



A prospective examination of risk factors in the development of intrusions following a trauma analog



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ABSTRACT

Several factors have been linked to the severity of posttraumatic distress, although retrospective designs in much of the literature limit conclusions regarding the temporal relation between risk factors and corresponding symptoms. To address these concerns, the current project employed an analog trauma paradigm to assess the impact of background characteristics, stress response, and post-stressor affect regulation on subjective distress and intrusive memories experienced during the subsequent processing of emotional stimuli. University students ($N = 184$; 56% female, 42% White/Non-Hispanic) were shown graphic scenes of a televised suicide. Physiological activation was recorded during exposure with emotion ratings collected following the film. Participants then viewed a sadness- or humor-eliciting prime under instructions to inhibit or naturally express emotion. Intrusions experienced during the priming film and residual distress at study's conclusion were rated prior to debriefing. Hierarchical regression identified reductions in emotional valence as a robust predictor of intrusions and distress. Sympathetic activation and exposure to the sadness prime were associated with intrusion frequency, whereas attenuated parasympathetic response predicted intrusion intensity. Expressive inhibition demonstrated a unique association with residual distress. Results suggest peritraumatic processes and post-exposure factors may hold more prominent relations with immediate trauma-related distress as compared to pre-existing survivor characteristics.

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1. Introduction

Research over the past three decades has identified a number of factors demonstrating reliable associations with posttraumatic distress: background characteristics such as gender, trauma history, and pre-existing depression; peritraumatic responses involving emotional and physiological reactions during the event; and post-exposure factors including cued emotion and affect regulation (Cisler, Olatunji, Feldner, & Forsyth, 2010; Litz, Kaloupek, Orsillo, & Weathers, 2000; Ozer, Best, Lipsey, & Weiss, 2003). Despite progress in isolating correlates of posttraumatic stress, retrospective designs in much of this literature limit conclusions regarding the temporal relation between risk factors and corresponding symptoms. Analog trauma studies - protocols in which intrusive

memories are elicited temporarily in non-clinical participants - have emerged as a flexible method for assessing prospective relations between risk factors and trauma-relevant outcomes (James et al., 2016). The goal of the current project was to examine the unique influence of background characteristics, stress response, and post-stressor affect manipulation on the development of intrusive memories and distress in participants exposed to an analog trauma.

Epidemiological research indicates that trauma exposure is exceedingly common, with 51–61% of the population experiencing one or more events over the course of their lifetime (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Estimates of the lifetime prevalence of posttraumatic stress disorder (PTSD), by contrast, are considerably lower (4–8%; Pietrzak, Goldstein, Southwick, & Grant, 2011; Kessler, Berglund, Demler, Jin, & Walters, 2005), generating considerable interest in factors that may increase an individual's probability of developing disorder.

Several influential meta-analyses have examined aggregate data from the existing literature to isolate variables holding reliable

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associations with PTSD (e.g., [Brewin, Andrews, & Valentine, 2000](#); [Ozer et al., 2003](#)). While meta-analytic procedures enhance precision in the estimation of relations between risk factors and symptoms, inferences drawn from these data remain limited. First, the majority of studies aggregated for analysis are cross-sectional, limiting strong conclusions regarding the temporal relation between risk factors and corresponding symptoms. Second, the emphasis on general associations with total symptom severity may obscure processes by which variables confer specific risk. For example, cross-sectional analyses have identified female gender as a consistent correlate of PTSD, but it remains unclear whether women are at greater risk for uniform symptom development, whether risk is limited to specific symptom domains, or whether increased vulnerability is attributable to post-exposure factors (e.g., lack of support, social blaming) unfolding in the weeks and months following the event.

Analog trauma studies are one approach used to address the limitations of cross-sectional designs. Analog paradigms involve presenting non-clinical participants with aversive film and/or photographic stimuli to elicit intrusive thoughts and images over a discrete period (e.g., [Holmes & Bourne, 2008](#); [James et al., 2016](#)). Intrusive memories are believed to be a hallmark symptom of PTSD, with multiple theoretical models identifying intrusions as a specific mechanism in the development of disorder (e.g., [Brewin, 2001](#); [Ehlers & Clark, 2000](#); [Foa, Steketee, & Rothbaum, 1989](#)). Within the analog trauma paradigm, intrusive memories and corresponding distress are assessed in the laboratory shortly after exposure (e.g., [Bomyea & Amir, 2012](#)) and/or in the days following participation (e.g., [Nixon, Cain, Nehmy, & Seymour, 2009](#)). Predictors of subsequent intrusions vary by study but typically include background characteristics, affective response to the analog trauma, and/or experimental manipulations targeting post-exposure processing ([James et al., 2016](#)).

1.1. Background characteristics

Background characteristics including gender, prior trauma exposure, and depression are routinely identified as general risk factors of posttraumatic stress (e.g., [Brewin et al., 2000](#); [Ozer et al., 2003](#)) although evidence of specific links to intrusive memories remains mixed. In a recent meta-analysis of 16 analog studies, both trauma history and participant gender failed to predict intrusive images occurring in the week following exposure ([Clark, Mackay, & Holmes, 2015](#)). Selected studies outside this review have observed more frequent intrusions and higher intrusion-related distress in women relative to men ([Kamboj et al., 2014](#); [Wessel, Overwijk, Verwoerd, & de Vrieze, 2008](#)); however, strong evidence for trauma history and biological sex as specific risk factors for traumatic intrusions remains limited.

Pre-existing depression, by contrast, has been identified as a predictor of intrusive memories in several analog studies. Meta-analyses by [Clark et al. \(2015\)](#) found that lower depression scores were associated with a reduction in the odds of intrusions assessed at 1-week post-exposure. [Laposa and Alden \(2006\)](#) also noted prospective relations between depression and the frequency of subsequent film-related intrusions. Existing research suggests that rumination and associated cognitive biases may predispose individuals with active depression to develop more negative appraisals of the traumatic event, increasing the likelihood of unwanted memories ([Angelakis & Nixon, 2015](#); [Spinhoven, Penninx, Krempeniou, van Hemert, & Elzinga, 2015](#)). Mental imagery has also been proposed as a common etiological factor for both depression and traumatic intrusions ([Holmes, Blackwell, Heyes, Renner, & Raes, 2016](#)). Within this framework, mental imagery is believed to serve as an “emotional amplifier” of negative

autobiographical memory including reactions to potentially traumatic events ([Holmes & Mathews, 2010](#)).

1.2. Affective response to the analog trauma

Subjective response to analog trauma stimuli has been shown to be a robust predictor of intrusive memories ([Clark et al., 2015](#); [James et al., 2016](#)). Physiological monitoring in these designs also enables a direct assessment of the extent to which biological processes relate to subsequent intrusions. For example, [Bryant, McGrath, and Felmingham \(2013\)](#) identified small effects of sympathetic change on intrusive memories in women presented with aversive images ($\beta = 0.15$). [Chou, La Marca, Steptoe, and Brewin \(2014\)](#) observed a similar relation between post-film sympathetic activation and the frequency of intrusions in a mixed-gender sample ($\beta = 0.17$). It is important to note that specific effects in these studies failed to reach formal criteria for statistical significance although the samples available for both analyses were limited ($N \leq 45$). Results are notable, however, given the paucity of research in this area and the concordance of effects with models positing a functional relation between increased arousal and the consolidation of traumatic memory ([Brewin, Gregory, Lipton, & Burgess, 2010](#); [Ehlers & Clark, 2000](#)).

Parasympathetic activation during exposure may also influence the development of psychopathology, but specific relations remain largely unexplored. Consistent with models identifying parasympathetic activation as a general resilience factor ([Friedman, 2007](#)), clinical studies have found PTSD symptom severity to be associated with lower resting parasympathetic activity as well as decreased response to experimental stressors ([Agorastos et al., 2013](#); [Norte et al., 2013](#)). Analog studies have yet to test the degree to which parasympathetic reactivity may predict aspects of intrusive memories and corresponding distress.

1.3. Experimental manipulations targeting post-exposure processing

A final set of factors involves the manipulation of emotional and regulatory processes following analog exposure. One area gaining recent attention involves the incorporation of positive mental imagery in the treatment of mood- and anxiety-related difficulties ([Holmes et al., 2016](#); [Tsai & McNally, 2014](#); [Zbozinek, Holmes, & Craske, 2015](#)). Modifications to the analog trauma paradigm in which aversive stimuli are replaced with positively valenced films suggests the presence of common mechanisms in the generation of involuntary positive and negative memory ([Clark, Mackay, & Holmes, 2013](#); [Davies, Malik, Pictet, Blackwell, & Holmes, 2012](#)). Research exploring the effects of mood-congruent recall suggests that positive mood induction may enhance the accessibility of positive autobiographical memory in select individuals (e.g., [Holmes et al., 2016](#); [Joormann & Siemer, 2004](#)). From this perspective, the deliberate activation of positive affect may serve to suppress or compete with the generation of negative mental imagery associated with PTSD and co-occurring disorders.

Strategies used to manage affective responding post-exposure may further influence the development of symptoms. Expressive suppression is a volitional regulatory strategy intended to inhibit the outward display of emotion ([Gross, 1998](#)). While trait-level suppression demonstrates robust associations with elevated depression, reduced emotional well-being, negative social relations, and greater posttrauma symptom severity ([Gross & John, 2003](#); [Moore, Zoellner, & Mollenholt, 2008](#)), few studies have explored specific links to traumatic intrusions. Existing research suggests the intentional down-regulation of expressive emotion may be associated with increased rumination, producing greater

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