



## Shorter communication

## Tell me more: Can a memory test reduce analogue traumatic intrusions?

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## ARTICLE INFO

## Article history:

Received 10 July 2008

Received in revised form

11 November 2008

Accepted 20 January 2009

## Keywords:

Intrusive imagery

PTSD

Information processing

Trauma

Trauma film

## ABSTRACT

Information processing theories of post-traumatic stress disorder (PTSD) state that intrusive images emerge due to a lack of integration of perceptual trauma representations in autobiographical memory. To test this hypothesis experimentally, participants were shown an aversive film to elicit intrusive images. After viewing, they received a recognition test for just one part of the film. The test contained neutrally formulated items to rehearse information from the film. Participants reported intrusive images for the film in an intrusion diary during one week after viewing. In line with expectations, the number of intrusive images decreased only for the part of the film for which the recognition test was given. Furthermore, deliberate cued-recall memory after one week was selectively enhanced for the film part that was in the recognition test a week before. The findings provide new evidence supporting information processing models of PTSD and have potential implications for early interventions after trauma.

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## Introduction

Although several studies have investigated the role of peri-traumatic processing in intrusion development, post-trauma processing has received less attention. However, experimentally investigating post-trauma processing is important because it relates to current clinical practice where treatment starts after a traumatic event has occurred. The present study investigated whether intrusive images from viewing an aversive film can be reduced by giving a neutral, verbal recognition memory test immediately post-film aimed to help structure verbal memory.

Intrusive images can be defined as mental pictures (and other sensations) that come into consciousness unwanted and uncontrollably. Intrusive images are a common form of re-experiencing a traumatic event (Speckens, Ehlers, Hackmann, Ruths, & Clark, 2007) and are a core feature of post-traumatic stress disorder (PTSD; American Psychiatric Association, 4th ed., text revision, 2000). Recent information processing theories of PTSD (Brewin, Dalgleish, & Joseph, 1996; Ehlers & Clark, 2000) converge on the idea that intrusive images develop due to impaired information processing during the traumatic event (Holmes & Bourne, 2008). Normally, there is a balance between perceptual and verbal conceptual information processing, leading to memory

representations that incorporate perceptual features of an event within a conceptual framework. However, under extreme stress, the balance shifts towards perceptual processing, leading to memory representations with perceptual features but relatively lacking a conceptual framework. This lack prevents the representation from being integrated within autobiographical memory, making the perceptual memory representation harder to recall deliberately and more prone to intrude into consciousness involuntarily. PTSD specific models (i.e., Brewin et al., 1996; Ehlers & Clark, 2000) build on existing theories of “normal” autobiographical memory (e.g., Conway, 1996; Conway & Pleydell-Pearce, 2000) to specify trauma-specific memory processes.

Several experimental studies support an information processing account of PTSD. For example, it has been found that blocking the perceptual processing of an aversive film decreased subsequent intrusive images of the film (Brewin & Saunders, 2001; Holmes, Brewin, & Hennessy, 2004; Stuart, Holmes, & Brewin, 2006). Conversely, interfering with verbal conceptual processing during the encoding of an aversive film increased intrusive images (Holmes et al., 2004). Furthermore, individuals with a perceptual processing style developed more intrusive images from an aversive film compared to individuals with a conceptual processing style (Halligan, Clark, & Ehlers, 2002). For a review, see Holmes and Bourne (2008).

Most studies have been on information processing during an aversive event with little experimental research investigating intrusion development post-event (Butler, Wells, & Dewick, 1995; Wells & Papageorgiou, 1995). Direct efforts to enhance conceptual post-event memory integration in order to reduce intrusive images

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have not been reported. Importantly, integrating a trauma representation in autobiographical memory is one goal of effective cognitive-behavioural treatment for PTSD (Degun-Mather, 2001; Ehlers & Clark, 2000; Kindt, Buck, Arntz, & Soeter, 2007). Also of clinical relevance is the consideration of early interventions following a traumatic experience. Cognitive-behavioural treatment (CBT) appears to be effective in the aftermath of trauma (Sijbrandij et al., 2007). Currently, clinical practice guidelines advise to offer CBT no sooner than 1 month post-trauma and only in cases of severe post-traumatic stress symptoms or acute stress disorder (National Institute for Health and Clinical Excellence, 2005). Up to now, there are no recommended interventions within the first month post-trauma. However, information processing theories of PTSD (Brewin et al., 1996; Ehlers & Clark, 2000) suggest that interventions aimed at enhancing memory integration should be helpful in preventing intrusion development.

In sum, the role of post-event information processing in intrusion development has been neglected in experimental studies despite clear theoretical and clinical relevance. The present study aimed to experimentally explore the effect of enhancing memory integration on the development of intrusive images. To induce intrusive images, participants viewed an aversive film with traumatic content. We aimed to enhance memory integration by administering a verbal recognition memory test for one part of the film directly after viewing. The items on the recognition memory test were in chronological order, thereby allowing participants to think through the film in a structured and detailed way. The recognition memory test was thus used as an experimental intervention rather than an actual memory test. Although the items were statements about emotional events from the film, the wording of the statements was neutral. By administering the recognition memory test, information of the trauma film is rehearsed in a structured way. This should enhance the formation of verbally accessible and organized memories that can be retrieved deliberately and according to the theories reduce intrusive images. We hypothesized that participants would show fewer intrusive images of the film after one week for that part of the film for which they received the memory test, in contrast to the other part of the film, for which they did not receive the memory test. In addition, we hypothesized that participants' performance on a memory test for the film would selectively strengthen memory for the part of that film for which the recognition memory test had been administered earlier.

## Method

### Overview

After screening for exclusion criteria (described below), participants viewed the aversive film. The film consisted of two parts, which were shown in counterbalanced order. After the film, participants completed the recognition memory test for one part of the film according to random allocation. Questionnaires were administered at baseline and post-film. In the week following film viewing, participants reported their intrusions of the film in a diary. After one week, participants returned for a follow-up session.

### Participants

All participants were psychology students in their first semester. They received course credit for participation. As required by the ethical committee (CMO approval number 2005/063), participants were informed about the graphic content of the film beforehand (as in previous studies by Holmes et al., 2004). Exclusion criteria were: panic attacks, panic disorder, PTSD, major depressive episode

**Table 1**

Number of participants for each combination of film version and recognition memory test version.

	Memory test version A	Memory test version B
Film version AB	13	13
Film version BA	15	11

(current and lifetime), social phobia, psychotic episode (current and lifetime), blood phobia, history of fainting and significant experience with road traffic accidents (RTA). Two participants terminated film viewing and did not complete the experiment. Total data from 57 participants were collected. Gender and age was equally distributed in the conditions (all  $p > 0.05$ ). Table 1 displays the number of participants in every condition.

### Materials

#### Aversive film

The aversive film from Hagens, Van Minnen, Holmes, Brewin, and Hoogduin (2008), originally compiled by Steil (1996), was used. It contains four scenes showing the aftermath of real-life RTAs and has previously been shown to induce intrusive images (e.g., Holmes et al., 2004). Following the method of Stuart et al. (2006), the film was divided into two parts (or 'blocks') that were matched for the number of intrusive images they were likely to produce based on data from a pilot study with student participants, see Table 2. Matching for number of intrusive images instead of time of the film scenes was done to create a comparable "baseline" number of intrusions for both film blocks; with "baseline" meaning the number of intrusions had there not be any intervention at all. Accordingly, the film was divided in scenes 1–3 (Block A; 8 min and 53 s) and scene 4 (Block B; 2 min and 45 s). The film blocks were presented in counterbalanced order (AB or BA). The film was projected onto a smooth white wall and sound was presented through headphones.

#### Memory integration

The recognition memory test used to enhance memory integration was similar to the recognition memory test used in the one-week follow-up session of previous studies (e.g., Holmes et al., 2004). It contained statements (for example, "There were three doctors in white coats present at the scene") for which participants had to decide whether they were true or false. The items were presented in chronological order and the statements, although emotional in content, were neutral in formulation. To match the film blocks, there were two versions of the test: Version A (Film block A) and version B (Film block B).

### Measures

#### Emotional impact of the film

This was measured with a mood questionnaire (Holmes et al., 2004). On a 0–10 point scale (0 = not at all, 10 = extremely), participants rated current happiness, fear, horror, depressed mood and anger. In addition, the Dutch version of the State-Trait Anxiety Inventory (Zelfbeoordelingsvragenlijst; Van der Ploeg, 1980) was used to assess state anxiety (STAI-S). This questionnaire contains 20

**Table 2**

Number of intrusive images from each scene of the aversive film in the pilot study.

	Part A		Part B	
	Scene 1	Scene 2	Scene 3	Scene 4
Intrusive images	34	20	30	85

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