all participants having experienced a trauma (PCL-5, PTCI) and equipment failure (heart-rate).

Overall, the experimental manipulation appeared successful. The rumination group tended to think about the film more ($p = .01$, $d = 0.77$), felt more driven to think about the film ($p = .01$, $d = 0.74$), and felt more distressed during the task ($p < .001$, $d = 2.23$) than the distraction group (see Table D2 in Appendix D). The PCL-5 and PTCI did not consistently correlate with intrusion variables (rs ranging from -.11 to .32, ps from .05 to .99; see Table D3 in Appendix D).

Effects of Experimental Manipulation

Intrusions. Group differences on intrusion variables at the initial experimental session were tested using 2 (condition) × 3 (time) mixed ANOVAs, and t-tests were conducted for 1-week follow-up analyses (see Table 12 for statistics).

Table 12

Effects of Experimental Manipulation on Intrusion Variables at Initial and Follow-up Sessions

	Rumination (n = 28)		Distraction (n = 29)		Condition			Statistic Time			Condition × Time		
	M	SD	M	SD	F	df	η_p^2	F	df	η_p^2	F	df	η_p^2
Heart-rate/ intrusion assessment period (initial session)													
Frequency					0.23	1, 54	.004	26.26**	2, 108	.33	1.78	2, 108	.03
Post-film (T1a)	4.92	3.45	5.15	2.93									
Post-manipulation (T2a)	2.92	3.30	1.79	1.61									
Post-reminder (T3a)	2.92	2.52	2.96	2.52									
Associated distress					0.08	1, 55	.001	49.81**	2, 110	.48	1.44	2, 110	.03
Post-film (T1a)	6.61	2.06	7.07	2.09									
Post-manipulation (T2a)	4.21	3.16	3.52	2.77									
Post-reminder (T3a)	3.96	2.98	3.69	2.92									
Intrusion monitoring period (initial session)													
Frequency					0.08	1, 55	.001	40.31**	1.56, 85.90	.42	0.26	1.56, 85.90	.01
Post-film (T1b)	9.67	7.77	9.16	7.52									
Post-manipulation (T2b)	5.84	5.81	5.11	4.79									
Post-reminder (T3b)	5.26	5.00	5.25	4.96									
Associated distress					0.40	1, 55	.01	40.37**	1.56, 85.90	.42	0.71	1.56, 85.90	.01
Post-film (T1b)	5.61	2.17	4.97	2.56									
Post-manipulation (T2b)	3.39	2.67	2.93	2.31									
Post-reminder (T3b)	3.11	2.85	3.10	2.41									
One-week follow-up intrusion monitoring period					t	df	d						
Frequency	2.49	2.95	2.45	3.13	0.05	54	0.01						
Associated distress	1.39	1.77	1.64	2.02	0.49	54	0.13						

Note. Degrees of freedom vary due to missing responses and lost to follow-up.

**$p < .001$.

There were no baseline group differences on any intrusion variables, all ps > .31, ds < 0.27. For both intrusion frequency and associated distress, there was no main effect of group, but the main effect of time was significant. No group × time interaction was found for frequency or associated distress, all ps > .17, and the groups were comparable on these variables at the initial session and also at 1-week follow-up, all ps > .10, ds < 0.49.

Intrusions during 1 week were examined using 2 (condition) × 7 (time) mixed ANOVAs, and t-tests were used for IES-R intrusion. No group difference was found during 1 week for intrusion frequency (p = .28, η_p^2 = .02), associated distress (p = .92, η_p^2 = .01) or IES-R intrusion (p = .31, d = 0.28) (see Table D4 in Appendix D).

Other symptoms. The effect of experimental manipulation on mood, heart-rate, and other clusters of IES-R was examined (see Table D5 in Appendix D). The group × time interactions were significant for all mood types, all ps < .05, η_p^2s > .06. At T2 (after the induction), the rumination group rated higher on sad mood (p = .04, d = 0.53) and lower on happy mood (p = .01, d = 0.73) than the distraction group. No significant group differences were found on anxious mood (p = .29, d = 0.25). At T3, however, no group differences were found on any mood type, all ps > .24, ds < 0.33. For heart-rate, the group × time interactions were nonsignificant, all ps > .74, η_p^2s < .01, and no group differences were found on the avoidance and hyperarousal subscales of IES-R, all ps > .46, ds < .21.

Moderation Analysis

The SPSS macro PROCESS (Hayes, 2013) was used to test the predictions that trait rumination and existing depression would moderate the effect of the experimental manipulation on intrusions. Experimental condition and baseline measure scores were mean centred prior to analysis. Significant moderations were probed with simple slopes analyses.

At T2a (after the induction), a significant moderation of RTQ-RNT was found for intrusion frequency (see Table 13). Figure 5 exhibits the result of a simple slopes analysis.

Table 13

Linear Model of Predictors (Experimental Condition and Trait Rumination) of Intrusion Frequency at T2a (Immediately after Experimental Manipulation)

	Coeff.	CI$_{95}$	*SE*	*t*	*p*
Constant	2.37	[1.79, 2.95]	0.29	8.22	< .001
RTQ-RNT	0.07	[0.04, 0.10]	0.02	4.15	< .001
Experimental condition	-1.21	[-2.39, -0.04]	0.59	2.07	.04
RTQ-RNT × Experimental condition	-0.12	[-0.19, -0.06]	0.03	3.76	< .001

Note. $N = 56$. $R^2 = .41$. *Coeff.* = Unstandardized coefficient; RTQ-RNT = Repetitive Thinking Questionnaire – Repetitive Negative Thinking.
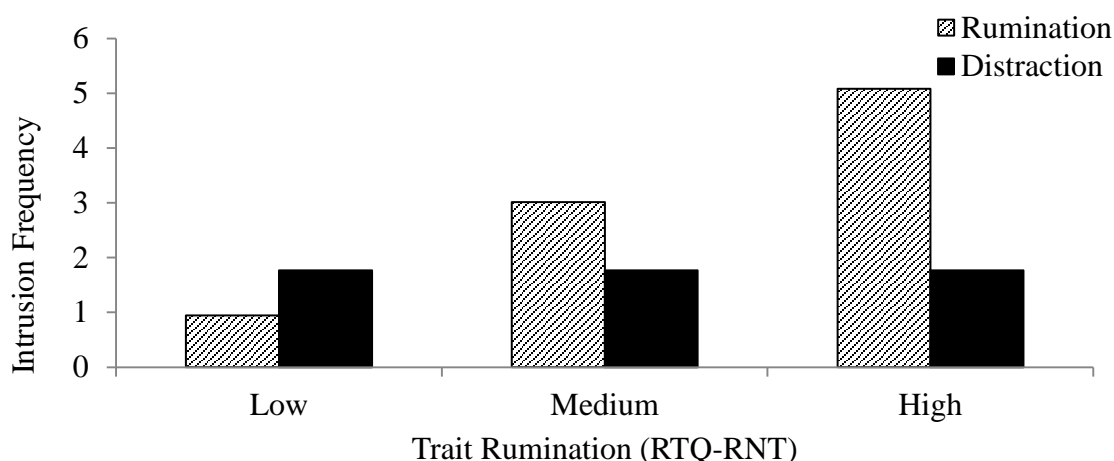
Figure 5. Mean intrusion frequency at T2a (immediately after the experimental manipulation) by group and trait rumination (RTQ-RNT). When trait rumination was low (i.e., 1 *SD* below the mean), there was a nonsignificant relationship between experimental condition and intrusion frequency ($B = 1.15$, CI$_{95}$ [-0.37, 2.66], $t = 1.52$, $p = .13$); at the mean value of trait rumination, there was an effect of experimental condition on intrusion frequency ($B = -1.21$, CI$_{95}$ [-2.39, -0.04], $t = 2.07$, $p = .04$); and this relationship became stronger at high levels of trait rumination (i.e., 1 *SD* above the mean) ($B = -3.58$, CI$_{95}$ [-5.49, -1.67], $t = 3.75$, $p < .001$).

No other moderation of trait rumination or existing depression was found, all *p*s > .06.

Moderated Mediation Analysis

Next, we tested whether the significant moderation of trait rumination occurred through film-related rumination (i.e., moderated mediation). PROCESS produced estimates of the direct and indirect effects of the experimental condition on intrusion frequency at T2 through film-related rumination (PTQ-S) at the time of manipulation, and reports whether these effects were moderated by trait rumination (RTQ-RNT) (see Figure 6 for those pathways). Indirect effects were estimated based on bias-corrected 5,000 bootstrapped samples.
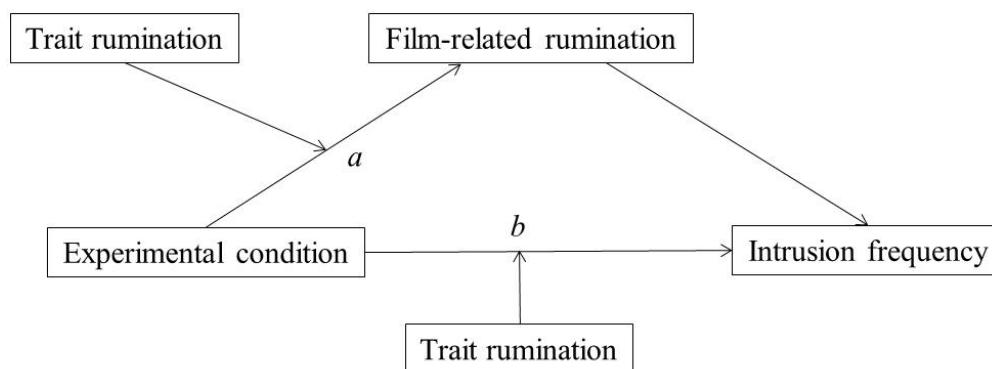
Figure 6. Moderated mediation model: Indirect effect of experimental manipulation on intrusion frequency via film-related rumination by trait rumination.

In the analysis of pathway *a*, although not formally significant, there was a suggestion that the condition × trait rumination interaction was a predictor of film-related rumination, $B = -0.32$, CI_{95} [-0.71, 0.07], $t(56) = 1.67$, $p = .10$. This indicates that the experimental condition had a different effect on film-related rumination for participants with different levels of trait rumination. More robust evidence for this interaction was seen when intrusion frequency was the dependent variable of interest, $B = -0.10$, CI_{95} [-.16, -.05], $t(56) = 3.64$, $p < .001$ (pathway *b*). As shown in Table 14, in the case of high trait ruminators (i.e., 1 *SD* above the mean), film-related rumination partially mediated the effect of the experimental manipulation on intrusion frequency, and full mediation was

found at the mean value of trait rumination. However, the mediation was not observed in

participants with lower general ruminative tendency (i.e., 1 *SD* below the mean).

Table 14

Direct and Indirect Effects of Experimental Manipulation on Intrusion Frequency via

Film-related Rumination at Different Levels of Trait Rumination

Trait rumination (RTQ-RNT)	Indirect effect		Direct effect	
	Coeff.	CI_{95}	*Coeff.*	CI_{95}
Low	-0.06	[-0.77, 0.69]	1.21	[0.07, 2.34]
Medium	-0.50	[-1.11, -0.12]	-0.71	[-1.88, 0.45]
High	-0.94	[-1.99, -0.32]	-2.64	[-4.55, -0.72]

Note. N = 56. *Coeff.* = Unstandardized coefficient; RTQ-RNT = Repetitive Thinking

Questionnaire – Repetitive Negative Thinking.

Discussion

Contrary to prediction, the rumination group did not experience more film

intrusions nor associated distress than the distraction control. Despite this, as predicted,

there was a moderation of trait rumination for intrusion frequency, which occurred partly

through film-related rumination (although this was not found for intrusion-related distress).

However, the moderation effect was not continued either later in the experimental session

or over the week. The lack of a longer-term effect might be because the ruminative

sentences were not particularly personally relevant to participants. As rumination is

considered to typically involve self-relevant themes (Nolen-Hoeksema et al., 2008), lower

self-relevance of ruminative thoughts would be less likely to influence later symptoms. In

addition, for unknown reasons, the current study failed to achieve the same level of

engagement (e.g., concentration, time spent thinking about task questions) as past research

(Ehring, Szeimies, et al., 2009; Zetsche et al., 2009). Whether a stronger induction of

trauma-related rumination would produce more consistent longer-term moderation remains

to be examined. Another unanswered question is whether the distraction induction constituted an appropriate control. As a distraction task might prevent optimal post-event processing of trauma and associated emotions (Ehring, Szeimies, et al., 2009), this might have resulted in the maintenance of intrusion symptoms. The effect of distraction may be clarified by emotional processing theory (Foa & Kozak, 1986) positing the importance of optimal emotional engagement for optimal posttrauma adjustment. Similarly cognitive theorists (e.g., Brewin, Dalgleish, et al., 1996; Ehlers & Clark, 2000) argue that avoidance of trauma memory leads to the maintenance of PTSD, and distraction may be analogous to the effect of thought suppression where rebound of trauma intrusions might occur (Wenzlaff & Wegner, 2000). In analogue trauma film intrusions research, null effects of induced state rumination (Ehring, Szeimies, et al., 2009; Warnock, 2012; Zetsche et al., 2009) have been observed when compared with distraction controls, whereas the only study to date that has found an effect of a rumination induction employed a no-task control comparison (Ball & Brewin, 2012). If distraction did paradoxically maintain intrusive experiences, the effect of induced rumination may have been obscured.

Study 4

Study 4 made methodological modifications to strengthen the ruminative experiences in the rumination condition and used a free-thinking control. Other aspects of the methodology were identical to Study 3 unless otherwise specified.

Method

Participants

Participants were 60 female university students with a M_{age} of 23.77 ($SD = 7.48$) who received course credits or financial reimbursement ($AUD30).

Materials

Analogue trauma film and film-reminders. Due to time constraints given the overall experimental tasks, only the sexual assault scene (4 minutes) of the same film was used. This scene was chosen over the physical assault scene based on greater distress rating (Ms = 6.01 and 5.62 for the respective scene) on the day of the film in Study 3. Two reminder pictures were replaced accordingly.

Experimental manipulation. Five sentences that Study 3 participants spent the longest time thinking about were used. Each sentence was presented for 1 minute during which participants were instructed to dwell on them, and then they were asked to write briefly the contents of their thoughts within 2 minutes. After completing five sentences, participants selected one sentence out of the five that meant the most to them (i.e., one that seemed most relevant to them, or one that they really kept thinking about), and read the selected sentence for 3 minutes before writing down a summary of their thoughts. Piloting suggested the new methods were an improvement (see Table D6 in Appendix D). In the *free-thinking condition*, participants were instructed to think about anything they would like for 1 minute, and then write a summary of their thoughts. After repeating the task five times, participants were asked to spend 3 minutes thinking about anything they prefer and then again write their thought contents. Appendix C2 details the manipulation materials.

Measures and Procedure

Study 4 focused on intrusion symptoms due to time constraints. Figure 7 summarises the procedure.

```
┌─────────────────────────────────────────────────────────────────────────┐
│          Participants complete DASS-D, PCL-5, PTCI, RTQ and PTQ           │
└─────────────────────────────────────────────────────────────────────────┘
                                    ⇩
┌─────────────────────────────────────────────────────────────────────────┐
│                            Participants view film                          │
└─────────────────────────────────────────────────────────────────────────┘
                                    ⇩
┌─────────────────────────────────────────────────────────────────────────┐
│   Participants complete intrusion monitoring task (T1) and intrusion-related distress │
│                         rating and film ratings                            │
└─────────────────────────────────────────────────────────────────────────┘
                                    ⇩
┌─────────────────────────────────────────────────────────────────────────┐
│                        Experimental group allocation                       │
└─────────────────────────────────────────────────────────────────────────┘
              ⇩                                           ⇩
┌───────────────────────────────┐       ┌───────────────────────────────────┐
│          Rumination            │       │           Free-thinking            │
└───────────────────────────────┘       └───────────────────────────────────┘
┌─────────────────────────────────────────────────────────────────────────┐
│                  Participants complete the respective tasks                │
└─────────────────────────────────────────────────────────────────────────┘
                                    ⇩
┌─────────────────────────────────────────────────────────────────────────┐
│                    Participants complete MCQ and PTQ-S                      │
└─────────────────────────────────────────────────────────────────────────┘
                                    ⇩
┌─────────────────────────────────────────────────────────────────────────┐
│   Participants complete intrusion monitoring task (T2) and intrusion-related distress │
│                                  rating                                     │
└─────────────────────────────────────────────────────────────────────────┘
                                    ⇩
┌─────────────────────────────────────────────────────────────────────────┐
│                  Participants view and hear film-reminders                  │
└─────────────────────────────────────────────────────────────────────────┘
                                    ⇩
┌─────────────────────────────────────────────────────────────────────────┐
│   Participants complete intrusion monitoring task (T3) and intrusion-related distress │
│                                  rating                                     │
└─────────────────────────────────────────────────────────────────────────┘
                                    ⇩
┌─────────────────────────────────────────────────────────────────────────┐
│  Participants leave experimental session and complete daily intrusions record for 7 days │
│              as well as RTQ-S and PTQ-S on Day 3 and Day 7                  │
└─────────────────────────────────────────────────────────────────────────┘
                                    ⇩
┌─────────────────────────────────────────────────────────────────────────┐
│   Participants return after 1 week and complete intrusion monitoring task, intrusion- │
│                  related distress rating and IES-R intrusion               │
└─────────────────────────────────────────────────────────────────────────┘
```

Figure 7. Flow diagram summarising the experimental procedure. DASS-D = Depression Anxiety Stress Scale – Depression; PCL-5 = PTSD Checklist for DSM-5; PTCI = Posttraumatic Cognitions Inventory; RTQ(-S) = Repetitive Thinking Questionnaire (– State version); PTQ(-S) = Perseverative Thinking Questionnaire (– State version); MCQ = Manipulation Check Questionnaire; IES-R = Impact of Event Scale-Revised.

Results

Manipulation Check and Covariates

No significant baseline group differences were found (see Table 15; correlations are shown in Table D7 in Appendix D).

Table 15

Age, Baseline Questionnaire Scores and Film Ratings by Group

	Rumination (*n* = 29)		Free-thinking (*n* = 30)		Statistic		
	M	*SD*	*M*	*SD*	*t*	*df*	*d*
Age	24.28	8.22	23.37	6.93	0.46	57	0.12
Baseline questionnaire							
DASS-D	4.34	5.34	5.83	6.78	0.94	57	0.24
RTQ-RNT	71.07	20.92	73.53	27.65	0.39	53.93	0.10
RTQ-ART	7.79	2.48	8.00	2.74	0.30	57	0.08
PTQ	26.69	9.30	25.87	13.49	0.27	57	0.07
PCL-5	19.10	14.26	14.26	13.14	1.02	38	0.35
PTCI	88.38	32.45	73.53	30.21	1.49	38	0.47
Film ratings							
Distress	8.14	2.26	8.13	1.48	0.01	57	0.01
Unpleasantness	8.72	2.19	8.87	1.87	0.27	57	0.07
Attention	7.86	1.64	8.57	1.41	1.77	57	0.47

Note. DASS-D = Depression Anxiety Stress Scale – Depression; RTQ-RNT = Repetitive Thinking Questionnaire – Repetitive Negative Thinking; RTQ-ART = Repetitive Thinking Questionnaire – Absence of Repetitive Thinking; PTQ = Perseverative Thinking Questionnaire; PCL-5 = PTSD Checklist for DSM-5; PTCI = Posttraumatic Cognitions Inventory.

Degrees of freedom vary due to not all participants having experienced a trauma (PCL-5, PTCI).

Overall, the experimental manipulation appeared successful. The rumination group felt somewhat more driven to think about the film ($p = .06$, $d = 0.51$) and felt more distressed during the task ($p < .001$, $d = 1.42$) than the free-thinking group (see Table D8 in Appendix D). The results of manipulation check were also compared to Study 3. The current rumination group showed comparable scores with Study 3 rumination group, all ds < 0.23 on the MCQ items and PTQ-S, suggesting that the modified methods for rumination induction failed to strengthen ruminative experiences (despite the improvement shown in piloting). The free-thinking group spent more time remembering the film and felt more distressed during manipulation than the Study 3 distraction control, all ds > 0.63, indicating that this non-distraction control instruction did not prevent further processing of the film memory and related distress as much as the distraction procedure. Hence, differences in findings between the experiments are likely to be attributable to the different control group rather than the changes with ruminative experiences. There was not a consistent pattern of correlations between the PCL-5 and PTCI and intrusion variables across time (rs ranging from .14 to .60, ps from > .001 to .39; see Table D9 in Appendix D).

Effects of Experimental Manipulation

Table 16 summarises statistics for the initial and follow-up sessions.

Table 16

Effects of Experimental Manipulation on Intrusion Variables at Initial and Follow-up Sessions

	Rumination (n = 29)		Free-thinking (n = 30)		Statistic								
					Condition			Time			Condition × Time		
	M	*SD*	*M*	*SD*	*F*	*df*	η_p^2	*F*	*df*	η_p^2	*F*	*df*	η_p^2
Frequency (initial session)					0.20	1, 56	.004	8.51**	2.112	.13	2.95	2, 112	.05
Post-film (T1)	9.94	8.58	13.07	8.86									
Post-manipulation (T2)	7.59	7.15	8.21	8.65									
Post-reminder (T3)	9.30	7.39	7.97	7.34									
Associated distress (initial session)					1.21	1, 56	.02	25.24**	2, 112	.31	3.26*	2, 112	.06
Post-film (T1)	6.36	3.15	6.63	2.43									
Post-manipulation (T2)	4.96	2.58	3.37	3.00									
Post-reminder (T3)	4.68	2.92	3.93	3.12									
One-week follow-up					*t*	*df*	*d*						
Frequency	2.28	2.91	4.10	3.52	2.12*	54	0.57						
Associated distress	1.55	2.13	1.83	2.19	0.49	54	0.13						

Note. Degrees of freedom vary due to missing responses, equipment failure and lost to follow-up.

p < .05, **p* < .001.

There was no baseline group difference in intrusion variables, all $ps > .17$, $ds < 0.36$. For both intrusion frequency and associated distress, there was no main effect of group, but the main effect of time was significant. For intrusion frequency, there was a nonsignificant trend for a group × time interaction, $p = .06$. However, no group differences were observed either at T2, $p = .77$, $d = 0.08$, or at T3, $p = .49$, $d = 0.15$. For intrusion-related distress, the group × time interaction was significant, $p = .04$. As depicted in Figure 8, this appeared to be driven by greater intrusion-related distress in the rumination group than the free-thinking group at T2, $p = .03$, $d = 0.57$, although this difference was not maintained at T3, $p = .35$, $d = 0.19$.
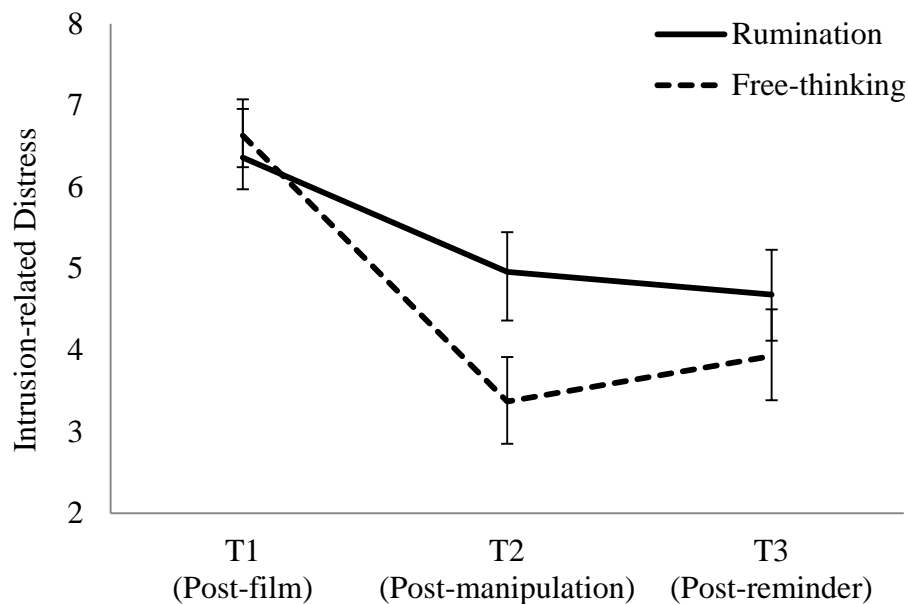
Figure 8. Mean intrusion-related distress (± standard error of the mean) over time by group.

At 1-week follow-up, the rumination group surprisingly had *fewer* intrusions than the free-thinking group. This was unexpected, however controlling for baseline T1 (post-film) intrusions rendered the difference nonsignificant, $p = .14$, $\eta_p^2 = .04$. However, at this time the groups were comparable on intrusion-related distress. No group differences were observed during 1 week for intrusion frequency ($p = .26$, $\eta_p^2 = .03$), associated distress ($p = .62$, $\eta_p^2 = .01$) or IES-R intrusion ($p = .87$, $d = 0.04$) (see Table D10 in Appendix D).

Moderation Analysis

No significant moderation of trait rumination or existing depression was found, all ps > .08.

General Discussion

The chief aims of the two experiments were to examine the effect of trauma-related rumination on analogue trauma intrusions, and the moderating roles of trait rumination and existing depression. The main findings were that trait rumination was a moderator of intrusion frequency in Study 3, and induced rumination increased intrusion-related distress in Study 4. However, a number of nonsignificant findings were also observed, including that pre-existing depression was not a moderator of intrusive experiences. These findings and their implications are elaborated on as follows.

In Study 3 we found that the effect of induced rumination on intrusion frequency was modified by trait rumination immediately after the induction. Thus, as discussed earlier, the inconsistencies in past analogue trauma rumination studies may be accounted for by different levels of trait rumination. A possible clinical implication is that when habitual ruminators engage in maladaptive trauma-related rumination upon trauma exposure, they may be more at risk of persistent trauma intrusions than people with low ruminative tendency. However, this moderation finding needs be interpreted with caution as it was not replicated in Study 4. Correlational data suggested that the distraction control may have interfered with the opportunity to ruminate in Study 3, whereas in the absence of a distraction instruction (i.e., free-thinking control, Study 4) ruminative tendencies may have emerged and this would have obscured the effect of the rumination induction among higher trait ruminators.

In Study 4, partially consistent with our expectation the effect of film-related rumination was found for intrusion-related distress (although not for intrusion frequency).

However, this was not found in Study 3. For the reasons discussed earlier, the discrepancies between the experiments may be attributable to the different control conditions used, with distraction in Study 3 fostering a maladaptive processing style comparable to the rumination condition. The impact of rumination on intrusion-related distress but not intrusion frequency in Study 4 provides further support for the proposal that distress associated with intrusions plays a key role in PTSD persistence rather than mere occurrence of intrusions (Steil & Ehlers, 2000). It is consistent with the proposed effect of trauma-related rumination on PTSD (Ehlers & Clark, 2000), and is also in keeping with associated clinical findings (e.g., Ehlers et al., 1998; Michael et al., 2007). The effect of induced rumination, however, was short lived; the group difference for intrusion distress was only found shortly after the trauma film. Given the relatively brief rumination manipulation and analogue nature of the trauma, this should not be too surprising. It is still worth noting that some degree of film-related rumination occurred during 1-week follow-up, and trait rumination (irrespective of condition) relatively consistently correlated with intrusion frequency and associated distress. Therefore the effect of experimentally induced rumination seems to have been overshadowed by participants' general ruminative tendency. On a separate matter, rumination was induced immediately after the film to some degree would have influenced the consolidation of memories related to the film. Whether rumination after the consolidation of trauma memories impacts on intrusive memories needs be investigated in future research. We also noted within Study 4 that the free-thinking group had a greater number of intrusions than the rumination group at 1-week follow-up. Although this is surprising, strong conclusions cannot be drawn from this finding considering the null group difference within the initial session and over 1 week, and the fact that the difference became nonsignificant when baseline frequency was controlled.

Contrary to expectation, pre-existing depressive symptoms were not found to moderate the effect of induced rumination on intrusions, although we noted a number of medium-large positive correlations between depression and intrusion-related distress in Study 4. These correlations are consistent with the proposed role that depression is thought to play in posttrauma adjustment (Foa & Kozak, 1986). However, the correlations were less consistent in Study 3. Somewhat in contrast to this, existing depression was found to correlate with naturally occurring trauma-related rumination during the experimental manipulation task in Study 3, which seems to support the role of low mood and negative thought themes in rumination (Meeten & Davey, 2011; Watkins & Nolen-Hoeksema, 2014), but this was not the case in Study 4. Together, although some evidence was obtained that existing depression leads to greater trauma-related rumination and trauma intrusions, existing depression does not seem to affect how the experimentally induced rumination impacts intrusions.

In terms of other symptoms examined in Study 3, the effects of trauma-related rumination were largely null save for the immediate deteriorations of sad and happy mood. The finding on depressed mood appears consistent with the theorised effect of rumination on depressed mood (Nolen-Hoeksema, 1991), clinical findings (e.g., Nolen-Hoeksema & Morrow, 1991) and past analogue studies (e.g., Zetsche et al., 2009) although Warnock (2012) is an exception. The null findings for anxious mood as well as heart-rate and other PTS symptoms do not provide evidence that trauma-related rumination maintains general anxiety, physiological arousal and avoidance reactions. Thus, in the context of the trauma film, trauma-related rumination appears to selectively influence depressed mood, but not other symptom clusters.

Several limitations are acknowledged. First, whereas the use of trauma film is a useful method to study posttraumatic stress reactions (Holmes & Bourne, 2008), viewing a

film is not the same as personally experiencing a traumatic event. Second, multiple methods were used to assess intrusive experiences, and it is conceded that each method suffers from disadvantages. Third, different measures of trait rumination were used, with several measures being newly developed and their validity not yet fully established. Fourth, only a minority of participants (10-12%) had moderate or higher levels of depressive symptoms. Finally, the present findings may be limited to women as gender differences in cognitive strategies in response to negative affect have been suggested (Nolen-Hoeksema, 1991), and differential findings by gender have been reported in analogue trauma rumination research (Warnock, 2012; Zetsche et al., 2009).

Despite these limitations the present studies do provide preliminary evidence for the effect of trauma-related rumination on intrusion-related distress, and the possible moderating role of trait rumination in the relationship between trauma-related rumination and trauma intrusions. Future research should investigate the exact mechanisms by which trauma-related rumination might prevent optimal posttrauma adjustment. Further work is clearly required, but if rumination is found to be a key moderator of posttrauma adjustment, clinicians do have available a number of interventions that might be helpful for PTSD sufferers. These include rumination-focused cognitive therapy (RF-CBT; e.g., Watkins et al., 2007), metacognitive therapy (MCT; e.g., Wells, 2008) and mindfulness-based stress reduction (MBSR; e.g., Kabat-Zinn & Hanh, 2009).

CHAPTER 6 – STUDY 5: EFFECT OF MINDFULNESS AND MEDIATION OF RUMINATION

Introduction

As reported in Chapter 5, Study 4 found preliminary evidence for the causal role of trauma-related rumination on maintaining distress associated with trauma intrusions. Hence, trauma-related rumination emerged as a potentially important target for intervention for PTSD. That is, if trauma-related rumination can be reduced through an intervention, it should result in a corresponding reduction in intrusive symptoms. As reviewed in Chapter 2, one potentially useful approach to decrease trauma-related rumination appears to be a mindfulness-based intervention, but evidence for this is lacking. Accordingly, Study 5 examined whether a reduction of trauma-related rumination acted as a mediator for the effect of mindfulness in reducing trauma intrusions and associated distress. With regards to mindfulness, whereas brief mindfulness training (e.g., 10 minutes) has been shown efficacious in decreasing varying types of psychopathology, major mindfulness-type interventions such as Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT) are commonly conducted over the course of a few months. Therefore, we examined both brief mindfulness training and trait mindfulness as predictors for later rumination and intrusions following analogue trauma.

Further, as discussed in Chapter 2, despite the potential importance of having better mindfulness capacity for reducing trauma-related rumination, trait factors influencing this and underlying mechanisms of this have not been studied extensively. Consequently, the current study explored the roles of three potential candidate variables, namely, inhibition capacity, negative interpretations of intrusions, and metacognitive beliefs about rumination. These variables appear likely candidates based on the view that higher levels of

mindfulness should result in better attentional control on the present moment and increased accepting attitudes toward the experience (Bishop et al., 2004). Specifically, better attentional control in the context of posttraumatic stress would see an improved capacity to inhibit unwanted memories of trauma. Thus better inhibition capacity would be associated with higher mindfulness capacity post trauma, which in turn would lead to less trauma-related rumination. Further, an accepting attitude following trauma should lead to a less negative interpretation of posttraumatic stress symptoms (e.g., intrusions) and reduced need to ruminate about trauma. That is, negative intrusion-related appraisals and metacognitive beliefs about trauma-related rumination would mediate the relationship between mindfulness and trauma-related rumination. Examinations of these variables would shed light for how to optimise mindfulness-based interventions for trauma survivors.

There were three main hypotheses. First, participants in the mindfulness condition would report less frequent intrusions of the trauma film, lower associated distress, lower levels of film-related rumination and lower PTS symptoms than those in the relaxation condition. Second, regardless of condition participants with higher levels of trait mindfulness would report lower levels of symptoms (i.e., less intrusions and lower associated distress and lower PTS symptoms) and film-related rumination than those with lower mindfulness capacity. Third, film-related rumination would mediate the relationship between mindfulness (condition or trait) and film intrusions and associated distress. Additionally, two predictions were made for the roles of the following variables in relation to the relationship between mindfulness and film-related rumination. First, negative interpretations of film intrusions and metacognitive beliefs about film-related rumination were expected to mediate the effect of mindfulness (condition or trait) on film-related rumination. Second, greater inhibition capacity was expected to predict better naturally

occurring state mindfulness after film, which in turn would predict lower film-related rumination.

Method

The methodology was identical to earlier chapters unless otherwise specified.

Participants

Participants were 60 female university students with a M_{age} of 22.63 ($SD = 7.54$). Participants received course credits or financial reimbursement (\$AUD30).

Materials

Trauma film. This study used the 8-minute version of the same film *Irreversible*.

Mindfulness and relaxation induction. Scripts of a guided meditation and progressive muscle relaxation in Vinci et al. (2014) were audio recorded to be used for the experimental manipulation of mindfulness or physical relaxation, respectively (see Appendix C3 for the scripts). The script of a guided meditation was adapted from Kabat-Zinn (1994) and participants were instructed to focus on the present moment with a nonjudgmental and accepting attitude. Prior to listening to the audio, participants were informed that they would be asked to write down the contents of the exercise after the audio; this was in order to increase engagement and compliance with the audio exercise. Following the audio exercise, participants were asked to practice the techniques they had learned from the audio and apply them to manage any unwanted memories, including film-related ones, during a 2-minute practice period.

During the 7-day interval, participants were instructed to use the techniques from the audio as much as possible whenever they noticed that they were ruminating about the film or any other matters. Participants were also provided with psychoeducation on ruminative thinking (see Appendix C3 for material) and were given a copy of the

instruction script of their respective experimental condition. In order to increase compliance with this homework, participants were informed that they would be given a quiz about the techniques when they returned after 1 week.

Measures

Manipulation check. The experimental manipulation was assessed using the Manipulation Check Questionnaire (MCQ) that asked participants' experiences during the audio exercise, practice time, and 1-week interval. Specifically, the MCQ asked two questions in relation to the audio exercise: levels of concentration (%) and time spent remembering the film (%). Then, the MCQ indexed to the practice time comprised four questions: time spent practicing the techniques (%), time spent remembering the film (%), the degree to which participants felt relaxed (0 = *not at all*; 4 = *extremely*), and the extent to which they were able to use the techniques to manage unwanted memories of the film (0 = *not at all*; 4 = *very well*). The MCQ in relation to the 1-week period had six questions: how good they were at remembering to use the technique to manage film-related rumination or ruminative thoughts in general (0 = *not at all*; 10 = *extremely*), how many times they used the techniques for film-related rumination or rumination in general, and finally, levels of perceived usefulness of the techniques to manage film-related rumination or rumination in general (0 = *not at all*; 10 = *extremely*).

Mindfulness. The Mindful Attention Awareness Scale (MAAS; K. W. Brown & Ryan, 2003) was used as a measure of trait and state mindfulness (the modified state version is shown as the MAAS-S within this study). The MAAS contains 15 items measuring the degree of attention and awareness to present moment experiences, which are the core characteristics of mindfulness. Participants answered how frequently they have the experience described in each item on a scale ranging from 1 (*almost always*) to 6 (a*lmost never*). A score is derived by obtaining the mean of the 15 items, with higher

scores indicating higher mindfulness capacity. The MAAS has been reported to have a good internal consistency, Cronbach's α = .81 (K. W. Brown & Ryan, 2003), and the present study had α = .91. Validity of the MAAS has been examined on the basis of correlations with measures of related but distinct constructs of psychological awareness and reflexive consciousness (e.g., the tendency to reflect upon oneself, the tendency to view oneself from the perspective of the social world). The overall pattern of correlations suggest that the MAAS has adequate convergent and discriminant validity (K. W. Brown & Ryan, 2003).

Rumination. A 10-item version of the Repetitive Thinking Questionnaire (RTQ-10; McEvoy, Tribodeau, & Asmundson, 2014) and its state version (RTQ-10-S) were used in place of the original RTQ and RTQ-S as measures of trait rumination and state film-related rumination, respectively. Each item is rated on a severity scale of 1 (*not at all true*) to 5 (*very true*), with higher scores indicate greater levels of rumination. The RTQ-10 comprises the 10 highest loading items from the 27-item original Repetitive Negative Thinking subscale of RTQ (RTQ-RNT) and has comparable internal reliability to the RTQ-RNT, Cronbach's αs = .94 and .92 in nonclinical and clinical samples, respectively (McEvoy et al., 2014). In the present study, Cronbach's α = .88. Convergent validity of the RTQ-10 has been demonstrated with significant correlations with a variety of negative emotions including anxiety, depression and general distress (Mahoney et al., 2012; McEvoy et al., 2010) and with other measures of rumination and worry (McEvoy et al., 2014). Divergent validity of the RTQ-10 has been reported in terms of small negative correlations with positive affect (McEvoy et al., 2014).

Negative interpretations of intrusions. The Negative Interpretation of Intrusive Thoughts (NIIT; Nixon et al., 2009) is a 9-item questionnaire that was used to measure the degree of participants' negative interpretations of their film-related intrusions. The NIIT

consists of a combination of 5 items from the PTCI and 4 items from the negative

interpretation of intrusions subscale from the Response to Intrusions Questionnaire (RIQ;

Clohessy & Ehlers, 1999). Participants responded to each item the extent to which they

interpret intrusions negatively on a scale of 1 (*totally disagree*) and 7 (*totally agree*).

Internal reliability of the NIIT has not been reported in published literature, and the current

study had Cronbach's αs = .87-.93. The NIIT has been found to be positively correlated

with thought suppression and intrusive experiences following analogue trauma in a

nonclinical sample (Nixon et al., 2009).

Metacognitive beliefs about rumination. The Positive Beliefs about Rumination

Scale – Adapted (PBRS-A; Watkins & Moulds, 2005) was used to assess the degree to

which participants believe that recurrent thinking about feelings and past events (i.e.,

rumination) would be helpful on a rating scale of 1 (*do not agree*) to 4 (*agree very much*).

In addition to baseline beliefs, the PBRS-A was modified to measure metacognitive beliefs

about trauma/film-related thoughts (PBRS-A-S). The PBRS-A is a modified version of the

original Positive Beliefs about Rumination Scale (PBRS; Papageorgiou & Wells, 2001)

that indexes metacognitive beliefs about usefulness of depressive rumination. Explicit

references to depression and rumination were removed in the PBRS-A, and thus

metacognitive beliefs about recurrent thinking independent of depression are assessed.

Internal consistency of the PBRS-A has been reported to be Cronbach's α = .89 (Watkins

& Moulds, 2005) and the present study had α = .85.

Executive control. The Trail Making Test (TMT) was used as a rudimentary

estimate of participants' inhibitory control ability. Originally a part of the Army Individual

Test Battery (1944), the TMT is currently included in the Halstead-Reitan

neuropsychological battery (Reitan & Wolfson, 1993). The TMT consists of two parts: A,

in which participants are asked to connect numbers in sequential order, and B, in which

they alternate between numbers and letters. Participants were asked to complete the task on a sheet of paper as quickly as possible without lifting a pencil from the paper, and errors were corrected by experimenter before moving on to the next number or letter. The time taken to complete the tasks was recorded. It has been noted that the TMT may reflect a wide variety of cognitive domains, and thus its ability to measure discrete domains has been somewhat questioned (see Bowie & Harvey, 2006, for review). Despite this, a general consensus appears that Part A performance indicates visuospatial processing speed and motor functioning (Jacobson, Blanchard, Connolly, Cannon, & Garavan, 2011). Part B is generally believed to involve higher level cognitive skills such as working memory and task-switching ability (SÁNchez-Cubillo et al., 2009) with some arguing that it might reflect difficulty with inhibition or attention (Miner & Ferraro, 1998).

The present study used the more easily administered TMT in place of a direct measure of inhibitory control such as the Go/No-Go (GNG) task due to time constraints. Despite this, inhibitory control comprises one of the important components of executive control (Aupperle et al., 2012) and a strong association between performance on the GNG Task and performance on the TNT task has been reported with rs = .84 and .81 for TMT-A and TMT-B, respectively (Langenecker, Zubieta, Young, Akil, & Nielson, 2007). Thus performance on the TMT task would offer somewhat indirect and approximate indication of participants' inhibitory control. In addition to the raw performance score on Part B, difference (B-A) and ratio (B/A) scores are commonly used as an index of executive control capacity. These scores are thought to reduce the impact of the individual's motor speed and visual processing speed from Part B performance (Cavaco et al., 2013). In general, these derived scores are considered purer measures of executive functions than the direct raw measures (e.g., Arbuthnott & Frank, 2000; Hester, Kinsella, Ong, & McGregor,

2005; Lamberty, Putnam, Chatel, Bieliauskas, & Adams, 1994; SÁNchez-Cubillo et al.,

2009).

Procedure

Figure 9 summarises the procedure.

Participants complete DASS-D, PCL-5, RTQ-10, PTQ, PBRS-A, MAAS and TMT

⬇

Participants view film

⬇

Participants complete intrusion monitoring task (T1), Intrusions Questionnaire, NIIT and film ratings

⬇

Experimental group allocation

⬇   ⬇

Mindfulness		Relaxation
Participants complete the respective tasks		

⬇

Participants complete MCQ, practice period and PTQ-S

⬇

Participants complete intrusion monitoring task (T2), Intrusions Questionnaire and NIIT

⬇

Participants leave experimental session and complete the respective tasks (mindfulness or relaxation techniques) and intrusions record daily for 7 days, and complete MAAS-S, RTQ-10-S, PTQ-S and PBRS-A-S on Day 3 and Day 7

⬇

Participants return after 1 week and are exposed to film-reminders

⬇

Participants complete intrusion monitoring task, Intrusions Questionnaire and NIIT

⬇

Participants complete IES-R and MCQ in relation to the 1-week period

⬇

Participants debriefed

Figure 9. Flow diagram summarising the experimental procedure. DASS-D = Depression Anxiety Stress Scale – Depression; PCL-5 = PTSD Checklist for DSM-5; RTQ-10(-S) = Repetitive Thinking Questionnaire – 10-item version (– State version); PTQ(-S) = Perseverative Thinking Questionnaire (– State version); PBRS-A(-S) = Positive Beliefs about Rumination Scale – Adapted (– State version); MAAS(-S) = Mindful Attention Awareness Scale (– State version); TMT = Trail Making Test; NIIT = Negative Interpretation of Intrusive Thoughts; MCQ = Manipulation Check Questionnaire; IES-R = Impact of the Event Scale – Revised.

Results

Preliminary Analysis

A total of 53 participants who completed the experiment were included in analyses. Six participants stopped viewing the film, and one participant chose not to complete intrusion monitoring tasks due to feeling distressed by film memories. The groups were comparable on baseline characteristics[8] as shown in Table 17.

Table 17

Age, Baseline Questionnaire and Assessment Scores, and Film Ratings by Group

	Mindfulness (*n* = 26)		Relaxation (*n* = 27)		Statistic		
	M	*SD*	*M*	*SD*	*t*	*df*	*d*
Age	23.42	8.18	22.59	7.80	0.38	51	0.10
Baseline questionnaire and assessment							
MAAS	3.66	1.01	3.41	0.98	0.95	51	0.26
DASS-D	4.92	4.51	8.37	8.57	1.84	39.68	0.50
PTQ	25.61	10.93	29.52	11.56	1.27	51	0.35
RTQ-10	27.42	7.83	30.11	7.95	1.24	51	0.34
PBRS-A	25.00	5.88	25.26	5.14	0.17	51	0.05
PCL-5	14.00	14.09	18.71	19.76	0.89	42	0.27
TMT Difference (B-A)	26.29	13.36	27.91	10.74	0.49	51	0.13
TMT Ratio (B/A)	1.97	0.67	2.20	0.55	1.32	51	0.38
Film ratings							
Distress	8.23	2.08	8.41	1.55	0.35	51	0.10
Unpleasantness	9.19	1.02	9.74	2.07	1.22	51	0.34
Attention	7.81	1.81	8.74	2.61	1.51	51	0.41

Note. MAAS = Mindful Attention Awareness Scale; DASS-D = Depression Anxiety Stress Scale – Depression; PTQ = Perseverative Thinking Questionnaire; RTQ-10 = Repetitive Thinking Questionnaire – 10-item version; PBRS-A = Positive Beliefs about Rumination Scale – Adapted; PCL-5 = PTSD Checklist for DSM-5; TMT = Trail Making Test.
Degrees of freedom vary due to not all participants having experienced a trauma (PCL-5).

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[8] Although nonsignificant, the relaxation group had somewhat higher scores on the DASS-D than the mindfulness group with a medium effect size. However, controlling for the DASS-D did not alter the overall findings.

The PCL-5 was generally consistently correlated with intrusion, rumination and symptom variables except for intrusion frequency (see Table 18 for correlations). Thus analyses were repeated after controlling for PCL-5 scores, but did not significantly alter findings.

Table 18

Correlations of Baseline PTSD Symptoms with Intrusion Rumination Variables and PTS Symptoms

		PCL-5
	N	*r*
Intrusion variables		
Intrusion frequency		
Post-film (T1)	44	-.12
Post-manipulation (T2)	44	.07
One week (average)	43	-10
One-week follow-up	43	.01
Intrusion-related distress		
Post-film (T1)	44	.23
Post-manipulation (T2)	44	.45**
One week (average highest distress)	43	.46**
One-week follow-up	43	.45**
NIIT		
Post-film (T1)	44	.56**
Post-manipulation (T2)	44	.63**
One-week follow-up	43	.65**
Rumination variables		
PTQ-S		
Initial session (post-manipulation)	44	.31*
Day 3	43	.48**
Day 7	43	.52**
RTQ-10-S		
Day 3	43	.52**
Day 7	43	.57**
PBRS-A-S		
Day 3	43	.33*
Day 7	42	.52**
PTS symptoms		
IES-R (1 week)	43	.75**

Note. PCL-5 = PTSD Checklist for DSM-5; NIIT = Negative Interpretation of Intrusive Thoughts; PTQ-S = Perseverative Thinking Questionnaire – State version; RTQ-10-S = Repetitive Thinking Questionnaire – 10-item version – State version; PBRS-A-S = Positive Beliefs about Rumination Scale – Adapted – State version; IES-R = Impact of Event Scale – Revised.
*$p < .05$, **$p < .01$.

As shown in Table 19, no group differences on levels of state mindfulness (MAAS-S) were observed, all ps > .13, suggesting that the experimental induction of mindfulness failed to significantly increase mindfulness capacity relative to the relaxation induction, although a small-moderate effect size was noted between groups in the expected direction on the MAAS-S on Day 3. As it was possible that the MAAS was not sensitive enough to detect changes in mindfulness following the manipulation, analyses involving the group comparison were still conducted. On the MCQ, no group differences were observed except that the mindfulness group showed lower levels of concentration on tasks during the manipulation period than the relaxation control. Thus analyses involving a group comparison were repeated by controlling for levels of concentration, but this did not alter findings.

Table 19

Results of Manipulation Check

	Mindfulness (*n* = 26)		Relaxation (*n* = 27)		Statistic		
	M	*SD*	*M*	*SD*	*t*	*df*	*d*
MCQ (post-manipulation)							
Concentration (%)	66.31	22.50	81.48	13.50	2.96*	40.65	0.82
Time spent remembering film (%)	23.04	27.23	17.59	22.32	0.80	51	0.22
MCQ (post-practice)							
Concentration (%)	61.38	33.74	70.48	25.69	1.11	51	0.30
Time spent remembering film (%)	16.65	25.56	15.78	19.37	0.14	51	0.04
Relaxed	2.77	0.86	3.06	1.00	1.11	51	0.31
Used technique to manage film-related rumination (0-4)	2.81	1.02	3.26	1.06	1.58	51	0.43
Perceived usefulness (0-4)	3.12	0.91	3.48	0.80	1.56	51	0.42
MAAS-S (1 week)							
Day 3	4.46	0.85	4.01	1.27	1.52	43.70	0.42
Day 7	4.65	0.87	4.55	1.25	0.34	44.56	0.09
MCQ (follow-up)							
Remembered to use for film-related rumination (0-10)	5.36	2.43	5.62	2.47	0.37	49	0.11
The number of times used for film-related rumination	2.66	2.74	2.23	1.36	0.71	49	0.20
Perceived usefulness for film-related rumination (0-10)	5.24	2.79	6.15	2.87	1.15	49	0.32
Remembered to use for general rumination (0-10)	4.92	2.89	5.04	2.79	0.15	49	0.04
The number of times used for general rumination	2.92	2.93	2.21	1.99	1.01	49	0.29
Perceived usefulness for general rumination (0-10)	5.13	2.88	4.96	3.40	0.18	49	0.05

Note. MCQ = Manipulation Check Questionnaire; MAAS-S = Mindful Attention Awareness Scale – State version. Degrees of freedom vary due to lost to follow-up.
*p < .05.

Effects of Experimental Manipulation

Intrusions. The effects of brief mindfulness training on intrusion frequency and associated distress were tested using 2 (condition) × 2 (time) mixed ANOVAs for the initial experimental session and for the 1-week interval, and t-tests were used for 1-week follow-up assessment. Tables 20 and 21 report statistics for the initial session/1-week follow-up sessions and the 1-week period, respectively.

Table 20

Effects of Experimental Manipulation on Intrusion Variables at Initial and Follow-up Sessions

	Mindfulness (n = 26)		Relaxation (n = 27)		Statistic								
					Condition			Time			Condition × Time		
	M	SD	M	SD	F	df	η_p^2	F	df	η_p^2	F	df	η_p^2
Frequency (initial session)					0.21	1, 51	.004	27.30**	1, 51	.35	0.19	1, 51	.004
Post-film (T1)	6.21	3.61	5.71	3.20									
Post-manipulation (T2)	3.89	2.65	3.75	2.07									
Associated distress (initial session)					1.56	1, 51	.03	59.53**	1, 51	.54	0.45	1, 51	.01
Post-film (T1)	6.42	2.06	6.89	2.62									
Post-manipulation (T2)	3.12	2.78	4.11	2.74									
One-week follow-up					t	df	d						
Frequency	3.65	2.97	3.38	2.23	0.36	49	0.10						
Associated distress	3.00	2.24	3.62	2.59	0.91	49	0.26						

Note. Degrees of freedom vary due to lost to follow-up.

**$p < .001$.

Table 21

Effects of Experimental Manipulation on Intrusion Variables during 1 Week

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Average	Condition			Statistic Time			Condition × Time		
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*F*	*df*	η_p^2	*F*	*df*	η_p^2	*F*	*df*	η_p^2
n with any intrusions																	
Mindfulness	25	16	17	15	12	9	8	-									
Relaxation	25	21	13	11	6	7	6	-									
Frequency									0.39	1, 49	.01	33.26**	2.04, 99.81	.40	0.12	2.04, 99.81	.002
Mindfulness	6.26 (5.73)	2.92 (3.52)	2.26 (2.07)	1.56 (2.14)	1.04 (1.49)	0.88 (1.99)	0.92 (1.87)	2.26 (2.14)									
Relaxation	5.94 (5.92)	2.92 (3.24)	1.73 (2.77)	1.02 (2.27)	0.92 (1.98)	0.50 (1.03)	0.31 (0.68)	1.91 (1.92)									
Highest associated distress									0.82	1, 49	.02	32.63**	5.34, 261.75	.40	1.64	5.34, 261.75	.03
Mindfulness	6.24 (2.37)	3.88 (3.61)	3.76 (3.61)	2.36 (3.12)	2.20 (2.99)	2.12 (3.21)	1.52 (2.87)										
Relaxation	6.27 (3.18)	4.81 (3.51)	3.00 (3.62)	2.23 (3.13)	0.65 (1.60)	0.89 (1.61)	0.69 (1.74)										
									t	*df*	*d*						
IES-R intrusion (1 week)									0.02	49	< 0.01						
Mindfulness								1.15 (0.89)									
Relaxation								1.15 (0.78)									

Note. n = 25 and 26 in the mindfulness and relaxation conditions, respectively. IES-R = Impact of Event Scale – Revised. Degrees of freedom vary due to not all participants completed the diary every day.
**$p < .001$.

For both intrusion frequency and associated distress at the initial session and during 1 week after film, there was a significant main effect of time, and the main effect of condition and the condition $\times$ time interaction were nonsignificant. No group difference was found for the IES-R intrusion indexed to the 1-week period or intrusion frequency and related distress at follow-up. When trait mindfulness (irrespective of experimental condition) was examined as a predictor for later intrusions within the initial session and at 1-week follow-up, no significant correlations were found for intrusion frequency with rs ranging from -.10 to .11, all ps > .45, and for intrusion-related distress with rs from -.03 to .19, all ps > .16. In contrast, trait mindfulness was negatively correlated with the IES-R intrusion indexed to the 1-week interval, $r(51) = -.37$, $p = .01$.

PTS symptoms. No group difference was found on the IES-R indexed to the 1-week period, $t(49) = 0.16$, $p = .87$, $d = 0.05$, with the mindfulness group ($M = 1.10$; $SD = 0.78$) being comparable to the relaxation group ($M = 1.13$; $SD = 0.80$). In contrast, trait mindfulness was negatively correlated with the overall IES-R score, $r(51) = -.36$, $p = .01$ as well as with the avoidance and hyperarousal subscales of the IES-R, both rs = -.30, all ps < .04.

Rumination. The effects of brief mindfulness induction on rumination were tested using a t-test for the initial experimental session and 2 (condition) $\times$ 2 (time) mixed ANOVAs for the 1-week interval (see Table 22 for statistics).

Table 22

Effects of Experimental Manipulation on Film-related Rumination at Initial and Follow-up Sessions

	Mindfulness ($n = 26$)		Relaxation ($n = 27$)		Statistic								
					Condition			Time			Condition $\times$ Time		
	M	SD	M	SD	t	df	d	F	df	η_p^2	F	df	η_p^2
Initial session (post-practice)													
PTQ-S	19.85	14.70	17.37	12.57	0.66	51	0.18						
					F	df	η_p^2						
PTQ-S (1 week)					0.002	1, 49	$< .001$	13.73*	1, 49	.22	0.49	1, 49	.01
Day 3	22.36	14.02	23.42	13.42									
Day 7	17.12	13.47	15.73	13.07									
RTQ-10 (1 week)					0.30	1, 49	.01	17.97**	1, 49	.27	0.11	1, 49	.002
Day 3	23.32	8.52	24.08	9.17									
Day 7	18.20	6.93	19.69	8.75									

Note. PTQ-S = Perseverative Thinking Questionnaire – State version; RTQ-10-S = Repetitive Thinking Questionnaire – 10-item version –

State version. Degrees of freedom vary due to lost to follow-up.

*$p < .05$, **$p < .001$.

In line with the findings for intrusion and PTS symptoms, no group differences were found for film-related rumination at the initial session or during the 1-week post-experiment period. That is, the main effect of time was significant but the main effect of condition and the condition × time interaction were nonsignificant. For trait mindfulness predicting film-related rumination, consistent negative correlations (albeit some being nonsignificant) were found with trauma-related rumination within the initial session and on Day 3 and Day 7 following the film (rs ranging from -.25 to -.42, all ps < .08). It is also noted that trait mindfulness was also negatively correlated with *trait* rumination, rs = -.25 and -.27, all ps < .08.

Mediation Analysis

The SPSS macro PROCESS (Hayes, 2013) was used to test the mediation of trauma-related rumination in the mindfulness-intrusions relationship. Confidence intervals (95% confidence level) for indirect effects are estimated by creating 5000 bootstrapped samples. Levels of film-related rumination measured during the practice period within the initial session and during the 1-week period (assessed on Day 3 and Day 7) were examined as mediators for the effects of group and trait mindfulness on intrusion variables at post-practice period (T2) as well as at 1-week follow-up with rumination measured on Day 3 and Day 7, respectively (see Tables 23, 24 and 25 for the respective statistics).

Table 23

Estimates for Mediating Effect of Film-related Rumination between Condition and Trait Mindfulness and Intrusions at Initial Session

| | Mediator (M) | | | Outcomes (Y) | | | | | |
| | Film-related rumination | | | Intrusion frequency | | | Intrusion-related distress | | |
Antecedent	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*
X (Condition)	-2.48	3.84	.52	0.06	0.60	.92	1.24	0.03	.08
M (PTQ-S)	-	-	-	0.08	0.02	< .001	0.10	0.03	< .001
Constant	22.32	6.38	.001	2.19	1.06	.05	-0.06	0.69	.96
	$R^2 = .01$			$R^2 = .23$			$R^2 = .26$		
	$F(1, 51) = 0.42, p = .52$			$F(2, 50) = 6.28, p = .004$			$F(2, 50) = 7.96, p = .001$		
X (MAAS)	-3.50	2.35	.14	0.05	0.32	.88	-0.23	0.30	.44
M (PTQ-S)	-	-	-	0.08	0.02	< .001	0.09	0.03	.002
Constant	30.93	9.17	.001	2.09	1.23	.10	2.79	1.41	.05
	$R^2 = .26$			$R^2 = .23$			$R^2 = .21$		
	$F(1, 51) = 2.21, p = .14$			$F(2, 50) = 6.60, p = .003$			$F(2, 50) = 7.73, p = .001$		

Note. *Coeff.* = Unstandardised coefficients; PTQ-S = Perseverative Thinking Questionnaire – State version; MAAS = Mindful Attention Awareness Scale.

Table 24

Estimates for Mediating Effect of Film-related Rumination on Day 3 between Condition and Trait Mindfulness and Intrusions at Follow-up

| | Mediator (M) | | | Outcomes (Y) | | | | | |
| | Film-related rumination | | | Intrusion frequency | | | Intrusion-related distress | | |
Antecedent	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*
X (Condition)	1.06	3.92	.79	-0.29	0.76	.71	0.55	0.65	.40
M (PTQ-S)	-	-	-	0.02	0.03	.46	0.06	0.03	.02
Constant	21.30	6.32	.002	3.39	1.53	.03	1.08	1.27	.40
	$R^2 = .002$			$R^2 = .02$			$R^2 = .13$		
	$F(1, 49) = 0.07, p = .79$			$F(2, 48) = 0.39, p = .68$			$F(2, 48) = 3.03, p = .06$		
X (Condition)	0.76	2.53	.77	-0.30	0.76	.69	0.56	0.68	.42
M (RTQ-10-S)	-	-	-	0.05	0.05	.32	0.08	0.04	.06
Constant	22.56	3.93	< .001	2.82	1.66	.10	0.59	1.39	.68
	$R^2 = .002$			$R^2 = .03$			$R^2 = .10$		
	$F(1, 49) = 0.09, p = .77$			$F(2, 48) = 0.59, p = .56$			$F(2, 48) = 2.25, p = .12$		
X (MAAS)	-3.83	2.54	.14	0.41	0.37	.27	0.18	0.35	.62
M (PTQ-S)	-	-	-	0.03	0.03	.31	0.07	0.03	.01
Constant	36.21	9.52	< .001	1.36	1.38	.33	1.21	1.34	.37
	$R^2 = .07$			$R^2 = .04$			$R^2 = .13$		
	$F(1, 49) = 2.28, p = .14$			$F(2, 48) = 1.28, p = .29$			$F(2, 48) = 3.59, p = .04$		
X (MAAS)	-2.28	1.64	.17	0.42	0.37	.26	0.12	0.38	.75
M (RTQ-10-S)	-	-	-	0.06	0.05	.21	0.09	0.04	.06
Constant	31.65	6.16	< .001	0.64	1.74	.71	0.90	1.81	.62
	$R^2 = .06$			$R^2 = .05$			$R^2 = .09$		
	$F(1, 49) = 1.93, p = .17$			$F(2, 48) = 1.42, p = .25$			$F(2, 48) = 1.87, p = .17$		

Note. Coeff. = Unstandardised coefficients; PTQ-S = Perseverative Thinking Questionnaire – State version; RTQ-10-S = Repetitive Thinking Questionnaire – 10-iterm version – State version; MAAS = Mindful Attention Awareness Scale.

Table 25

Estimates for Mediating Effect of Film-related Rumination on Day 7 between Condition and Trait Mindfulness and Intrusions at Follow-up

| | Mediator (M) | | | Outcomes (Y) | | | | | |
| | Film-related rumination | | | Intrusion frequency | | | Intrusion-related distress | | |
Antecedent	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*
X (Condition)	-1.39	3.79	.72	-0.21	0.77	.78	0.71	0.66	.29
M (PTQ-S)	-	-	-	0.04	0.03	.28	0.07	0.03	.01
Constant	18.51	6.09	.004	3.22	1.50	.04	1.15	1.10	.30
	$R^2 = .003$			$R^2 = .04$			$R^2 = .15$		
	$F(1, 49) = 0.13, p = .72$			$F(2, 48) = 0.75, p = .48$			$F(2, 48) = 3.84, p = .03$		
X (Condition)	1.49	2.25	.51	-0.42	0.74	.58	0.44	0.65	.50
M (RTQ-10-S)	-	-	-	0.10	0.06	.12	0.12	0.05	.02
Constant	16.71	3.33	< .001	2.24	1.63	.18	0.46	1.26	.72
	$R^2 = .01$			$R^2 = .10$			$R^2 = .16$		
	$F(1, 49) = 0.44, p = .51$			$F(2, 48) = 1.39, p = .26$			$F(2, 48) = 3.30, p = .05$		
X (MAAS)	-3.61	2.16	.10	0.46	0.36	.22	0.18	0.34	.61
M (PTQ-S)	-	-	-	0.05	0.04	.20	0.07	0.03	.01
Constant	28.99	7.85	.001	1.16	1.47	.43	1.57	1.23	.21
	$R^2 = .07$			$R^2 = .06$			$R^2 = .13$		
	$F(1, 49) = 2.79, p = .10$			$F(2, 48) = 1.45, p = .24$			$F(2, 48) = 4.28, p = .02$		
X (MAAS)	-3.42	1.40	.02	0.76	0.31	.02	0.40	0.33	.23
M (RTQ-10-S)	-	-	-	0.14	0.06	.02	0.14	0.05	.002
Constant	30.86	5.53	< .001	-1.70	1.56	.28	-0.70	1.41	.62
	$R^2 = .18$			$R^2 = .15$			$R^2 = .17$		
	$F(1, 49) = 6.01, p = .02$			$F(2, 48) = 5.45, p = .01$			$F(2, 48) = 5.88, p = .01$		

Note. *Coeff.* = Unstandardised coefficients; PTQ-S = Perseverative Thinking Questionnaire – State version; RTQ-10-S = Repetitive Thinking Questionnaire – 10-item version – State version; MAAS = Mindful Attention Awareness Scale.

Film-related rumination was not found to mediate the effect of condition or trait mindfulness on intrusion frequency or associated distress at any time point, as revealed by all bootstrapped 95% confidence intervals involving zero.

Additional Variables

Relationship of mindfulness with other variables. Prior to testing each prediction involving the additional variables, relationships of mindfulness with these variables were explored. Specifically, ANOVAs and t-tests tested whether the group differed on their levels of negative interpretations of film intrusions (NIIT) and metacognitive beliefs about film-related rumination (PBRS-A-S). Correlations of trait mindfulness (MAAS) with negative interpretations of intrusions (NIIT), metacognitive beliefs about rumination or film-specific rumination (PBRS-A and PBRS-A-S, respectively), and inhibitory control capacity (TMT difference and ratio) were also examined.

The groups were comparable on metacognitive beliefs about film-related rumination, with a 2 (condition) $\times$ 2 (time) mixed ANOVA revealing only the significant main effect of time, $F(1, 47) = 6.95$, $p = .01$, $\eta_p^2 = .13$, but no main effect of condition, $F(1, 47) = 0.17$, $p = .68$, $\eta_p^2 = .004$ nor interaction, $F(1, 47) = 0.45$, $p = .51$, $\eta_p^2 = .01$. Similarly, no group difference was observed on negative interpretations of intrusions. Specifically, a mixed ANOVA found only the significant main effect of time, $F(1, 51) = 37.62$, $p < .001$, $\eta_p^2 = .43$. The main effect of condition was nonsignificant, $F(1, 51) = 1.08$, $p = 30$, $\eta_p^2 = .02$, as was the interaction, $F(1, 51) = 2.81$, $p = .61$, $\eta_p^2 = .004$. Again, no group difference in negative interpretations of intrusions was found at 1-week follow-up, $t(32.94) = 1.77$, $p = .09$, $d = 0.49$.

Trait mindfulness was found to be correlated with metacognitive beliefs about film-related rumination (i.e., perceived need to ruminate about the film and related matters)

measured on Day 3 ($r(51) = -.38$, $p < .01$) and Day 7 ($r(51) = -.33$, $p < .05$). Interestingly, trait mindfulness was not correlated with baseline metacognitive beliefs about rumination (PBRS-A) ($r(53) = .12$, $p = .38$). In contrast, trait mindfulness was not found to be correlated with negative interpretations of intrusions (rs ranging between -.10 and -.21, all ps > .13), or with inhibitory capacity (estimated based the TMT performance) (rs ranging between -.01 and .02, all ps > .87).

Mediation of negative interpretations of intrusions for the effects of mindfulness on rumination. Whether the effects of mindfulness (condition or trait) on trauma-related rumination were mediated by negative interpretations of intrusions was examined. For the effect of mindfulness training (i.e., condition), negative interpretations of intrusions measured after the induction (T2) was examined as a mediator on film-related rumination measured on Day 3 and Day 7 following the film. With trait mindfulness as an antecedent, negative interpretations of intrusions measured after film (T1) and after experimental manipulation (T2) was examined as a mediator that was expected to impact on film-related rumination measured on Day 3 and Day 7. Tables 26 and 27 summarise the findings for film-related rumination assessed on Day 3 and Day 7, respectively. Using PROCESS, the analysis failed to detect any mediation of negative interpretations of intrusions, as revealed by all bootstrapped 95% confidence intervals involving zero.

Table 26

Estimates for Mediating Effect of Negative Interpretations of Intrusions at Initial Session between Trait Mindfulness and Film-related

Rumination on Day 3

Antecedent	Mediator (M) Negative interpretations of intrusions NIIT			Outcomes (Y) Film-related rumination RTQ-10-S			PTQ-S		
	Coeff.	*SE*	*p*	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*
X (Condition)	1.69	1.70	.33	-0.09	2.50	.97	-0.35	3.78	.93
M (NIIT T2 post-manipulation)	-	-	-	0.50	0.12	< .001	0.84	0.17	< .001
Constant	9.47	2.21	< .001	17.83	3.69	< .001	13.40	5.90	< .001
	$R^2 = .02$			$R^2 = .12$			$R^2 = .14$		
	$F(1, 49) = 0.99, p = .33$			$F(2, 48) = 10.63, p < .001$			$F(2, 48) = 13.92, p < .001$		
X (MAAS)	-1.68	1.21	.17	-1.57	1.45	.29	-2.68	2.17	.22
M (NIIT T1 post-film)	-	-	-	0.43	0.17	.01	0.68	0.21	.002
Constant	22.18	4.64	< .001	22.24	6.69	.002	21.12	9.73	.04
	$R^2 = .04$			$R^2 = .20$			$R^2 = .22$		
	$F(1, 49) = 1.94, p = .17$			$F(2, 48) = 4.82, p = .01$			$F(2, 48) = 7.35, p = .002$		
X (MAAS)	-0.76	0.87	.39	-1.94	1.57	.22	-3.25	2.33	.17
M (NIIT T2 post-manipulation)	-	-	-	0.46	0.12	.001	0.77	0.17	< .001
Constant	14.65	3.66	< .001	24.90	6.73	< .001	24.97	9.89	.02
	$R^2 = .02$			$R^2 = .16$			$R^2 = .43$		
	$F(1, 49) = 0.76, p = .39$			$F(2, 48) = 12.54, p < .001$			$F(2, 48) = 17.30, p < .001$		

Note. *Coeff.* = Unstandardised coefficients. NIIT = Negative Interpretation of Intrusive Thoughts; RTQ-10-S = Repetitive Thinking Questionnaire – 10-iterm version – State version; PTQ-S = Perseverative Thinking Questionnaire – State version; MAAS = Mindfulness Attention Awareness Scale.

Table 27

Estimates for Mediating Effect of Negative Interpretations of Intrusions at Initial Session between Trait Mindfulness and Film-related

Rumination on Day 7

	Mediator (M) Negative interpretations of intrusions NIIT			Outcomes (Y) Film-related rumination RTQ-10-S			PTQ-S		
Antecedent	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*
X (Condition)	1.69	1.70	.33	0.57	2.15	.79	-2.63	3.63	.47
M (NIIT T2 post-manipulation)	-	-	-	0.55	0.19	.01	0.74	0.18	< .001
Constant	9.47	2.21	< .001	11.50	2.15	.26	11.52	6.26	.07
	$R^2 = .02$			$R^2 = .18$			$R^2 = .11$		
	$F(1, 49) = 0.99, p = .33$			$F(2, 48) = 5.04, p = .01$			$F(2, 48) = 8.89, p < .001$		
X (MAAS)	-1.68	1.21	.17	-2.95	1.48	.05	-2.76	2.19	.22
M (NIIT T1 post-film)	-	-	-	0.28	0.19	.14	0.51	0.20	.01
Constant	22.18	4.64	< .001	24.60	7.42	.002	17.65	9.39	.07
	$R^2 = .04$			$R^2 = .25$			$R^2 = .16$		
	$F(1, 49) = 1.94, p = .17$			$F(2, 48) = 5.46, p = .01$			$F(2, 48) = 6.06, p = .01$		
X (MAAS)	-0.76	0.87	.39	-3.04	1.36	.03	-3.13	2.10	.14
M (NIIT T2 post-manipulation)	-	-	-	0.50	0.21	.02	0.65	0.18	.001
Constant	14.65	3.66	< .001	23.57	6.45	.001	19.52	8.47	.03
	$R^2 = .02$			$R^2 = .32$			$R^2 = .16$		
	$F(1, 49) = 0.76, p = .39$			$F(2, 48) = 7.73, p < .001$			$F(2, 48) = 10.14, p < .001$		

Note. *Coeff.* = Unstandardised coefficients; NIIT = Negative Interpretation of Intrusive Thoughts; RTQ-10-S = Repetitive Thinking Questionnaire – 10-iterm version – State version; PTQ-S = Perseverative Thinking Questionnaire – State version; MAAS = Mindfulness Attention Awareness Scale.

Mediation of metacognitive beliefs about rumination for the effects of mindfulness on rumination. Next, the mediating role of metacognitive beliefs about rumination in the relationship between mindfulness (condition or trait) and trauma-related rumination was tested. To test this, metacognitive beliefs about trauma film-related rumination that were measured on Day 3 after the film was examined as a mediator for how trait mindfulness or mindfulness induction impacted on trauma-related rumination measured on Day 7. Table 28 exhibits the results produced by PROCESS, and no predicted mediation was found with all bootstrapped 95% confidence intervals including zero.

Table 28

Estimates for Mediating Effect of Metacognitive Beliefs about Rumination on Day 3 between Trait Mindfulness and Film-related Rumination on

Day 7

	Mediator (M) Beliefs about rumination PBRS-A-S			Outcomes (Y) Film-related rumination RTQ-10-S			PTQ-S		
Antecedent	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*
X (Condition)	1.59	1.71	.36	0.94	2.31	.69	-2.45	3.91	.53
M (PBRS-A-S)	-	-	-	0.35	0.21	.11	0.67	3.92	.08
Constant	14.05	5.35	< .001	11.85	3.87	.004	9.16	6.56	.17
		$R^2 = .02$			$R^2 = .08$			$R^2 = .09$	
	$F(1, 49) = 0.87, p = .36$			$F(2, 48) = 1.83, p = .17$			$F(2, 48) = 1.60, p = .21$		
X (MAAS)	-2.37	1.00	.02	-3.01	1.79	.10	-2.46	2.47	.33
M (PBRS-A-S)	-	-	-	0.17	0.26	.51	0.49	0.41	.22
Constant	24.70	3.77	< .001	26.63	10.16	.01	16.96	13.67	.05
		$R^2 = .15$			$R^2 = .19$			$R^2 = .11$	
	$F(1, 49) = 5.68, p = .02$			$F(2, 48) = 5.08, p = .01$			$F(2, 48) = 3.22, p = .05$		

Note. *Coeff.* = Unstandardised coefficients; PBRS-A-S = Positive Beliefs about Rumination Scale – Adapted – State version; RTQ-10-S = Repetitive Thinking Questionnaire – 10-iterm version – State version; PTQ-S = Perseverative Thinking Questionnaire – State version; MAAS-S = Mindfulness Attention Awareness Scale – State version.

Mediation of state mindfulness for the effects of inhibitory capacity on rumination. Lastly, whether inhibitory control (estimated using the TMT) predicted levels of trauma-related rumination was examined and whether this was mediated by state mindfulness. Correlational analyses revealed that the TMT scores (both difference and ratio) were not correlated with trauma-related rumination, rs ranging between -.07 and .20 (all ps > .16), except for a positive correlation between TMT difference scores and PTQ-S measured at the initial session, $r(53) = .34$, $p = .01$. PROCESS was then employed to test the mediation of state mindfulness measured on Day 3 for the effect of inhibitory control on trauma-related rumination measured on Day 7 (see Table 29 for statistics). As with the previous results, these analyses also did not find any mediation, with all bootstrapped 95% confidence intervals including zero.

Table 29

Estimates for Mediating Effect of State Mindfulness on Day 3 between Inhibitory Control and Film-related Rumination on Day 7

Antecedent	Mediator (M)			Outcomes (Y)					
	State mindfulness			Film-related rumination					
	MAAS-S			RTQ-10-S			PTQ-S		
	Coeff.	*SE*	*p*	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*
X (TMT difference)	-0.05	0.1	.66	-0.04	0.09	.64	0.08	0.17	.66
M (MAAS-S)	-	-	-	-3.74	1.01	.01	-4.86	1.64	.01
Constant	4.36	0.36	< .001	35.94	6.24	< .001	34.90	8.23	< .001
	$R^2 = .003$			$R^2 = .27$			$R^2 = .17$		
	$F(1, 49) = 0.20, p = .66$			$F(2, 48) = 7.50, p = .002$			$F(2, 48) = 4.38, p = .02$		
X (TMT ratio)	-0.10	0.22	.66	-1.20	1.69	.48	-1.34	3.35	.69
M (MAAS-S)	-	-	-	-3.76	1.00	.01	-4.95	1.63	.004
Constant	4.44	0.53	< .001	37.37	6.93	< .001	40.14	9.40	< .001
	$R^2 = .003$			$R^2 = .27$			$R^2 = .17$		
	$F(1, 49) = 0.20, p = .66$			$F(2, 48) = 7.31, p = .002$			$F(2, 48) = 5.08, p = .01$		

Note. *Coeff.* = Unstandardised coefficients; MAAS-S = Mindfulness Attention Awareness Scale – State version; RTQ-10-S = Repetitive Thinking Questionnaire – 10-item version – State version; PTQ-S = Perseverative Thinking Questionnaire – State version; TMT = Trail Making Test.

Discussion

The main aims of the present study were to examine whether brief mindfulness training would reduce analogue trauma intrusions, PTS symptoms and trauma-related rumination, and whether reductions in trauma-related rumination played a mediating role in the mindfulness-intrusions relationship. However, none of these predictions were supported. These null findings remained unchanged when trait mindfulness was examined as a predictor for intrusions and as a precedent for the mediation of trauma-related rumination. However, trait mindfulness was negatively associated with post-film PTS symptoms and rumination. The study also explored the potential mediating role of negative interpretations of intrusions and metacognitive beliefs about rumination in the mindfulness-rumination relationship and also examined state mindfulness as a mediator for the effect of inhibitory control on trauma-related rumination. However, none of these mediations was supported. These findings are now discussed.

The null effects of the mindfulness induction on film intrusions (frequency or associated distress) or PTS symptoms do not provide support for the speculated usefulness of mindfulness or acceptance-based (a component of mindfulness) interventions for decreasing distress associated with intrusive cognitions (Shipherd & Salters-Pedneault, 2008) nor the findings lend support to the proposal that mindfulness may promote corrective learning (Baer, 2003). The null finding is inconsistent with past research that has shown some efficacy of mindfulness-based interventions for PTSD symptoms (e.g., A. P. King et al., 2013; Waelde et al., 2008), although, as reviewed in Chapter 2, these studies were uncontrolled or not randomised and the results from the only randomised controlled study have been inconclusive (Kearney et al., 2013). The current finding is also inconsistent with a past experimental study that found the efficacy of brief teaching of acceptance-based techniques in decreasing distress (but not frequency) during intrusions of

a personal negative experience (Marcks & Woods, 2005). Thus the utility of mindfulness-based interventions for PTSD/intrusions appears not always replicable.

Similarly, trauma-related rumination was not found to decrease following the brief mindfulness training. This null result is in contrast to previous studies reporting the effect of mindfulness (MBSR or brief teaching) on reducing rumination or worry (e.g., Burg & Michalak, 2010; Lenze et al., 2014). Furthermore, if rumination has a function of avoidance and contributes to impaired inhibitory control as discussed in Chapter 2, the null results imply that a brief mindfulness teaching is not able to reduce cognitive avoidance or improve inhibitory capacity. This is somewhat inconsistent with past research that provided preliminary evidence for the effect of mindfulness-type interventions in reducing avoidance of fear (Arch & Craske, 2006) and improving inhibitory control ability (Chambers et al., 2008). It however should be noted that, as discussed in Chapter 2, the effect of mindfulness-type interventions has not been reported in the context of traumatic stress.

However, as the current study observed that levels of mindfulness following the experimental mindfulness induction were comparable to the relaxation induction (albeit a nonsignificant small-medium size group difference was observed on Day 3 favouring the mindfulness condition), the ability of brief training to increase mindfulness is somewhat questioned. The failure of the current method to improve mindfulness ability is in contrast to the original study (Vinci et al., 2014), and this indicates that training in its brief form may not always improve mindfulness capacity or might hint at possible publication bias regarding the efficacy of brief training in improving mindful attitudes. Alternatively, given levels of mindfulness were assessed using another measure in Vinci et al. (2014), it is possible the current measure of mindfulness, MAAS, was not able to capture the aspects of mindfulness that may have been increased following the training. It is acknowledged that

MAAS is a unidimensional measure focusing predominantly on the mindfulness *awareness* facet of mindfulness ability (K. W. Brown & Ryan, 2003), whereas mindfulness as a whole is believed to consist of multiple components. Furthermore, as the levels of mindfulness following the in-session exercise were not assessed, whether the mindfulness capacity did improve at this time is uncertain. Nonetheless the lack of evidence for increased mindfulness using the current methodology precludes strong conclusions from being made in terms of the effectiveness/ineffectiveness of successful mindfulness training in treating symptoms or reducing rumination.

Interestingly, whereas trait mindfulness (irrespective of condition) was also not found to be correlated with intrusion frequency or associated distress, it was negatively correlated with PTS symptoms including the intrusive symptom cluster measured using the IES-R. Although speculative, the inconsistent findings may imply that trait mindfulness selectively impacts on other types of PTS symptoms and other aspects of intrusive symptoms (e.g., a sense of nowness, vividness) but not occurrences of intrusions and related emotional distress per se. The protective role of trait mindfulness for PTS symptoms adds to past research that reported cross-sectional negative correlations between mindfulness after trauma and PTSD symptoms (Bernstein et al., 2011; B. W. Smith et al., 2011) and between a component of mindfulness (acceptance) following trauma and PTSD symptoms (Ehring & Quack, 2010; Vujanovic et al., 2009). However, null correlations of other components of mindfulness (e.g., observing, acting with awareness) with different symptom clusters have been reported (Vujanovic et al., 2009). The inconsistent pattern of findings depending on types of symptoms and different facets of mindfulness seem to imply that different components of mindfulness selectively impacts on certain but not all types of symptoms.

The negative association of trait mindfulness was also found with rumination (with both general ruminative tendency and rumination related to the film). This finding adds to previous findings for the inverse correlations of mindfulness with rumination (Keune et al., 2012) as well as with symptoms of avoidance (Thompson & Waltz, 2010) and inhibitory control ability (e.g., Lee & Chao, 2012). Additionally, the current finding provides some indirect support for the proposed role of mindfulness capacity in improving attentional control over unwanted thoughts (Teasdale et al., 1995). Therefore, successful mindfulness-based interventions should lead to reduced rumination, thereby indicating the importance of promoting mindfulness capacity in intervening with ruminative tendency and trauma-triggered rumination. The selective predictive role of trait mindfulness for lower trauma-related rumination but not trauma intrusions is noteworthy. This might indicate that a successful mindfulness-based intervention primarily decreases rumination, but not directly intrusive symptoms. This pattern of finding is somewhat consistent with the limited number of studies to date that report that mindfulness-based interventions particularly reduces symptoms of avoidance (see Banks et al., 2015, for review), with avoidance being a postulated function of rumination according to Ehlers and Clark (2000).

The mediating role of trauma-related rumination in the mindfulness-intrusion relationship was not observed. However, this is not surprising given the fact that there was not the effect of mindfulness (trait or training) on intrusions. The null finding is somewhat inconsistent with past research that reported rumination is a mediator in varying types of psychopathology (e.g., Hawley et al., 2014; Jain et al., 2007). Whereas it might be that rumination does not play a mediating role in the context of posttraumatic stress unlike other kinds of psychopathology, past research does suffer from methodological problems as discussed in Chapter 2. To overcome limitations of the current study and similar past research, a more methodologically robust investigation of the mediating role of trauma-

related rumination is warranted, which should involve an improved method of mindfulness induction and a sequential assessment of mindfulness, rumination, and then intrusive cognitions.

None of the additional variables of interest was found to have the expected relationship with mindfulness and trauma-related rumination. Specifically, the null mediating effects of negative interpretations of intrusions or metacognitive beliefs about trauma-related rumination indicate a lack of strong evidence that these variables underlie how mindfulness (trait or condition) impacts on trauma-related rumination. Again, the null mediations following the present brief training need be interpreted with caution given its failure to improve mindfulness capacity. Furthermore, the absence of the mediation of post-film state mindfulness in the relationship between inhibitory control and film-related rumination suggests that in this study any benefit of inhibition ability reducing rumination did not occur through increased mindfulness ability. These findings overall thus failed to support the proposed beneficial functions of mindfulness in improving attentional control and increasing accepting attitudes (Bishop et al., 2004). As examinations of these variables were exploratory in nature within the present study, future research should more explicitly investigate the roles of these variables in the mindfulness-rumination relationship. Such investigation may include the assessment of these variables and symptom variables at multiple time points in order to capture possible changes over the course of a study, and the use of a more direct measure of inhibition (e.g., Go/No-Go task) in place of the TMT.

Although the study was the first to explicitly test the effect of mindfulness following analogue trauma and had several strengths (the use of a relaxation comparison procedure controlling for the mere relaxation effect of mindfulness, assessments of various types of symptoms over the course of 1 week), there were of course limitations. These include the analogue nature of trauma as well as the use of only female nonclinical

participants (for the reasons discussed in earlier studies in this thesis). As highlighted

previously, brief mindfulness training may not be able to improve mindfulness capacity;

however a standard form of mindfulness-based interventions that commonly involve 8

weeks of weekly sessions and homework exercises would not fit in the context of analogue

trauma that normally generates only a short-term intrusive experiencing and other

symptoms. An improved methodology of brief mindfulness induction would be helpful in

investigating the efficacy of mindfulness-based interventions using the trauma film

paradigm. Alternatively, regardless of methodology or delivery format, the benefit of

mindfulness-type interventions may be limited among unselected samples that are likely to

have higher levels of mindful attitudes than samples consisting of trauma victims (e.g., the

current participants had $M = 3.53$ vs. $M = 3.0$ in survivors of childhood sexual abuse in

Kimbrough et al. (2010)). Other possible moderators determining the degree of benefit

from mindfulness-based interventions may include individuals' trait characteristics. For

instance, higher mindful capacity has been found to be related to lower neuroticism and

higher optimism and self-esteem (K. W. Brown & Ryan, 2003), and thus people with

certain personality traits may particularly benefit from this type of intervention. These

possible moderating factors were not considered in the current study. Finally, compliance

with the homework appeared compromised, with participants reporting that they did not

remember to use the respective techniques very well outside of the laboratory (Ms = 5.49

and 4.98 on a scale of 0-10 for film-related rumination and general rumination,

respectively). However, this only modest level of compliance might also be because they

did not have a great deal of rumination, as evidenced by low levels of film-related

rumination (e.g., $M = 16.41$ on the RTQ-10-S on Day 7 vs. the suggested clinical cut-off of

32 in McEvoy et al. (2014)). In addition, these techniques were not perceived to be useful

during this period (Ms = 5.71 and 5.04 on a 0-10 point scale for film-related rumination

and general rumination, respectively) but this may have reflected that there was a lack of need for the techniques, due to relatively low levels of rumination and intrusions.

In summary, the current study did not find evidence that brief training of mindfulness decreases distressing trauma intrusions or PTS symptoms and thus facilitates optimal posttrauma adjustment. The training also failed to reduce trauma-related rumination. However, the lack of evidence for the effect of the present brief training on increasing mindfulness precludes any strong conclusions from being made about the utility of successful mindfulness-based interventions in reducing PTSD symptomatology and rumination. Despite this, trait mindfulness was found to predict lower levels of PTS symptoms and trauma-related rumination, indicating a possible utility of mindfulness-based interventions for PTSD. It is possible mindfulness might selectively impact on certain types of symptoms and not intrusive cognitions. The study failed to find evidence for the mediation of trauma-related rumination; however this is not surprising given the null effects of mindfulness on trauma intrusions. Future research should continue to examine potential methods to decrease trauma-related rumination (e.g., longer-term mindfulness-based interventions such as MBCT and MBSR, rumination-focused CBT) and whether reductions in rumination are associated with additional efficacy in PTSD treatments.

CHAPTER 7 – GENERAL DISCUSSION

Overview

This PhD thesis investigated the role that trauma-related rumination may play in the maintenance of intrusive memories of trauma using the analogue trauma film paradigm. The first studies (Studies 1 and 2) examined trauma-related rumination as a mechanism underlying how depression interferes with optimal posttrauma adjustment. As these studies provided preliminary evidence for the mediating role of trauma-related rumination in the depression-intrusion relationship, the next experiments (Studies 3 and 4) tested whether trauma-related rumination was a causal factor for the maintenance of trauma intrusions using an experimental manipulation of rumination. Preliminary evidence was obtained for the causal effect of trauma-related rumination on maintaining distress during intrusive experiencing, and thus trauma-related rumination emerged as a potentially important target for treating posttraumatic stress symptoms. Consequently, the final study (Study 5) explored whether trauma-related rumination and trauma intrusions may be reduced using brief mindfulness training, and the reduction of rumination was examined as a possible process underlying the effect of mindfulness on trauma intrusions. No evidence was found for the efficacy of brief training on increasing mindfulness capacity or decreasing rumination and intrusions following analogue trauma. In contrast, trait rumination was found to selectively predict lower trauma-related rumination, but not trauma intrusions. This final chapter now integrates the findings to discuss their theoretical and clinical implications as well as limitations and future research avenues.

Findings, Implications, and Future Research

There were three main theories that guided the current thesis: the Emotional Processing Theory (EPT; Foa & Kozak, 1986), response styles theory of depression

(Nolen-Hoeksema, 1991), and the cognitive model of PTSD (Ehlers & Clark, 2000). The initial background for the present thesis was that although EPT argues that depression prevents optimal emotional processing and offers several reasons for this (e.g., perceived inability to cope with fear, emotional numbness), underlying cognitive processes have not been explicitly proposed within this theory. Hence, I proposed that rumination may be one likely process as it is a cognitive feature of depression (Nolen-Hoeksema, 1991) and is a maladaptive coping strategy after trauma (Ehlers & Clark, 2000). The findings from Study 1 lent support to this proposal, showing that trauma-related rumination mediates the effect of depression on intrusion frequency and associated distress. While requiring further replication, it seems trauma-related rumination could be identified explicitly in EPT as one possible mechanism underlying the theorised suboptimal trauma processing associated with depression. For example, ruminative thinking is thought to maintain maladaptive appraisals of trauma and its meaning and thus maintains a sense of current threat in sufferers (Ehlers & Clark, 2000); this might lead to emotional overengagement with the fear memory. Or the cognitive avoidance function of rumination (Ehlers & Clark, 2000) may result in less opportunities for appropriate habituation of anxiety to trauma memories to occur, thereby causing underengagement. These possible pathways for how trauma-related rumination leads to suboptimal activation of the fear structure need be empirically tested in future research.

However, null results were also observed for some predictions, with key findings being the null effects of the influence of low mood in Study 1 and existing depression (dysphoria group or depressive symptoms) in Study 2, and that trauma-related rumination did not act as a mediator in Study 2. These null results are now considered. The null effects of successfully induced low mood on intrusion frequency or associated distress in Study 1 were in contrast to the effect of naturally occurring depressive symptoms found within the

same study. This null result is in contrast to Wilksch (2011); one explanation is that temporary (state) experiences of depressed mood may not be the most critical causal component responsible for the maintenance of intrusive symptoms, which may not be surprising given the multi-faceted and complex nature of depressive symptomatology. Despite this, momentary depressed affect might still have a causal impact under certain circumstances as has been seen in relation to other types of psychopathology (or associated cognitions/behaviours). Some of these examples include the fact that persistence of rumination following a low mood induction only occurred during an experimentally instructed ruminative mode of thinking (Hawksley & Davey, 2010) and increased depressive attitudes following a low mood induction was found in individuals with a previous diagnosis of depression but not in never-depressed individuals (Jeanne, Gross, Persons, & Hahn, 1998). Whether such interactions between induced momentary low mood and other potential variables occur in relation to trauma intrusions and other posttraumatic stress symptoms need be examined in the future.

The failure of Study 2 to replicate the finding of Study 1 with regards to the effect of existing depression and the mediating effect of trauma-related rumination somewhat precludes strong conclusions regarding these effects. However, as discussed in Chapter 4 this study suffered from some methodological limitations, and these limitations need be addressed in future research by, for example, improving recruitment of high dysphoria (e.g., recruiting from a wider community outside of university) and increasing reliability of dysphoria classification (e.g., using multiple measures of depression). If these effects were replicated, there would be important clinical implications as follows. First, if depression is a risk factor for the maintenance of posttraumatic stress, depressive symptoms need be assessed and may need to be directly addressed in order to facilitate optimal recovery in trauma victims (or potential future trauma victims such as military personal and fire

fighters). In line with this, targeting Major Depressive Disorder (MDD) (using behavioural activation) in Cognitive Processing Therapy (CPT) was found more efficacious relative to standard CPT in comorbid PTSD/MDD (Angelakis, 2014). Second, if trauma-related rumination is a mediator in the mood-PTSD symptom relationship, it needs be assessed and targeted during intervention for posttraumatic stress in victims with higher levels of depression (e.g., PTSD suffers with comorbid depression). A successful intervention for trauma-related rumination should also reduce depressive symptomatology (Nolen-Hoeksema, 1991), which is again likely to result in decreased posttraumatic stress symptoms. However, whether trauma-related rumination does directly maintain PTSD/trauma intrusions remained unknown, and thus this was tested in the next studies in this thesis.

The causal effect of trauma-related rumination was tested in Studies 3 and 4 using an experimental manipulation of rumination. This prediction was predominantly guided by the cognitive model of PTSD (Ehlers & Clark, 2000) that postulates the maintaining role of rumination in PTSD. Additionally, based on a review of theories and past research, higher trait rumination and existing depression appeared to maximise the effect of induced trauma-related rumination on intrusions. The first of these studies (Study 3) tested these predictions using established methodology of experimental rumination and distraction (control) manipulations (Ehring, Szeimies, et al., 2009). This study found evidence for the moderating role of trait rumination on intrusion frequency, indicating that trait rumination may be responsible for the (at times) contradictory findings seen in the analogue trauma rumination literature (e.g., Ball & Brewin, 2012; Ehring, Szeimies, et al., 2009). A resultant clinical implication arising out of this was discussed in an earlier chapter, that is, engaging in trauma-related rumination can be maladaptive, particularly in people with general ruminative tendency. However, I was unable to rule out the possible effect of the

distraction procedure as an alternative explanation for the Study 3 findings. This was because, consistent with the speculation made by Ehring, Szeimies, et al. (2009), the degree of access to film memories and associated emotional distress during the manipulation task (based on levels of film-related rumination and distress) indicated that the distraction procedure might have inhibited post-event and emotional processing, which might have led to the present pattern of findings. That is, temporary inhibition of film memories and associated distress manifested in the distraction task might have resulted in the rebounding of the memories and distress after the task, which in turn might have obscured the group difference. Further, the distraction task might have allowed habitual ruminators to successfully suppress intrusions, thereby minimising the impact of trait rumination on intrusion frequency in this condition and thus producing the interaction of trait rumination and condition. This speculation appears somewhat supported by the fact that the moderation of trait rumination was no longer observed in Study 4 where the control condition comprised a non-distracting task.

Consequently, the next study (Study 4) used a non-distracting control of free-thinking procedure and found that experimentally induced trauma-related rumination predicted intrusion-related distress. This finding offers support for the cognitive model of PTSD (Ehlers & Clark, 2000) in relation to the proposed role of trauma-related rumination in the disorder. Although this was not found for intrusion *frequency*, the model suggests that it is the distress rather than occurrences of intrusions that predicts chronic PTSD (Steil & Ehlers, 2000), and the current results are consistent with this proposal. It follows that reductions in trauma-related rumination should lead to a corresponding decrease in posttraumatic stress symptoms including distressing intrusions, and thus trauma-related rumination could be an intervention target in people with PTSD.

The findings of Study 4 identified further important avenues for future research. Although the maladaptive effect of rumination was suggested in the cognitive model (Ehlers & Clark, 2000), until recently, the exact underlying mechanisms for how this operates have remained speculative, as there has been little direct investigation of these processes. As reviewed in Chapter 2, some of the possible problematic functions of rumination may include promoting increased access to trauma memories, functioning as an avoidance mechanism, maintaining problematic appraisals, and reduced inhibitory control. All these proposals need to be empirically tested. Additionally, future studies should be conducted to address other aspects of rumination. First, as has been shown in Studies 3 and 4, the type of comparison control conditions appeared to have a differential impact on posttraumatic processing and reactions. Hence, having multiple comparison groups within a study may assist in ruling out alternative explanations associated with a control procedure. Second, the lack of longer-term impact on intrusions in both studies somewhat weakens the current findings. Difficulty in manipulating rumination was discussed in Chapter 4; the effect of manipulated rumination on inducing ruminative experiences appears to be overshadowed by general ruminative tendency. Nevertheless future studies should continue to attempt to strengthen an experimental method of rumination induction. Third, in both Studies 3 and 4, no evidence was found that existing depression interacted with the rumination induction to influence trauma intrusions. Further, no consistent pattern of correlations was found between depression and rumination and intrusions across studies with rs ranging from -.17 to .42, and thus the role of depression postulated by relevant theories in terms of its impact on PTSD/trauma intrusions (Foa & Kozak, 1986) and on rumination (Nolen-Hoeksema, 1991) need refinement. This refinement will likely identify other variables that might explain inconsistent findings in the field.

As trauma-related rumination emerged as a possible important target for treating PTSD (based on Study 4), the final study (Study 5) explored whether an intervention for trauma-related rumination would result in corresponding reductions of intrusion frequency and associated distress. In the absence of any established intervention for trauma-related rumination in the literature, mindfulness-based interventions appear to hold some potential utility to address this type of rumination. Accordingly a brief form was tested in the context of analogue trauma film. However, the brief training failed to improve mindfulness capacity, and thus unsurprisingly it failed to decrease trauma-related rumination or trauma intrusions. Despite this, the finding that trait mindfulness predicted lower levels of trauma-related rumination and PTS symptoms (although not intrusive cognitions per se) suggests that successful mindfulness-based interventions could be useful in treating PTSD. Given the selective impacts of trait mindfulness on rumination but not intrusions, combining a treatment mainly targeted to reduce intrusive cognitions with mindfulness-based ones may optimise the treatment for overall PTSD symptoms. Nevertheless the mechanisms underlying how mindfulness-based interventions may decrease rumination and overall symptoms need to be continued to be investigated.

Although not the main focus on the thesis, in all studies trauma-related rumination was predicted by trait rumination, and this is in line with the suggestion that ruminative tendency is a relatively stable characteristic over time (Nolen-Hoeksema et al., 1993). General ruminative tendency prior to trauma has been identified as a risk factor for the development of PTSD (Spinhoven et al., 2015). It follows that intervening with habitual rumination should protect individuals from future development of PTSD upon trauma exposure. As discussed by Watkins (2015) in detail, childhood experiences of difficult-to-understand situations (e.g., abuse, neglect) are thought to contribute to the development of ruminative tendency as a coping strategy. Thus it is important to assess and intervene with

ruminative thinking in early life. In this respect, recent research has focused on the developing an assessment tool for rumination for children (Bijttebier, Raes, Vasey, Bastin, & Ehring, 2015) and has shown that rumination and worry-focused CBT for adolescents is efficacious in preventing future development of depression (at 1 year post intervention) through the reduction of excessive worry and rumination (Ehring, 2015). Given the role that rumination plays in posttraumatic stress, future studies of rumination-targeted interventions should investigate whether such interventions would also reduce the likelihood of future development of PTSD.

In addition to the methodological limitations already discussed with specific reference to the relevant study, the following three limitations that apply to overall thesis are reiterated. First of all, all studies in this thesis were conducted within an analogue design using a fictional film clip as a trauma stimulus. While the trauma film paradigm is an established method of examining factors influencing posttraumatic stress (Holmes & Bourne, 2008), nevertheless the extent to which the findings can be generalised to real trauma survivors is uncertain. Although intrusions are thought to develop from stressors that themselves range on a continuum from watching films to experiencing real life trauma (Holmes & Bourne, 2008), whether the findings using short scenes of interpersonal assaults can be extended to more complex, early or prolonged trauma exposure (e.g., childhood abuse, repeated torture) and different types of trauma (e.g., natural disaster, motor vehicle accidents) remains to be investigated. An implicit assumption by the experimental field is that the relationship between the level of stressor and intrusions is linear. However it is possible that there are thresholds at which both intrusion experiences and the mechanisms that influence such intrusions become non-linear, and future research needs to investigate such possibilities.

Next, findings were not completely consistent across measures of rumination. For instance, in Study 3 the moderation of trait rumination on intrusion frequency was only found when trait rumination was measured using the RTQ-RNT but not PTQ. Furthermore, across studies different degrees of correlations were seen for different questionnaires of trait rumination with intrusion variables. As an example, rs between trait rumination measures (PTQ, RTQ-RNT and RTQ-10) and intrusion frequency or related distress at follow-up (1 week or 3 days) varied from .01 to .35 (see Table E1 in Appendix E for correlations). These discrepancies existed despite the fact that all of these questionnaires are thought to assess the extent of ruminative thinking. These measures are unlikely to be assessing exactly the same construct; whereas the PTQ measures general experiences (i.e., how an individual typically thinks about negative experiences), the RTQ is indexed to a particular recent distressing or upsetting situation. Furthermore, it is acknowledged that both PTQ and RTQ are relatively new measures of repetitive negative thinking compared to more established measures of rumination, with the most commonly used one being the Ruminative Response Scale (RRS; Nolen-Hoeksema & Morrow, 1991). On the other hand, the RRS was not used in the current thesis as it specifically measures depressive rumination (which might not be directly relevant in the context of posttraumatic stress in some situations), in contrast to the PTQ and RTQ that are independent of the disorder-specific concern. Despite this, some variability in findings across rumination measures should not be surprising because, as reviewed in Chapter 2, varying definitions exist for rumination. Therefore, future research should investigate what aspects or components of rumination contribute to the development and maintenance of PTSD, and the importance of this is now becoming apparent. For example, in recently published research, anticipatory rumination and repetitive rumination were found to increase symptoms of

PTSD and depression comorbidity, but this was not found for problem-focused rumination and counterfactual rumination (Roley et al., 2015).

Finally, all studies except for Study 1 used female samples only. As discussed in Chapter 3, gender appears to be a potential confound on the results based on the differential responses to the film by gender seen in Study 1, and thus the remaining studies used the gender restriction for participation. Whereas the extent to which gender impacts on the variables of the current thesis' interest is uncertain, it appears reasonable to expect some differences in rumination between female and male participants. For example, in the depression literature, it has been established that women tend to use ruminative thinking in the face of distressing experiences, whereas distracting coping strategies are relatively more commonly employed among men (Nolen-Hoeksema, 1991). As ruminative tendency is considered a relatively stable characteristic in people (Nolen-Hoeksema et al., 1993), it might be more difficult to manipulate ruminative thinking upon experimental instruction in male participants who are less likely to have a habit or ability to use ruminative thinking than females. As discussed in Chapter 4, past analogue rumination research reported some gender differences in rumination and symptoms variables, although no clear evidence was offered for differential effects of experimental manipulation (Warnock, 2012; Zetsche et al., 2009). Accordingly, gender needs be considered as a possible moderator of posttraumatic stress on symptom and response variables, particularly in the context of ruminative thinking. Additionally, it seems also possible that the nature of the current film depicting a scene whereby a female person was assaulted by a man might have contributed to the gender differences. Thus a replication of the present findings using other types of analogue trauma film may be useful to determine this respect.

Conclusion

In conclusion, this PhD represents a systematic examination of the role of trauma-related rumination on PTS-like intrusion experiences. Although not completely unequivocal, support was found for the role of trauma-related rumination in predicting intrusive experiences, and this may be particularly problematic with individuals with existing mood difficulties. As with any research program, these findings require replication. However they do suggest that rumination is a fruitful avenue of further research in order to better understand posttraumatic responses. It is hoped this and future research will provide a platform from which more effective interventions for PTSD can be developed.

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APPENDIX A – GENDER DIFFERENCES IN RESPONSES TO FILM (STUDY 1)

Table A1

Film-related Distress and Intrusion Frequency and Associated Distress by Gender

	Male (*n* = 28)	Female (*n* = 53)	Statistic		
	M (SD)	*M (SD)*	*t*	*df*	*d*
Film-related distress	6.89 (2.22)	8.58 (1.37)	3.69*	38.10	0.99
Intrusion frequency (post-film)	7.96 (6.14)	10.49 (6.81)	1.64	79	0.38
Intrusion-related distress (post-film)	3.64 (2.25)	5.70 (2.36)	3.79**	79	0.89

Note. *p* < .05, **p* < .001.

APPENDIX B – ONLINE SURVEY STUDY (STUDY 2)

Introduction

The main purpose of the current online survey was to pre-screen participants for Study 2. However, the survey also provided an opportunity to examine and test hypothesised relationships between main variables of the current thesis' interest (i.e., existing depression, trait rumination and PTSD symptoms and related unhelpful cognitions) in a large sample of university students. Based on the past literature reviewed in Chapter 2, it was expected that (1) depressive symptoms and general ruminative tendency would be positively correlated with PTSD symptoms and associated beliefs, and (2) depressive symptoms and trait rumination were expected to be positively intercorrelated.

Method

Participants

A total of 245 female university students completed the online survey. Exclusion criteria were people with a current formal diagnosis of a mental health disorder, and previous participation in a study involving a trauma film. The sample had a M_{age} of 21.38 ($SD = 5.98$). Participants received course credits or financial reimbursement ($AUD5).

Materials and Measures

The survey was developed using the online survey tool, Qualtrics (http: www.flinderspsychology.qualtrics.com). The survey consisted of the PCL, PTCI, DASS-D, PTQ and RTQ.

Procedure

The online survey was made available via the university research participation pool and was advertised as Trauma Film Study Phase I. Participants were informed that the results of the survey would be used to randomly sample participants who would like to volunteer to participate in second phase of the study that would involve viewing an 8 minute film clip containing graphic scenes of physical and sexual violence. Participants were asked not to fill in their contact details at the end of the survey if they did not want to participate in the Phase II experimental session. Participants were also informed that as the experiment would involve one-on-one testing, it was not possible to accommodate everyone who wanted to participate in the Phase II. In the survey, all participants answered about their prior trauma experiences and completed the DASS-D, PTQ and RTQ. Participants who reported at least one experience of prior trauma also completed the PCL and PTCI. Participants completed the survey at a computer of their convenience.

Results

Correlations of PTSD Symptoms and Trauma-related Beliefs with Depression and Rumination

Correlations of PTSD symptoms and trauma-related beliefs with depression and rumination were examined in participants who reported a previous exposure to trauma (72.7% of total participants). Table B1 exhibits participants' trauma history and PTSD symptoms and related beliefs.

Table B1

Participants' Trauma History and PTSD Symptoms and Trauma-related Beliefs

	Experienced	Index trauma
Trauma type	%	%
Serious accident, fire, or explosion	26.5	19.1
Natural disaster	4.5	3.9
Non-sexual assault by family/acquaintance	19.6	12.9
Non-sexual assault by stranger	13.5	6.7
Sexual assault by family/acquaintance	15.5	13.5
Sexual assault by stranger	5.7	2.8
Military combat or war zone	0.4	0.0
Sexual contact under 18 with older person	14.3	6.7
Imprisonment	0.8	0.0
Torture	1.2	0.0
Life-threatening illness	22.9	18.0
Other	15.5	16.3
Time since index trauma	%	
Less than 1 month	3.4	
1 to 3 months	2.2	
3 to 6 months	7.9	
6 months to 3 years	32.0	
3 to 5 years	18.5	
More than 5 years	36.0	
Symptoms and trauma-related beliefs	*M*	*SD*
PCL	35.25	15.64
PTCI	96.66	43.15

Note. N = 178. Index trauma = the traumatic event for which the participant reported as the worst; PCL = PTSD Checklist; PTCI = Posttraumatic Cognitions Inventory.

As shown in Table B2, as predicted the severity of PTSD symptoms and trauma-related unhelpful beliefs were positively correlated with levels of depression and trait rumination, except for the RTQ-ART.

Table B2

Correlations of PTSD Symptoms and Trauma-related Beliefs with Depression and

Rumination

	PCL	PTCI
	r	*r*
DASS-D	.48**	.62**
PTQ	.49**	.61**
RTQ-RNT	.37**	.49**
RTQ-ART	.11	.02

Note. *N* = 178. PCL = PTSD Checklist; PTCI = Posttraumatic Cognitions Inventory; DASS-D = Depression Anxiety Stress Scale – Depression; PTQ = Perseverative Thinking Questionnaire; RTQ-RNT = Repetitive Thinking Questionnaire – Repetitive Negative Thinking; RTQ-ART = Repetitive Thinking Questionnaire – Absence of Repetitive Thinking.

**$p < .01$.

Correlations between Depression and Rumination

Table B3 exhibits correlations between depression and trait rumination. As expected, the severity of depression was positively correlated with levels of general ruminative tendency, again except for the RTQ-ART.

Table B3

Descriptive Statistics and Intercorrelations for Depression and Rumination

				1	2	3
		M	*SD*	*r*	*r*	*r*
1.	DASS-D	8.79	7.42	-	-	-
2.	PTQ	30.15	13.67	.49**	-	-
3.	RTQ-RNT	78.97	24.44	.42**	.57**	-
4.	RTQ-ART	8.90	3.01	.09	.02	-.03

Note. $N = 245$. DASS-D = Depression Anxiety Stress Scale – Depression; PTQ = Perseverative Thinking Questionnaire; RTQ-RNT = Repetitive Thinking Questionnaire – Repetitive Negative Thinking; RTQ-ART = Repetitive Thinking Questionnaire – Absence of Repetitive Thinking.

**$p < .01$.

Discussion

The online survey was used to examine the relationships among depression, ruminative tendency and PTSD symptoms and associated unhelpful beliefs. As expected, depression and trait rumination were generally positively correlated with PTSD symptoms and associated cognitions with large effect sizes. Therefore, people with higher depression and greater tendency to ruminate experience more severe PTSD symptoms and problematic trauma-related cognitions. The depression-PTSD association is in line with facets of emotional processing theory (Foa & Kozak, 1986) theorising that depression contributes to the maintenance of PTSD. Similarly, the association between general ruminative tendency and PTSD symptoms and associated beliefs would imply the role of rumination in inhibiting best posttrauma adjustment (Ehlers & Clark, 2000) as ruminative tendency is a relatively stable characteristic that is triggered by a stressful event (Nolen-Hoeksema et al., 1993). The current findings are consistent with the correlational findings of Study 1 and a large body of clinical research reporting the associations of PTSD

symptoms and cognitions with depression (see Angelakis & Nixon, 2015, for review) and with rumination (e.g., Ehlers et al., 1998; Kleim et al., 2007). In terms of depression and rumination, their intercorrelations were again large in effect size between these variables. Hence, this finding adds to a numerous number of clinical studies documenting that individuals with higher depression have greater ruminative tendency than those with lower depression (e.g., see Nolen-Hoeksema et al., 2008, for review), and provides support for the response styles theory of depression (Nolen-Hoeksema, 1991).

Interestingly, no correlation was observed for the RTQ-ART, which measures the absence of repetitive thinking, with depression or PTSD symptoms and related cognitions. Whereas this might indicate that the extent of absence of rumination is not a good predictor for depression or rumination relative to the degree of negative rumination measured with another subscale (RTQ-RNT), it should be noted that the RTQ-ART consists of only 4 items and thus its reliability may be limited. Nonetheless the causal relationship of depression, rumination, and PTSD symptoms and cognitions cannot be determined from the current survey. It should also be noted that participants' reported prior trauma did not necessarily meet the PTSD Criterion A. Despite these apparent limitations, the current survey results provide evidence for the strong association of depression and rumination as well as for the relationship of depression and rumination with PTSD symptoms and related unhelpful cognitions.

APPENDIX C – EXPERIMENTAL MATERIALS (STUDIES 3-5)

Appendix C1: Study 3 Experimental Materials

Transcript

Rumination Condition

Instruction: Imagine that you are a best friend of the victims who was attacked, and read the following transcript very closely.

It's already been a few days now since the assaults, but I just can't get them out of my head. My friends say that it was not my fault, but I nevertheless think about it a lot. Why did my friends have to get hurt? Why couldn't I prevent the assaults? If I only had not let them go at all! All the time I think about how it came to this, how terrible it all was and how immense their fears were. If I could only forget it all or undo what happened! What is going to happen now? I feel so sick and am in terrible pain! Everything hurts, I can hardly move, and I can't see myself functioning for the next few weeks. I wonder whether my friends will ever be the same again. If not, what shall become of them? Everything would change, their work, their life – I don't want to think about it! Nothing will be as it was… It is all so empty…

Distraction Condition

Instruction: Read the following transcript.

I stop in Ninglu, the last village in Shanxi before the border to Inner Mongolia. It has 120 inhabitants and is surrounded by an old garrison wall. Old people sit on the village square and enjoy the sun. When I arrive in a Chinese village, I often enquire about residents with historical knowledge. Sometimes I get referred to a village sage or a hobby historian. The official archaeologists and historians in China are overstretched and their research resources do not permit devoting themselves to places like Ninglu. On the village square I am advised to talk to the old Chen. Chen Zhen is 53, potato farmer, and he owns five sheep. He wears thick glasses and his silvery hair is clipped short. At home he opens a drawer and gets out a stack of rice paper pages stapled together. "The annals of Ninglu, start of research 22 January 1992" is written on the cover page. I open the book and read Chen's handwritten records…

Sentences

Instruction: Read each sentence presented on the screen silently. Think about the question and answer it in your own mind. Press the space bar when no thoughts related to the sentence comes to your mind anymore.

<u>Rumination Condition</u>

- Why is it that so many assaults have to occur?
- Why does going out at night have to be so dangerous?
- Why is it not possible to undo such bad events?
- Why can I be sure that assaults like these won't happen to me?
- How can I be sure that I won't die as a result of an assault?
- What if my family would be assaulted like this?
- What if I were to be assaulted like this?
- How awful must it be to hear my family cry in pain?
- Why do people assault others?
- Why must my safety at night depend on other people?
- Why do people assault others without thinking of the consequences?
- What if it were me suffering such terrible pain?
- How could I ever get over assaults like these?
- How could I ever return to a normal life after assaults like these?
- How is it possible being happy again after assaults like these?
- How could I ever stop feeling guilty about not doing enough to stop the assaults?
- How terrifying the fear during such assaults must be?
- What great fear would one be exposed to in such assaults?

<u>Distraction Condition</u>

- Name all the tropical fruits you know.
- Name all the prime ministers that you can remember.
- What lives in the sea?
- What comes to your mind when thinking of Italy?
- Name all the spices you can think of.
- What kinds of sports are represented in the Olympic Games?
- Name as many types of trees you can think of.

- Name as many mountains as possible.

- What breeds of dogs do you know?

- Name as many terms associated with computers as possible.

- What proverbs do you know?

- What Australian rivers do you know?

- What cartoon characters do you know?

- Name all retail chains you know.

- What Australian actors do you know?

- What European capitals do you know?

- What flavours of ice cream do you know?

- What Australian musicians or music groups do you know?

- What fairy tales do you know?

- What writers do you know?

Appendix C2: Study 4 Experimental Materials

Transcript

<u>Rumination Condition</u>

Instruction: Imagine that you are a best friend of the woman who was attacked, and read the following transcript very closely.

It's already been a few days now since the assault, but I just can't get it out of my head. My friends say that it was not my fault, but I nevertheless think about it a lot. Why did my friend have to get hurt? Why couldn't I prevent the assault? If I only had not let her go at all! All the time I think about how it came to this, how terrible it all was and how immense her fear was. If I could only forget it all or undo what happened! What is going to happen now? I feel so sick and am in terrible pain! Everything hurts, I can hardly move, and I can't see myself functioning for the next few weeks. I wonder whether my friend will ever be the same again. If not, what shall become of her? Everything would change, her work, her life – I don't want to think about it! Nothing will be as it was... It is all so empty...

<u>Free-thinking Condition</u>

Instruction: For the next 1 minute, think about anything you would like to.

Sentences

<u>Rumination Condition</u>

Phase I

Instruction: Think about the questions or let your thoughts drift to related issues and follow the associated thoughts. Think about each question as intensely as you can for 1 minute until the next instruction appears on the screen. After 1 minute, you will be asked to write down the content of your thoughts.

- Why is that so many assaults have to occur?
- What if my family were assaulted like this?
- How awful must it be to hear my family cry in pain?
- Why do people assault others without thinking of the consequences?
- How terrifying the fear during such assaults must be?

Phase II (upon completion of Phase I)

Instruction: Select one sentence that means the most to you (e.g., it seems most relevant to you, or you noticed you really kept thinking about that thought). Again, think about the question, or let your thoughts drift to related issues and follow associated thoughts. Think about the question you have selected as intensely as you can for 3 minutes until the next instruction appears on the screen. After 3 minutes, you will be asked to write down the content of your thoughts.

Free-thinking Condition

Phase I

Instruction: For the next 1 minute, think about anything you would like to. This time, after 1 minute, you will be asked to write down the content of your thoughts.

Phase II (upon completion of Phase I)

Instruction: This time, for the next 3 minutes, think about anything you would like to. After 3 minutes, you will be asked to write down the content of your thoughts.

Appendix C3: Study 5 Experimental Materials

Audio Exercise Scripts

<u>Mindfulness Condition</u>

While sitting down in your chair, place your feet flat on the floor. Sit up straight. Relax your shoulders, relax your neck, and place your hands in your lap or on your knees. As you settle into a comfortable position, commit yourself to simply being fully awake, fully present for these next few moments. If you feel comfortable with it, gently close your eyes. Otherwise, just look toward the floor.

Focus on tuning into the feeling of the breath moving in and out of your body. Focus on the sensation of the breath moving through your nose on each inbreath and each outbreath. Allow yourself to just be here in this moment, following the breath as it comes in and as it goes out. Just breathe and let go. Breathe and let be.

Naturally your mind may wander off into thoughts of one kind or another. Take note of any thoughts as they come up. Note what's on your mind and how your body is feeling. Acknowledge these thoughts, whatever they are, without judging or evaluating them. And then just gently let them go. Bring your attention back to the breath, focusing on the feeling of the breath coming in and out of your nostrils.

And each time you notice that your mind has gone off somewhere else, wherever that may be, just bring your attention back to the feeling of the breath. And if the mind wanders off a thousand times, you simply bring it back a thousand times, intentionally cultivating an attitude of patience and gentleness towards yourself. This means choosing as best you can not to react to or judge any of your thoughts or feelings, impulses or perceptions, reminding yourself instead that absolutely anything that comes into the field of awareness is ok. We simply sit with it and breathe with it and observe it, staying open and awake in the present moment, right here, right now, a continual process of seeing and letting be, seeing and letting go, rejecting nothing, pursuing nothing, dwelling in stillness and in calmness as the breath moves in and out.

If you'd like, commit yourself to bringing this attitude of attention and acceptance with you throughout your day, being fully aware in the present moment, noticing any thoughts or feelings that may arise, without judging them – just being right here and right now, accepting the present moment, and accepting yourself, no matter what happens. Remember that you can always bring your focus back to your breath, back to the sensations of the present moment, to cultivate this sense of attention and acceptance.

Relaxation Condition

While sitting down in your chair, place your feet flat on the floor. Sit up straight. Relax your shoulders, relax your neck, and place your hands in your lap or on your knees. If you feel comfortable with it, gently close your eyes. Otherwise, just look toward the floor. For the next several minutes, I would like you to try and relax your body. Start by taking a few deep breaths to relax. As you do so, your body may physically begin to feel more relaxed. Continue to take a few more deep breaths, and let go of any tension you may feel. Just allow yourself to relax.

Draw your attention to the muscles in your right hand and relax them. Release any tension in your hand. You may begin to feel more heavy. Now, relax your left hand. Just let the muscles go. Relax your entire right arm in a similar way. Allow your muscles to feel more and more relaxed. Shift your attention to your left arm and relax it as well. Continue to release any tension in your hands and arms feel.

Relax the muscles in your face and neck. Slowly notice how your body is feeling more and more heavy with relaxation. Continue to allow all the muscles in your face and neck to relax. Your upper body may feel more relaxed now than it did when you first started to relax your muscles.

Draw you attention to your chest and shoulders. Allow your chest and shoulders to relax. Recognize how your body may feel warm and heavy as you continue to relax more deeply. Just let the muscles go. Relax the muscles in on your abdomen and back. Again, just allow all of these muscles to relax. Continue to relax. You may feel less tense and more relaxed. Attend to the muscles in your upper leg and tell these muscles to relax as well. Notice the relaxation you are experiencing. Continue to relax by relaxing your calves. Your body may be becoming more heavy and relaxed. Let your body relax and release any tension. You may feel more relaxed now than you did initially. Shift your attention to your feet. Again, allow all the muscles around your feet to relax.

While continuing to relax your body, take a few more deep breaths. Your hands, arms, face, and neck may feel more relaxed. Also your chest, shoulders, abdomen and back may be less tense. Finally, the muscles in your legs and feet may also be more relaxed. Take one more deep breath in and out and slowly open your eyes.

Homework Instruction

It's normal to have some thoughts about the film and your reactions during the coming week. For example, an image of the film might pop into your mind and you might start thinking about the film.

Your thoughts might drift to related issues and you might continue to think about them, and this is called rumination.

Rumination is different from normal thoughts. Ruminative thoughts are characterised by "why" or "what if" type questions evaluating the meaning, causes and consequences of the film, and it does not lead to any solution to the questions. For example, "what if my family were assaulted like this?" or "why do people assault others without thinking of the consequences" or "why is that so many assaults have to occur?"

During the coming week, if you notice you are ruminating about the film or any other things, use the techniques you have learned from the audio today. The diary contains these techniques as a reminder. Please read those each day as you will be given a quiz when you return in 1 weeks' time.

APPENDIX D – SUPPLEMENTARY TABLES (STUDIES 3 AND 4)

Table D1

Study 3: Descriptive Statistics and Intercorrelations for Trait Rumination and Existing

Depression, and Intrusion Variables

				DASS-D	RTQ RNT	RTQ ART	PTQ
	N	*M*	*SD*	*r*	*r*	*r*	*r*
Baseline questionnaire							
DASS-D	57	6.37	5.37	-			
RTQ-RNT	57	71.09	19.30	.38**	-		
RTQ-ART	57	8.12	2.89	-.16	-.16	-	
PTQ	57	29.91	12.18	.49**	.43**	-.23	-
Intrusion frequency							
Post-film (T1a)	56	5.04	3.16	.07	.37**	.02	.17
Post-film (T1b)	57	9.41	7.58	.01	.24	-.15	.10
Post-manipulation (T2a)	56	2.33	2.61	.16	.41**	-.001	.10
Post-manipulation (T2b)	57	5.47	5.28	.06	.33*	-.23	.25
Post-reminder (T3a)	56	2.94	2.50	.02	.34**	-.16	.18
Post-reminder (T3b)	57	5.25	4.94	-.05	.25	-.32*	.08
One week (average)	55	1.58	1.50	-.09	.26	-.13	.20
One-week follow-up	56	2.47	3.01	.17	.09	-.19	.13
Intrusion-related distress							
Post-film (T1a)	57	6.84	2.07	.11	.42**	-.14	.23
Post-film (T1b)	57	5.28	2.37	.08	.33*	.07	.23
Post-manipulation (T2a)	57	3.86	2.96	.15	.30*	-.06	.34*
Post-manipulation (T2b)	57	3.16	2.48	.11	.36**	-.18	.30*
Post-reminder (T3a)	57	3.82	2.92	.11	.44**	-.27*	.36**
Post-reminder (T3b)	57	3.11	2.61	.04	.40**	-.23	.32*
One week (average highest distress)	55	2.43	1.77	-.17	.21	-.05	.11
One-week follow-up	56	1.52	1.89	.06	.22	-.23	.09
IES-R intrusion							
One week	56	5.15	4.59	.15	.37**	-28*	.40**

Note. DASS-D = Depression Anxiety Stress Scale – Depression; RTQ-RNT = Repetitive
Thinking Questionnaire – Repetitive Negative Thinking; RTQ-ART = Repetitive Thinking
Questionnaire – Absence of Repetitive Thinking; PTQ = Perseverative Thinking
Questionnaire; IES-R = Impact of Event Scale – Revised.
*p < .05, **p < .01.

Table D2

Study 3: Results of Manipulation Check

	Rumination (*n* = 28)		Distraction (*n* = 29)		Statistic		
	M	*SD*	*M*	*SD*	*t*	*df*	*d*
Identification with thought transcript	2.07	1.03	1.15	1.30	3.19*	55	0.78
Concentration	2.64	1.10	2.14	1.09	1.74	55	0.46
Time spent thinking about questions	75.57	18.56	69.93	22.27	1.04	55	0.28
Time spent remembering film	40.36	30.94	19.48	22.75	2.89*	49.53	0.77
Distress during manipulation	2.39	1.03	0.41	0.73	8.33**	48.62	2.23
Driven to continue thinking about film	1.96	1.50	1.00	1.07	2.78*	48.64	0.74
PTQ-S	28.71	13.67	21.90	13.58	1.89	55	0.50

Note. PTQ-S = Perseverative Thinking Questionnaire – State version.

p < .05, **p* < .001.

Table D3

Study 3: Correlations of Baseline PTSD Symptoms and Trauma-related Beliefs with

Intrusion Variables

	N	PCL-5 r	PTCI r
Intrusion frequency			
Post-film (T1a)	37	.001	-.08
Post-film (T1b)	38	-.06	-.11
Post-manipulation (T2a)	37	-.01	-.03
Post-manipulation (T2b)	38	.13	.04
Post-reminder (T3a)	37	.10	.06
Post-reminder (T3b)	38	-.02	-.11
One week (average)	36	.03	.08
One-week follow-up	37	-.001	-.03
Intrusion-related distress			
Post-film (T1a)	38	.12	.10
Post-film (T1b)	38	-.02	-.11
Post-manipulation (T2a)	38	.04	.10
Post-manipulation (T2b)	38	.30	.29
Post-reminder (T3a)	38	.31	.29
Post-reminder (T3b)	38	.32	.25
One week (average highest distress)	36	.03	.001
One-week follow-up	37	-.07	-.04
IES-R intrusion			
One week	37	.06	.17

Note. PCL-5 = PTSD Checklist for DSM-5; PTCI = Posttraumatic Cognitions Inventory;

IES-R = Impact of Event Scale – Revised.

Table D4

Study 3: Intrusion Variables during 1 Week by Condition

	Day 1 M (SD)	Day 2 M (SD)	Day 3 M (SD)	Day 4 M (SD)	Day 5 M (SD)	Day 6 M (SD)	Day 7 M (SD)	Average M (SD)	Condition F	df	η_p^2	Time F	df	η_p^2	Condition × Time F	df	η_p^2
n with any intrusions																	
Rumination	22	16	14	7	7	6	5	-									
Distraction	25	23	16	9	12	8	10	-									
Frequency									2.89	1, 51	.05	35.35**	1.85, 94.16	.41	1.38	1.85, 94.16	.02
Rumination	4.04 (4.82)	2.31 (3.03)	0.93 (1.71)	0.47 (0.98)	0.54 (1.03)	0.26 (0.51)	0.35 (0.75)	1.22 (1.35)									
Distraction	5.74 (4.94)	3.79 (3.84)	1.71 (1.95)	0.60 (1.21)	0.89 (1.27)	0.35 (0.59)	0.69 (1.02)	1.92 (1.61)									
Highest associated distress									0.81	1, 45	.02	24.56**	6, 270	.35	0.34	6, 270	.01
Rumination	5.61 (3.03)	3.65 (3.58)	2.52 (3.37)	1.65 (2.96)	1.09 (2.23)	0.65 (1.64)	1.09 (2.50)	2.21 (1.56)									
Distraction	5.75 (2.95)	4.46 (3.31)	2.92 (3.03)	1.54 (2.70)	2.21 (2.89)	1.17 (2.51)	1.46 (2.48)	2.64 (1.95)									
									t	*df*	*d*						
IES-R intrusion (1 week)									1.03	54	0.28						
Rumination								0.57 (0.50)									
Distraction								0.72 (0.64)									

Note. n = 28 in each group. IES-R = Impact of Event Scale – Revised. Degrees of freedom vary due to not all participants completed the diary every day.
**p < .001.

Table D5

Study 3: Effects of Experimental Manipulation on Mood, Heart-rate and IES-R Avoidance and Hyperarousal

	Rumination (*n* = 28)		Distraction (*n* = 29)		Statistic								
					Condition			Time			Condition × Time		
	M	*SD*	*M*	*SD*	*F*	*df*	η_p^2	*F*	*df*	η_p^2	*F*	*df*	η_p^2
Mood (initial session)													
Anxious					0.01	1, 54	< .001	19.99**	2, 108	.27	3.22*	2, 108	.06
Post-film (T1)	5.78	2.69	6.48	2.39									
Post-manipulation (T2)	4.81	3.15	4.07	1.98									
Post-reminder (T2)	4.52	3.16	4.76	2.63									
Sad					1.54	1, 54	.03	20.90**	2, 108	.28	4.13*	2, 108	.07
Post-film (T1)	5.81	2.15	5.79	2.54									
Post-manipulation (T2)	5.15	2.74	3.69	2.48									
Post-reminder (T3)	4.81	2.84	3.93	2.85									
Happy					1.67	1, 54	.03	23.02**	2, 108	.30	6.61*	2, 108	.11
Post-film (T1)	2.74	2.11	2.55	1.99									
Post-manipulation (T2)	3.30	1.88	4.69	2.00									
Post-reminder (T3)	3.52	1.99	4.17	2.16									
Heart-rate (initial session – before and after manipulation)					0.03	1, 51	.001	14.61	2, 102	.22	0.30	2, 102	.01
Pre-manipulation (T1a)	78.96	9.20	78.96	11.40									
During manipulation	75.19	9.08	76.19	10.77									
Post-manipulation (T2a)	78.10	9.62	78.58	11.40									
Heart-rate (initial session – before and after reminder)					0.02	1, 51	< .001	31.81**	2, 102	.38	0.14	2, 102	.003
Pre-reminders (T2a)	78.10	9.62	78.58	11.40									
During reminder	71.67	8.82	72.41	10.61									
Post-reminder (T3a)	75.75	8.43	75.69	10.35									
IES-R (1 week)					*t*	*df*	*d*						
Avoidance	0.90	0.73	1.05	0.80	0.75	54	0.20						
Hyperarousal	0.32	0.44	0.38	0.50	0.48	54	0.13						

Note. IES-R = Impact of Event Scale – Revised. Degrees of freedom vary due to one participant each failed to complete a mood rating and IES-R and equipment failure (heart-rate). *p < .05, **p < .001.

Table D6

Study 4: Results of Rumination Induction Piloting

	Study 3 (N = 28)		Piloting (N = 6)		Statistic		
	M	*SD*	*M*	*SD*	*t*	*df*	*d*
Concentration	2.64	1.10	3.17	0.75	1.11	32	0.50
Time spent thinking about questions	75.57	18.56	84.17	6.65	1.11	32	0.50
Time spent remembering film	40.36	30.94	46.50	42.91	0.41	32	0.19
Distress during manipulation	2.39	1.03	2.33	1.21	0.13	32	0.06
Driven to continue thinking about film	1.96	1.50	2.83	0.98	1.35	32	0.61
PTQ-S	28.71	13.67	28.67	13.02	0.01	32	0.003

Note. PTQ-S = Perseverative Thinking Questionnaire – State version.

Table D7

Study 4: Descriptive Statistics and Intercorrelations for Trait Rumination and Existing

Depression, and Intrusion Variables

	N	M	SD	DASS-D	RTQ RNT	RTQ ART	PTQ
				r	r	r	r
Baseline questionnaire							
DASS-D	59	5.10	6.11	-			
RTQ-RNT	59	72.32	24.40	.32*	-		
RTQ-ART	59	7.90	2.60	.09	-.40**	-	
PTQ	59	26.27	11.53	.43**	.57**	-.11	-
Intrusion frequency							
Post-film (T1)	59	11.52	8.73	.05	.17	-.22	.19
Post-manipulation (T2)	59	7.91	7.90	.09	.26	-.23	.22
Post-reminder (T3)	59	8.52	7.31	.03	.12	.05	.07
One week (average)	59	1.98	1.92	.09	.16	-.01	.04
One-week follow-up	56	3.16	3.32	.25	.26	.07	.14
Intrusion-related distress							
Post-film (T1)	59	6.39	2.87	.25	.04	-.15	.24
Post-manipulation (T2)	58	4.14	2.92	.08	.01	-.12	.12
Post-reminder (T3)	59	4.22	3.06	.22	.01	.10	.20
One week (average highest distress)	58	2.29	2.17	.26*	.12	.10	.24
One-week follow-up	58	1.69	2.15	.32*	.09	.12	.19
IES-R intrusion							
One week	58	0.79	0.61	.42**	.38**	.09	.39**

Note. DASS-D = Depression Anxiety Stress Scale – Depression; RTQ-RNT = Repetitive Thinking Questionnaire – Repetitive Negative Thinking; RTQ-ART = Repetitive Thinking Questionnaire – Absence of Repetitive Thinking; PTQ = Perseverative Thinking Questionnaire; IES-R = Impact of Event Scale – Revised.
*p < .05, **p < .01.

Table D8

Study 4: Results of Manipulation Check

	Rumination (*n* = 29)		Free-thinking (*n* = 30)		Statistic		
	M	*SD*	*M*	*SD*	*t*	*df*	*d*
Identification with thought transcript	2.21	1.26	-	-	-	-	-
Concentration	2.62	1.05	2.38	1.30	0.78	57	0.20
Time spent thinking about questions	72.90	22.70	50.00	31.73	3.20*	52.57	0.83
Time spent remembering film	33.72	26.19	36.58	30.94	0.38	57	0.10
Distress during manipulation	2.34	0.97	0.97	0.96	5.42**	57	1.42
Driven to continue thinking about film	1.93	1.16	1.30	1.32	1.95	57	0.51
PTQ-S	29.21	13.77	25.67	15.21	0.94	57	0.24

Note. PTQ-S = Perseverative Thinking Questionnaire – State version.

p < .05, ***p* < .001.

Table D9

Study 4: Correlations of Baseline PTSD Symptoms and Trauma-related Beliefs with Intrusion

Variables

	N	PCL-5	PTCI
		r	*r*
Intrusion frequency			
Post-film (T1)	40	.19	.30
Post-manipulation (T2)	40	.19	.35*
Post-reminder (T3)	40	.17	.23
One week (average)	40	.37*	.27
One-week follow-up	40	.27	.27
Intrusion-related distress			
Post-film (T1)	40	.14	.28
Post-manipulation (T2)	39	.40*	.34*
Post-reminder (T3)	40	.27	.24
One week (average highest distress)	40	.40*	.40*
One-week follow-up	40	.39*	.36*
IES-R intrusion			
One week	40	.60**	.49*

Note. PCL-5 = PTSD Checklist for DSM-5; PTCI = Posttraumatic Cognitions Inventory; IES-R = Impact of Event Scale – Revised.

*p < .05, **p < .001.

Table D10

Study 4: Intrusion Variables during 1 Week by Condition

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Average	Condition			Statistic Time			Condition × Time		
	M (SD)	*M* (SD)	*M* (SD)	*M* (SD)	*M* (SD)	*M* (SD)	*M* (SD)	*M* (SD)	*F*	*df*	η_p^2	*F*	*df*	η_p^2	*F*	*df*	η_p^2
n with any intrusions																	
Rumination	26	20	17	12	11	8	11	-									
Free-thinking	25	20	16	12	7	9	5	-									
Frequency									1.14	1, 54	.02	38.06**	2.12, 114.510	.41	1.36	2.12, 114.510	.03
Rumination	6.61 (5.53)	2.76 (3.16)	1.95 (2.51)	1.36 (2.42)	1.19 (1.75)	0.99 (1.98)	0.92 (1.59)	2.25 (2.01)									
Free-thinking	4.74 (4.99)	2.09 (2.71)	1.60 (2.33)	1.61 (2.33)	0.55 (1.19)	0.80 (1.77)	0.49 (1.30)	1.70 (1.82)									
Highest associated distress									0.28	1, 52	.01	20.02**	6, 312	.28	0.74	6, 312	.01
Rumination	5.59 (3.23)	3.26 (3.39)	2.89 (3.41)	2.00 (2.91)	2.26 (3.45)	1.30 (2.90)	2.26 (3.35)	2.40 (2.09)									
Free-thinking	4.96 (3.51)	3.41 (3.18)	2.93 (3.51)	1.96 (3.17)	1.33 (2.95)	1.37 (2.76)	1.15 (2.74)	2.18 (2.27)									
									t	*df*	*d*						
IES-R intrusion (1 week)									0.16	56	0.04						
Rumination								0.77 (0.58)									
Free-thinking								0.80 (0.66)									

Note. n = 29 in each group. IES-R = Impact of Event Scale – Revised. Degrees of freedom vary due to not all participants completed the diary every day.
**p < .001.

APPENDIX E – CORRELATIONS OF TRAIT RUMINATION WITH INTRUSION VARIABLES AT FOLLOW-UP (STUDIES 1-5)

Table E1

Correlations of Different Measures of Trait Rumination with Intrusion Variables at Follow-up

Study	1	2		3		4		5	
Measure	PTQ	PTQ	RTQ-RNT	PTQ	RTQ-RNT	PTQ	RTQ-RNT	PTQ	RTQ-10
N	81	44	44	56	56	56	58	51	51
	r	*r*	*r*	*r*	*r*	*r*	*r*	*r*	*r*
Frequency	.22*	.12	.27	.13	.09	.14	.26	.20	.08
Associated distress	.13	.01	.09	.09	.22	.19	.09	.35*	.26

Note. PTQ = Perseverative Thinking Questionnaire; RTQ-RNT = Repetitive Thinking Questionnaire – Repetitive Negative Thinking; RTQ-10 = Repetitive Thinking Questionnaire – 10-item version.
*$p < .05$.