



## False memories for missing aspects of traumatic events

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### ABSTRACT

Can people come to remember an event as being more traumatic than they initially experienced? Participants watched a highly structured and emotionally disturbing film depicting a car accident in which five people, including a baby, are killed. We broke the film down into a series of short clips; some of which we removed. Later, we tested participants' memory for what they had and had not seen. While participants were highly accurate identifying what they had and definitely had not seen, they also falsely claimed to have seen 26% of the *missing* clips, clips that fitted with the film but were removed before screening. Moreover, participants were particularly likely to recall the missing clips that were considered to be the most critical and traumatic. Importantly, they did so with high confidence. We discuss both intentional and unintentional recall mechanisms that may promote the observed memory distortion.

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### 1. Introduction

Recently, researchers have devoted considerable effort to examining the cognitive factors involved in the development of Post Traumatic Stress Disorder (PTSD; see for example, Ehlers & Clark, 2000). While we know that memorial factors are integral to the maintenance of the diagnosis (e.g., flashbacks, intrusive recollections), the accuracy of people's memory for the precipitating event has received little consideration from theorists. Considering the well-documented malleability of memory, we wondered whether memory distortion might also play a role in the promotion and maintenance of PTSD symptoms (see also Rubin, Berntsen, & Bohni, 2008). For memory distortion to have such an effect, we hypothesized that people would have to come to remember an event as having *more* traumatic content. Thus, in this paper, we examine whether people can come to remember entire aspects of a traumatic event that they did not originally see.

Generally speaking, there are at least two reasons to believe that memory distortion may play a role in the development and maintenance of PTSD symptoms. First, research shows that victims of traumatic experiences—whether a single tragic event (e.g., a sexual assault) or a sustained stressful experience (e.g., war)—do not always remember the event consistently, or accurately (Engelhard, van den Hout, & McNally, 2008; Harvey & Bryant, 2002; Schwarz, Kowalski, & McNally, 1993; Southwick, Morgan, Nicolaou, & Charney, 1997). For example, Southwick et al. asked Desert Storm veterans whether

certain traumatic events (e.g., experiencing sniper fire, sitting with the dying) had occurred during their Gulf War service at 1 month and 2 years after the veterans' return. They found that 88% of veterans gave a different response for at least one of the events at the second session; 61% changed more than one. Most importantly, the more responses changed, the greater the severity of veterans' PTSD symptoms.

Second, we know that the qualitative characteristics of a negative memory can change over time in response to social influences. For example, we recently told people that their negative autobiographical experience was either more or less negative than what others had experienced. We found that memory characteristics, such as vividness, a sense of reliving and remembering, and a first person perspective, as well as stress and negative emotions—characteristics associated with a diagnosis of PTSD—were retained or strengthened a week later in people who were told that the experience was worse than other people's experiences (Takarangi & Strange, 2010; see also, Talarico & Rubin, 2003).

Taken together then, we know that experiences of trauma are not protected from more general memory distortion. What we don't know is whether people can develop systematic memory distortions for the specific content of a traumatic event. Indeed attempts to experimentally manipulate memories of traumatic events are, for obvious reasons, scarce. Still, there is a series of studies examining the impact of suggestive questioning on people's memories for surprising, traumatic, and *collective* events (e.g., Crombag, Wagenaar, & van Koppen, 1996; Nourkova, Bernstein & Loftus, 2004; Ost, Vrij, Costall, & Bull, 2002). For example, Nourkova et al., were able to convince 12.5% of their Russian participants that they had witnessed a wounded animal in the film footage of the Moscow apartment bombings (9 and 13

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September, 1999). In addition, Crombag et al. interviewed Dutch participants about an El Al Boeing 747 that crashed into an apartment building, killing 43 people. While there was no film of the crash, there was considerable media coverage of the aftermath. Crombag et al., however, asked their Dutch participants whether they saw film depicting the moment of impact. Sixty-six percent of their participants responded that they had seen this footage, and elaborated on their memories (e.g., the plane was already burning when it crashed). In summary, these studies demonstrate that traumatic events are not immune to suggestive influences. Indeed, Crombag et al. (1996) concluded their study with the speculative suggestion that traumatic events might be *more malleable* than benign events because they typically provide more avenues for imagination, which can pose problems for people's source monitoring ability (Johnson, Hashtroudi, & Lindsay, 1993; Lindsay, 2008). However, these studies do not tell us whether traumatic memory distortion can occur systematically and without external suggestion. Moreover, the typical paradigm researchers have employed—suggestive questions about a surprising collective traumatic event—does not allow for a great deal of experimental control.

To answer our question then, we turned to the experimental-clinical literature and, in particular, the Traumatic Film Paradigm (TFP). In the TFP, non-clinical participants are exposed to film depicting traumatic content and they complete a series of pre- and post-measures designed to measure their response to the film. A significant body of research has established that the TFP is an effective laboratory analog to real-world trauma (for a review, see Holmes & Bourne, 2008). Indeed, the TFP has been used to examine a variety of symptoms associated with PTSD—distress, dissociation, intrusive memories, fear, avoidance and arousal—resulting in significant advances in our understanding of PTSD symptom development (e.g. Brewin & Saunders, 2001; Halligan et al., 2002; Holmes, James, Coode-Bate, & Deepro, 2009; Laposa & Alden, 2006). However, the traumatic films researchers have typically employed involve a compilation of traumatic scenes that do not contain a clear beginning, middle and end like a real-world experience would. To determine whether people falsely remember *more* traumatic content than they actually experienced, we needed to examine memory for a single traumatic event with an obvious structure.

To do so, we adapted a paradigm developed by Gerrie, Belcher, and Garry (2006) and Gerrie and Garry (2007). Briefly, they asked participants to watch a film of a structured event (a woman making a sandwich). The film was divided into short film clips, each depicting a specific aspect of the larger event (taking the bread out of the bag). Importantly some of those clips were removed from the film. Later, during a surprise memory test, participants were shown clips they saw, clips they didn't see and didn't fit with the event, and the clips Gerrie et al. had removed. Participants were very good at remembering the clips they actually saw, and correctly rejecting those that did not fit the movie. However, they also falsely remembered 58% of the missing clips. Further, Gerrie et al. sorted the missing clips according to whether they were critical or non-critical to the event (see also Reed, Montgomery, Schwartz, Palmer, & Pittenger, 1992). They found that participants were more likely to falsely remember seeing the non-critical aspects of the event (69% vs 46%).

We adapted Gerrie et al.'s procedure using a film that depicts a graphic and fatal car accident. The film shows the prelude to the accident and the accident itself, continues with the aftermath as emergency services arrive, and finally ends with the driver who caused the accident being air-lifted to a hospital. With pilot testing we determined the clips to remove from the event phase of the study, and of those, which clips were critical and which were not critical to the event. We then simply asked participants to watch the film, and to return 24 h later when we gave them a surprise memory test.

Recall that our primary interest is whether people can come to remember an event as being more traumatic than they initially experienced. Put another way, can people come to recall entire

critical—traumatic—scenes that they did not actually see? On one hand, cognitive research has established that emotion *improves* memory for the central details of an event—whether we define the central details as the gist of the event, or those details that are spatially central—and, while the evidence is more mixed, overall memory appears to be impaired for the more peripheral details (see, for a review, Reisberg & Heuer, 2004). Consequently, people are less likely to experience memory distortion for the central, critical details of an event (e.g., Christianson & Loftus, 1991; Gerrie et al., 2006; Gerrie & Garry, 2007; Sutherland & Hayne, 2001). Thus, there is ample reason to expect that our participants will be more likely to falsely remember the *least critical* aspects of a traumatic event. On the other hand, we know that people suffering from PTSD paradoxically struggle with both intentional and unintentional memories of a traumatic event, which may make it more likely that people will false alarm to the *most critical* aspects of the event. That is, people suffering from PTSD often *describe* their recall as fragmented and poorly organized, and complain that there are details missing from their memory (Amir, Stafford, Freshman, & Foa, 1998; Foa, Molnar, & Cashman, 1995; Foa & Riggs, 1993; Koss, Figueredo, Bell, Tharan, & Tromp, 1996; van der Kolk & Fisler, 1995). Note, however, that experimental attempts to observe that fragmentation have produced scant evidence that it is a real phenomenon (Kindt & van den Hout, 2003; Rubin, Berntsen, & Bohni, 2008; Rubin, Boals, & Berntsen, 2008). Nevertheless, one of the hallmarks of PTSD is the involuntary re-experiencing of the vivid and emotional aspects of an event; customarily referred to as “intrusions” (see Ehlers & Clark, 2000). It seems likely then that people will be most likely to rehearse the more critical aspects of the event, whether intentionally or unintentionally (two cars colliding, rather than the broken glass). According to the Source Monitoring Framework, those scenes will feel more familiar and people should, therefore, be more likely to false alarm to the *most critical* aspects of the event (Johnson et al., 1993; Lindsay, 2008).

## 2. Pilot testing

### 2.1. Materials

Our film was a United Kingdom public service announcement warning against the dangers of texting while driving. It is publically available and depicts a fatal car accident on a country road. Briefly, three teenage women are in a car arguing over a text message that the driver is attempting to send. The driver, not paying attention, crosses the center line and collides with another vehicle head-on. When the driver's car stops, another car crashes into its side. The moments of impact are graphically depicted, as is the driver's distress as she regains consciousness. There are at least five fatalities, including a baby. The film continues to depict the aftermath of the accident as emergency services arrive and ends with a close-up of the driver's face as she is air-lifted to a hospital.

### 2.2. Method

#### 2.2.1. Phase 1

We first asked 7 independent judges to break the 3 min 49 s film down into its smallest parts. More specifically, we instructed the judges to watch the film in its entirety and then to watch it a second time, identifying chunks that depicted a discrete event within the larger event. We explained that while there was clearly a beginning, middle and an end to the film, we wanted to divide it up into much smaller clips. Participants were also instructed that they should be able to label each clip with a (single) description of what occurred; this exercise yielded 28 clips that were an average of 8.04 s ( $SD = 2.31$  s).

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