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Intrusive images and voluntary memory for affective pictures: Contextualization and dual-task interference



Julie Krans^{a,*}, Oliver Langner^{b,1}, Andrea Reinecke^c, David G. Pearson^d

^a School of Psychology, University of New South Wales, Sydney, NSW 2052, Australia

^b Friedrich-Schiller University Jena, Germany

^c Department of Psychiatry, University of Oxford, United Kingdom

^d School of Psychology, University of Aberdeen, United Kingdom

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ABSTRACT

Background and objectives: The present study addressed the role of context information and dual-task interference during the encoding of negative pictures on intrusion development and voluntary recall. **Methods:** Healthy participants were shown negative pictures with or without context information. Pictures were either viewed alone or concurrently with a visuospatial or verbal task. Participants reported their intrusive images of the pictures in a diary. At follow-up, perceptual and contextual memory was tested.

Results: Participants in the context group reported more intrusive images and perceptual voluntary memory than participants in the no context group. No effects of the concurrent tasks were found on intrusive image frequency, but perceptual and contextual memory was affected according to the cognitive load of the task.

Limitations: The analogue method cannot be generalized to real-life trauma and the secondary tasks may differ in cognitive load.

Conclusions: The findings challenge a dual memory model of PTSD but support an account in which retrieval strategy, rather than encoding processes, accounts for the experience of involuntary versus voluntary recall.

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1. Introduction

Memory plays a key role in the understanding of Posttraumatic Stress Disorder (PTSD). For one, intrusive memories occur in the form of flashbacks, inducing a re-experience of the event as if it were happening again (American Psychiatric Association, 2000). Further, the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; APA, 2000) includes ‘inability to recall an important aspect of the trauma’ in the classification criteria. Thus, on the one hand, involuntary recall appears to be enhanced, whereas voluntary recall is suggested to be hampered. For theoretical and clinical reasons it is important to better understand the role of memory processes in stress reactions.

Clinical models of PTSD suggest that intrusive images result from specific peri-traumatic encoding (Brewin, Dalgleish, & Joseph,

1996; Brewin, Gregory, Lipton, & Burgess, 2010; Holmes & Bourne, 2008). In the dual-representation theory of PTSD (Brewin et al., 1996) experienced events are viewed as being encoded by two parallel memory systems: Situationally Accessible Memory (SAM) and Verbally Accessible Memory (VAM). The SAM system contains detailed perceptual information that can be involuntarily triggered by matching internal or external cues that match low-level sensory features of the stored representations. In contrast, VAMs result from the conscious experience of an event and consist of abstract declarative representations that support the integration of information within autobiographical memory. In the updated model (Brewin et al., 2010) involuntary recollections are argued to primarily result from activation within the sensory-bound representational system, particularly when sensory-bound representations of an event are encoded into memory together with impoverished or absent encoding of associated contextualized representations (Brewin et al., 2010). It would therefore be expected that relatively more perceptual encoding results in more intrusive memories and impaired voluntary recall, while relatively more contextual encoding results in fewer intrusive memories and enhanced

* Corresponding author. Tel.: +61 (0) 2 9385 8249; fax: +61 (0) 2 93853641.

E-mail address: j.krans@unsw.edu.au (J. Krans).

¹ This study was conducted at the Behavioural Science Institute, Radboud University Nijmegen, the Netherlands.

voluntary recall (Brewin & Saunders, 2001; Holmes, Brewin, & Hennessey, 2004).

In contrast, several models of autobiographical memory suggest that intrusive and voluntary recall stem from different retrieval strategies rather than differences during encoding (e.g., Berntsen, 2009, 2010; Conway & Pleydell-Pearce, 2000; Mace, 2007). For example, Berntsen (2009, 2010) has argued that involuntary memories represent a basic mode of remembering that uses the same episodic memory system as voluntary memory. Mace (2007; Mace, Clevinger, & Martin, 2010) has proposed that involuntary recollection occurs either by recollection of a single involuntary memory following cueing by a related sensory or abstract experience, or by “chained involuntary remembering”, in which the direct cueing of one involuntary memory automatically triggers the involuntary recollection of another.

A key feature of these retrieval-based models is that trauma memories are judged not to be fixed during encoding but instead change over time as a result of individuals’ goals and current concerns (see also Conway, 2005; Conway & Pleydell-Pearce, 2000; Rubin, Berntsen, & Bohni, 2008). Such models predict that increased availability of explicit memory for the trauma is linked to PTSD symptoms rather than a peri-traumatic shift in encoding from conceptual to sensory-perceptual processing. For this study, this means that the more information that is encoded (regardless of whether it is perceptual or contextual), the more involuntary memories should occur and the better voluntary recall should be.

Recently, Pearson, Ross, and Webster (2012) tested part of this prediction by manipulating contextual information independently of perceptual encoding. Participants viewed negative images either under neutral conditions or paired with a single word as contextual information. In line with the above, contextual information was found to significantly increase the number of involuntary images rather than leading to a reduction. Pearson et al. (2012) argued that contextual representations play a causal role in intrusion frequency by increasing the sensitivity of the memory to involuntary retrieval by associated internal and external cues. The primary goal of our current study was to experimentally test whether adding contextual information for a ‘traumatic’ event would decrease or increase intrusion frequency.

Based on working memory theory (Baddeley, 1986, 2000; Baddeley & Hitch, 1994), the dual representation account (Brewin et al., 2010; Holmes et al., 2004) predicts that reducing visuospatial input (i.e., with a concurrent visuospatial task during encoding) decreases the number of intrusions, whereas interfering with verbal processing (i.e., with a concurrent verbal task during encoding) increases intrusion frequency. Several studies have tested this hypothesis using dual-task instructions during an aversive film. It has been reported that tapping a visuospatial pattern (e.g., Brewin & Saunders, 2001; Holmes et al., 2004; Krans, Näring, Holmes, & Becker, 2010a) or modelling clay while viewing an aversive film (Krans, Näring, Holmes, & Becker, 2010b; Stuart, Holmes, & Brewin, 2006) reduces intrusive images compared to a no-task control condition. Additionally, Bourne, Frاسquilho, Roth, and Holmes (2010) and Holmes et al. (2004) found that intrusion frequency was higher after verbal interference during the encoding of a distressing film compared to a condition with no concurrent task. However, another study found a trend for the opposite direction (Krans, Näring, & Becker, 2009). One study reported that a conceptual interference task did not show an effect on intrusion frequency (Logan & O’Kearney, 2012). Pearson and Sawyer (2011) showed that performing a verbal interference task while encoding distressing pictures decreased intrusion frequency comparable to a condition in which a visual interference task was conducted. A similar pattern was found when participants were asked to imagine the scene of a road traffic accident (Krans et al., 2010b).

Furthermore, whereas some of the studies found that voluntary recall (in the form of a cued-recall and/or recognition memory task) showed the same modulation pattern as involuntary memory, others found no effects of dual-task competition on voluntary memory of the analogue trauma.

One significant limitation in the majority of the above mentioned studies is that either a visuospatial or a verbal interference condition was compared to a no task control group. This may be problematic as tasks may involve both modality-specific (i.e., visuospatial or verbal) as well as more general cognitive resources (for a discussion of the importance to distinguish between imagery and verbal processes in encoding and retrieval please see Paivio, 1971). We therefore aimed to experimentally compare the effects of a concurrent visuospatial task, a concurrent verbal task, and a no task control condition during encoding on both involuntary and voluntary memory of an analogue trauma.

To address our research goals, we recruited healthy participants and presented them with pictures depicting negative emotional content. Such pictures can effectively induce intrusive images (Pearson et al., 2012; Pearson & Sawyer, 2011) and have several advantages over the more commonly used ‘trauma film’ in that a within-subjects design can be realized more effectively (Pearson & Sawyer, 2011) and contextual information can be more easily manipulated (Berger, 2002). This allows for a procedure that keeps the perceptual information constant while manipulating the contextual information. Further, pictures from well-piloted databases such as the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1997) provide normative valence and arousal ratings from large samples.

In the present study, one group of participants received context information presented along with the pictures whereas a second group viewed the pictures with the context information omitted. Dual-task analogue intrusion studies conducted by Holmes and colleagues (Bourne et al., 2010; Holmes et al., 2004) suggest that interfering with verbal processing should result in more intrusions. Therefore, enhancing verbal processing by adding contextual information should reduce intrusions according to a dual representation account (Brewin et al., 1996, 2010). The opposite finding would support models of autobiographical memory (e.g., Berntsen, 2009, 2010; Conway & Pleydell-Pearce, 2000). During picture viewing, participants performed a visuospatial task, a verbal task, or no concurrent task in counterbalanced order. A dual representation perspective would predict the most intrusive images and lowest voluntary recall from the verbal interference task, and fewest intrusions but better voluntary recall from the visuospatial interference task. From an autobiographical memory perspective both tasks should decrease intrusion frequency as well as voluntary recall compared to the no task control condition (Baddeley, 1986, 2000; Berntsen, 2009, 2010; Conway & Pleydell-Pearce, 2000).

2. Method

This study was approved by the Radboud University faculty Ethical Committee (ECG 09032009).

2.1. Participants

Participants were 60 undergraduate students from the Radboud University participant pool. Exclusion criteria were: panic attacks, panic disorder, PTSD, major depressive episode (current and lifetime), psychotic episode (current and lifetime), blood phobia and a history of fainting. Participants received course credit for participation. Two participants failed to meet task demands and their data was removed from the dataset.

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