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Contextual representations of negative images modulate intrusion frequency in an intrusion provocation paradigm

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ABSTRACT

Background and objectives: To understand how memories of negative events become highly accessible in the context of trauma, we tested the hypothesis that contextual information modulates how easily intrusions can be provoked by perceptual stimuli..
Methods: Healthy participants viewed pictures depicting trauma scenes either with or without accompanying moderate (i.e. survival, recovery) or severe (i.e. fatality, permanent injury) outcome information. All participants viewed the same depictions of trauma scenes. Involuntary memories for the pictures were assessed using self-report diaries and an adapted version of the Impact of Event Scales (IES). A blurred picture perceptual priming paradigm was adapted to be used as an intrusion provocation task.
Results: The severe outcome group experienced a significantly higher frequency of intrusions on the intrusion provocation task in comparison to both moderate outcome and control (no-context) conditions. The severe outcome condition did not increase intrusions on the self-report diaries or the adapted IES. There was no effect of condition on ratings for the emotionality, self-relevance, valence, or seriousness of the trauma scenes.
Limitations: The analogue method should not be generalized directly to incidences of real-life trauma. It was unclear why differences in intrusion frequency were found in the provocation task only. The relative amount of individual conceptual and data-driven processing adopted by the participants was not assessed.
Conclusions: Manipulating contextual information that determines the meaning of sensory-perceptual features for a trauma scene can modulate subsequent intrusion frequency in response to visually similar cues.

Perceptual and contextual information related to trauma events have been theorized to play unique roles in intrusion development (e.g., Brewin, 2014; Krans, Langner, Reinecke, & Pearson, 2013). For example, the importance of perceptual memory features in the cognitive model of PTSD proposed by Ehlers and Clark (2000). Intrusive trauma imagery is explained using a distinction between conceptual and data-driven processing in memory (Roediger, 1990). Data-driven processing has been defined as "encoding that focuses on the surface level (i.e. sensory details) of information rather than its meaning" (Ehlers, Michael, Chen, Payne, & Shan, 2006, p. 318), while conceptual processing is defined as encoding that "reflect[s] meaning or conceptual elaboration" (Roediger, 1990). It has been argued that if an individual lacks conceptual processing and engages mainly in data-driven processing (i.e. they process the sensory impressions of an event rather than its meaning), then the resulting trauma memory will demonstrate strong perceptual priming effects for accompanying stimuli (Ehlers & Clark, 2000). Other models which attribute the occurrence of involuntary intrusions predominantly to sensory-perceptual information include the dual-representation theory of PTSD (Brewin, Gregory, Lipton, & Burgess, 2010) and the Self-Memory System model of autobiographical memory (Conway & Pleydell-Pearce, 2000). Many previous analogue trauma studies of intrusive memory have adopted a theoretical framework based on the assumption that greater contextualisation of memories should result in fewer involuntary

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recollections (e.g. Bourne, Frasquilho, Roth, & Holmes, 2010; Glazer, Mason, King, & Brewin, 2013). These models consider the data-driven and conceptual processing as an intra-individual style that interacts with the nature of the trauma.

In the present study we are examining the effects of conceptual and perceptual information on the nature of the (analogue) trauma on the development of intrusive memories. Conceptual processing here can be thought of in terms of resulting in abstract contextual memory representations which code the *meaning* of an event separately from associated sensory-perceptual representations (Pearson, 2014). In the general non-clinical memory literature it has been common for the encoding of data-driven and conceptual information to be manipulated using differential presentation of pictorial and verbally-based stimuli (e.g., Weldon, Roediger, Beitel, & Johnston, 1995; McDaniel, Robinson-Riegler, & Einstein, 1998; Vandierendonck & Rosseel, 2000), and such paradigms can be adapted to examine involuntary memory intrusions. Pearson, Ross, and Webster (2012) presented participants with pictures depicting real-life images of violence with or without additional contextual information specifying the words "war" or "crime". Results showed presence of contextual information significantly increased the frequency of involuntary intrusions, but without any effect on reported vividness or emotionality. Krans et al. (2013) presented participants with pictures depicting traumatic events either alone or accompanied by contextual statements (e.g. "This woman was asleep when a fire started in her kitchen. She is unconscious and is being carried out of her house by firemen"), and also found the presence of contextual information increased intrusion frequency. Overall these findings demonstrate that the contextual interpretation of sensory-perceptual elements of a scene during encoding can be integral to their subsequent occurrence as traumatic intrusions.

However, one limitation of previous contextual studies is that the contextual information accompanying trauma stimuli was consistent with either moderate *or* severe interpretations of the visual stimuli. For example, the contextual statements used by Krans et al. (2013) did not differentiate between severe and moderate outcomes, leaving the relative consequences of contextual information that differs in meaning unknown.

The present study aimed to address the research question of whether the accessibility of memory representations for trauma material is determined solely by encoded sensory-perceptual information, or whether there is also a contribution made by more abstract cognitive components that specify *meaning*. We adopted a paradigm in which the available perceptual information for trauma scenes was held constant across all conditions, while only information affecting the *interpretation* of the scenes was manipulated. The study expands on the methodology of previous studies by adapting a perceptual priming paradigm to provoke intrusions (Krans, Näring, Holmes, & Becker, 2010; Lang, Moulds, & Holmes, 2009), allowing the effect of contextual information on intrusion frequency to be examined. In Ehlers and Clark (2000) model of PTSD, persistent intrusions are associated with strong perceptual priming effects, in which data-driven processing of a trauma event results in a reduced perceptual threshold for encoded stimuli. Involuntary intrusions are triggered when an individual encounters external cues in the environment that share sensory-perceptual characteristics with stimuli encoded during the original event. For example, in one case study patterns of sunlight on a lawn triggered intrusions of car headlights for the victim of a car accident (Ehlers & Clark, 2000, p. 326). The experimental evidence for perceptual priming triggering intrusive memories is compelling, although it largely originates from analogue trauma studies (Ehlers et al., 2006). For example, Michael and Ehlers (2007) asked participants to complete a blurred object identification task, and found that perceptual priming of the objects was enhanced if they preceded a "traumatic" picture story rather than a neutral one. Similarly, Sündermann, Hauschildt, and Ehlers (2013) found that neutral objects were more strongly primed if they had been presented within the context of a trauma story rather than a neutral one.

The main aim of the current study was to experimentally compare the effects of providing severe or moderate outcome contextual information on involuntary memory for analogue trauma stimuli. Following previously established procedures (Krans et al., 2013; Pearson et al., 2012; Pearson & Sawyer, 2011), we recruited healthy participants and presented them with pictures depicting negative emotional material. One group of participants received additional contextual information for each picture specifying a moderate outcome that placed emphasis on survival and recovery (e.g. "There were many survivors") while a second group received contextual information specifying a severe outcome for the same pictures which placed emphasis on fatality and permanent injury (e.g. "There were few survivors"). A third control group viewed the pictures alone without any accompanying contextual information. Because all participants viewed exactly the same pictures the surface sensory details available for encoding were held constant across the three groups, and only the encoding of *meaning* was manipulated; i.e. what participants believed the pictures were representing. As meaning was specified by the verbal textual descriptions rather than the sensory content of the pictures themselves, this manipulation affects the content of the available conceptual information rather than sensory information. We sought to examine whether there was a significant difference between the severe outcome and moderate outcome contextual conditions; particularly whether contextual information specifying a severe interpretation of scene content was associated with a significantly higher rate of involuntary intrusions.

1. Method

This study was approved by the Human Research Ethics Advisory Panel (Panel C, Behavioural) at the University of New South Wales (HREAP 123–162).

1.1. Participants

In total 120 participants were tested. Data was lost for one participant due to a technical error and seven participants failed to return for the second session. A further two participants reported depression levels in the moderate and severe range and were also excluded from the analysis. The final dataset contained data from 110 participants (moderate outcome context condition $n = 37$, 26 female; severe outcome context condition $n = 38$, 17 female; control condition $n = 35$, 21 female) including 64 women and 46 men with a mean age of $M = 24.43$, $SD = 5.16$, range 18–46 years old. Participants were 67 students of various courses and of various degrees (from undergraduate to PhD) and 43 Sydney community participants. Psychology undergraduate participants received course credit for participation whereas other participants were reimbursed $30 for their time. Exclusion criteria were: panic attacks, panic disorder (current and lifetime), PTSD (current and lifetime), major depressive episode (current and lifetime), psychotic episode (current and lifetime), blood phobia, and history of fainting.

1.2. Materials

1.2.1. Sample characteristics

Trait anxiety was measured with the State-Trait Anxiety Inventory-Trait version (STAI-T; Spielberger, Gorsuch, Lushene,