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THE LEGAL SYSTEM AND MEMORY FOR ANALOGUE TRAUMATIC EXPERIENCES

by

DAISY A. SEGOVIA

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements of the degree of Doctor of Philosophy, The City University of New York

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This manuscript has been read and accepted by the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy

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Abstract

THE LEGAL SYSTEM AND MEMORY FOR ANALOGUE TRAUMATIC EXPERIENCES

by

Daisy A. Segovia

Advisor: Professor Deryn Strange

Trauma and its consequences are ubiquitous in the courtroom. Research on memory for trauma suggests there is reason to suspect that traumatized people may be prone to memory errors. Additionally, jurors’ views of witnesses are important as they tend to mistrust evidence given by witnesses they believe to be not credible. If traumatized people are prone to errors, is there a way to safeguard against those errors and make jurors more trusting of their memory reports?

In Part One, I polled participants on their views toward traumatized people and trauma memory (Study 1). Results of this study suggest people have somewhat positive views of traumatized people’s memory and competency to testify. Results from Study 2 imply that these views may be unsubstantiated.

In Study 2, participants watched a traumatic film with missing scenes. Some saw the scenes unfold in their correct temporal sequence; others saw a random sequence. I manipulated participants’ conscious processing of that film via an instruction: some were told to focus on the meaning of the event (conceptual), some on the sensory details (data-driven), and some received no instruction (control). A week later, I gave participants a memory test. False recognition of missing clips was high but did not differ across groups. However, experimental participants were more likely than controls to falsely remember the traumatic, compared to
non-traumatic, missing clips. Moreover, self-reported disorganization appeared more important to the malleability of people’s trauma memories than objective measures.

In Part Two (Study 3), I investigated whether cross-examination safeguarded participants’ memory reports. Participants watched the same film used in Study 2. Then, participants underwent direct examination, which included misleading questions. Participants were accurate on specific questions, but they frequently yielded to misleading questions. Two days later, participants returned for an unexpected cross-examination and memory recognition test. Participants’ interview and recognition accuracy worsened after cross-examination. Participants misremembered clips that were asked about in cross-examination more often than clips that were not. This research lends further evidence for the malleability of trauma memories and the need for the general public to be educated about this issue. Possible theoretical and practical implications are discussed.
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CHAPTER 1: INTRODUCTION

“No diagnosis in the history of American psychiatry has had a more dramatic and pervasive impact on law and social justice than post-traumatic stress disorder...”- Alan A. Stone (Stone, 1993, p. 23).

Trauma and its consequences are ubiquitous in the courtroom. Indeed, most trials involve “an injury, a trauma for which [the trial] compensates and that it attempts to remedy and overcome” (Felman, 1999, p. 36). Historically, a diagnosis of post-traumatic stress disorder (PTSD) has been invoked by defendants to excuse, mitigate, or explain their involvement in a crime, or by prosecutors to establish a causal relationship between a crime and a victim’s subsequent psychopathology, where it is introduced as aggravating evidence in sentencing, or as evidence of the need for victim compensation (Mezey, 2006; Stone, 1993). However, exactly how traumatic experiences affect memory is also of great importance to the legal system. Witnesses, victims, and even defendants can be psychologically traumatized by their involvement in crime, potentially compromising their memory of the events. If these people are called upon to testify in court, can we trust that their testimony is a reliable account of the crime?

Wigmore (1940) asserted that the legal system can permit some errors in memory reports, as long as the facts are correctly assessed by fact-finders, such as jurors. There are a few factors that come into play when assessing facts in memory reports: first, how fact-finders perceive the person giving the memory report is important to decision-making. Jurors are required to weigh the evidence presented to them in a court of law and decide whether or not a legal wrong was committed and whether that wrong needs to be remedied. However, their perception of the reliability and credibility of the witness often determines their assessment of the facts given by the witness. Indeed, research has shown that jurors’
perceptions of witnesses adversely affect their decision-making (Golding, Dunlap, & Hodell, 2009; Nunez, McCoy, Clark, & Shaw, 1999; Stewart & Jacquin, 2010; Stobbs & Kebbell, 2003). Second, whether or not a person is capable of providing an accurate memory report is also an important factor to consider when assessing facts. This factor can be influenced by both internal (e.g., cognitive ability) and external (e.g., suggestion) factors. Research shows that some groups of people—for example, children and adults with intellectual disabilities—are more vulnerable to memory errors and more susceptible to suggestion. The adverse affects of trauma, particularly when it results in PTSD, may also make a person more vulnerable to memory errors and suggestion. However, to date, little research has experimentally examined trauma victims’ memory abilities and thus it is unclear whether or not they should be considered a vulnerable group with respect to their memories.

To illustrate the significance of this issue, in 1995, a case was brought before the International Criminal Tribunal in which a woman accused a soldier of rape and sexual assault (Prosecutor v. Furundzija). As a result of the assault, the woman sought medical and psychological treatment and was subsequently diagnosed with PTSD. The Furundzija case was the first to question the impact of PTSD on a witness’ memory (Campbell, 2002). The defense argued that the victim’s testimony was unreliable on the grounds that her memory was adversely affected by her psychological disorder, leading her to falsely identify the accused and give an inconsistent and insufficient account of the assault. By contrast, the prosecution argued that “inconsistency does not necessarily mean inaccuracy” (p. 163) and that it was more important that the overall representation of the event be accurate than the specific details. The Tribunal had to consider whether the woman had indeed suffered from PTSD (thus, making her medical records and diagnosis known to them) and whether her diagnosis had affected her memory. Ultimately, the Tribunal allowed her psychological
reports to be admitted as evidence because those reports, “clearly had the potential to affect the credibility of the prosecution evidence.” The defense’s claims about the unreliability of the victim’s testimony hinged on the “psychological sequelae of PTSD” (Campbell, 2002, p. 163)—that is, the defense argued that the more trauma she suffered, the worse her testimony might be. The Tribunal had no other physical evidence to rely on, thus her testimony was paramount to the case.

The Tribunal in the Furundzija case raised several important points about the memory of a traumatized person. The Tribunal highlighted that trauma may adversely affect the capability of a witness to provide accurate testimony. The Tribunal also acknowledged that the person’s psychological disorder may affect his or her credibility to jurors. Thus, the Furundzija case raises important questions about the testimony of a person diagnosed with PTSD. First, can symptoms of PTSD affect a person’s memory to the extent that they would not be able to offer an accurate account of a crime? Theories that describe the development and maintenance of PTSD posit that there may be reason to suspect that a traumatized person may be prone to memory errors. Second, should a PTSD diagnosis be a factor in assessing a person’s credibility? Past research has shown that jurors’ views of witnesses are important and that they tend to mistrust evidence given by witnesses that they believe cannot provide accurate memory reports. Finally, if traumatized people are prone to errors, is there a way to safeguard against these errors and make jurors more trusting of their memory reports? Currently, the legal system relies on cross-examination to fix inaccuracies given by testifying witnesses. However, there is evidence to suspect that the court’s faith in the power of cross-examination to correct errors may be misplaced.

In the following studies, I investigated jurors’ perceptions of traumatized people, the effect of cognitive processing at the time of an analogue traumatic event on memory
accuracy for the event, and whether traumatized people are more susceptible to the adverse affects of interviewing (misinformation and cross-examination). Specifically, the aims of my dissertation research were:

1. Investigate people’s beliefs about traumatic memory and their attitudes towards traumatized people.

2. Explore whether the way a traumatic experience is encoded affects the accuracy of witnesses’ later memory.

3. Examine whether traumatized people are susceptible to misinformation.

4. Investigate whether a traumatized person can benefit from cross-examination.

In Part One, I discuss the current literature on the symptoms and prevalence of PTSD, theories concerning traumatic experiences and the development of PTSD, and discuss how PTSD affects memory. Then I discuss how traumatized people are influenced by external factors in the legal system and how jurors perceive witnesses, especially of vulnerable populations. Study 1 examined people’s beliefs towards traumatized people and trauma memory. Study 2 tests the prevailing theories of PTSD by examining whether encoding at the time of the event affects PTSD symptomatology and people’s subsequent memory for the event. In Part Two, I discuss the literature on cross-examination of vulnerable populations and why evidence suggests that cross-examination may not safeguard their memory reports in the way the courts might hope. Then, in Study 3, I test whether misinformation and cross-examination affect people’s memory for an analogue traumatic event.
CHAPTER 2: PART 1: TRAUMATIC MEMORY

According to the DSM-5 (American Psychiatric Association, 2013), post-traumatic stress disorder (PTSD) is a trauma or stressor-related disorder that can develop when people are exposed to a traumatic event (e.g., death, threatened death, actual or threatened injury, or actual or threatened sexual violence). PTSD comprises four clusters of symptoms: a) intrusions (i.e., persistent re-experiencing of the traumatic event such as intrusive recollections of the event, nightmares, dissociative reactions); b) effortful avoidance of distressing trauma-related stimuli; and c) negative alterations in cognition and mood (e.g., inability to recall key features of the event, persistent negative beliefs about oneself); and d) alterations in arousal and reactivity (e.g., exaggerated startle response and hypervigilance).

The Department of Veterans Affairs reported that the estimated lifetime prevalence of PTSD among United States civilians is 6.8% with similar rates evident in other countries (e.g., 6.1% in New Zealand; Kessler & Ustun, 2008). However, prevalence rates for veterans are estimated to be even higher, ranging from 6% amongst those returning from Operation Enduring Freedom and Operation Iraqi Freedom, to 31% for Vietnam War veterans (Erbes, Westermeyer, Engdahl, & Johnsen, 2007; Kessler & Ustun, 2008).

PTSD has enormous personal and societal costs due primarily to loss of productivity and treatment expenses. Additionally, there are significant non-mental health costs related to PTSD, such as caregiver burden, domestic violence, substance abuse, homelessness and crime; accounting for these factors, the biyearly economic cost of PTSD and concomitant depression among U.S. combat veterans alone is estimated at 4-6 billion dollars (Tanielian & Jaycox, 2008). PTSD also poses several costs to the legal system. Additional data on PTSD prevalence indicates that it is relatively common among crime victims—especially victims of rape and physical attacks (Kilpatrick & Acierno, 2003). For example, Rothbaum et al. (1992)
found that of those people who indicated rape was the most traumatic event they had experienced, 65% of men and 46% of women developed PTSD after the event. Similar studies have found that the majority of rape victims sampled (90%) met the criteria for PTSD within two weeks of the rape, and half continued to meet the criteria a few months later (Rothbaum et al., 1992). PTSD also often occurs after other victimization experiences—for example, in one study, PTSD was present in 16.5% of assault victims, 12.2% of molestation victims (26.6% among women), and 21.3% of physical assault victims (Kessler, Sonnega, Bromet, & Hughes, 1995; Kilpatrick, 1987). Freedy et al. (1994) assessed PTSD in a sample of crime victims and found that over half (59%) of the assault victims and the majority (71%) of family and friends of homicide victims went on to experience PTSD. Thus it is important to consider whether victims’ memory reports are likely to be distorted in ways that might be important to the justice system.

**PTSD: The Theories**

In the Furundzija case discussed in Chapter 1, the defense argued that the victim’s testimony was unreliable because “high levels of stress hormones can damage the area of the brain…responsible for memory” (as quoted in Campbell, 2002, p. 162). Although this claim is simplistic at best, it does raise at least one question: does PTSD lead to memory difficulties and if so, what causes these memory difficulties? In the last several years researchers have devoted considerable effort to examining issues related to the development and maintenance of PTSD (Dunmore, Clark, & Ehlers, 2001; Ehlers & Clark, 2000; Ehring, Ehlers, & Glucksman, 2006); problems with memory have emerged as a key issue. Collapsing across the different theories, we know, for example, that people suffering from PTSD paradoxically struggle with both involuntary and intentional memories of a traumatic event. On the one hand, they have difficulty intentionally retrieving a complete memory of the event. Indeed,
research indicates that people with PTSD describe their recall as fragmented and poorly organized, and they often complain that there are details missing from their memory and that they have difficulty recalling the temporal order of events (Amir, Stafford, Freshman, & Foa, 1998; Foa, Molnar, & Cashman, 1995; Foa, Riggs, Dancu, & Rothbaum, 1993; Koss, Figueredo, Bell, Tharan, & Tromp, 1996; van der Kolk & Fisler, 1995). On the other hand, one of the hallmarks of PTSD is the involuntary reliving of vivid and emotional aspects of the event; that reliving typically consists of sensory impressions (e.g., sights, sounds, smells, etc.) rather than verbal narratives of the event. Moreover, those impressions are experienced as if they are happening presently, rather than as memories of the past. Indeed, the emotions remain as vivid—sometimes more so—than they were at the time of the experience. Unlike narrative accounts of trauma, the reliving experiences do not occur deliberately, but are involuntarily induced by various internal or external situations and stimuli. For example, the pop of a car backfiring can trigger flashbacks of gunfire encountered during wartime for a veteran (Ehlers, 2010).

Clearly then, the idea that PTSD victims have difficulty with their memories is not a lawyer-manufactured problem, as illustrated by the Furundzija case. Theorists have attempted to explain the problems with both over- and under-remembering in different ways. For example, Brewin and colleagues (1996) posit that there are two separate modes of memory for trauma.

**The dual representation theory of PTSD.** Brewin and his colleagues proposed the dual representation theory of PTSD (Brewin et al., 1996), in which they suggest that traumatic memories are encoded in two distinct memory systems: a verbally accessible and a situationally accessible system. Briefly, they suggest that narrative memory is stored in the “verbally accessible memory” (VAM) system. The goal of the VAM system is to integrate
memory for the trauma with other autobiographical memories, which allows for its intentional retrieval when required. However, these memories can lack rich perceptual or sensory detail because they are limited by how much information a person consciously attends to as the traumatic event is unfolding and the amount of information that can be processed at the time (Brewin & Holmes, 2003; Brewin, 2001b). By contrast, sensory impressions (e.g., the sound of breaking glass) are stored in the “situationally accessible memory” (SAM) system. The SAM system records sensory images of the event and thus memories of these sensory images can be triggered later by external or internal reminders of trauma. In contrast to VAM memories, SAM memories are purported to contain extensive perceptual and sensory information and do not require conscious attention to process.

According to Brewin et al. (1996), the SAM system also records the body’s physical responses to trauma such as heart rate, temperature changes, and pain—which can result in emotionally laden sensory flashbacks that are accompanied by the same physical symptoms. Importantly, the SAM system does not store any verbal codes, which make memories stored in this system difficult to communicate to others and difficult to integrate into preexisting autobiographical memory.

Brewin et al. (Brewin et al., 1996; Brewin & Holmes, 2003; Brewin, 2001b) cite neurological evidence in support of their dual representation theory. For example, they claim that the hippocampus is crucial in the formation of verbally accessible memories of trauma (Brewin, 2001a). Research on the relationship between memory and stress has, indeed, shown that prolonged periods of intense stress are associated with high levels of cortisol which impairs the functioning of the hippocampus (Metcalf & Jacobs, 1998). Thus, high levels of stress may adversely affect the quality of VAM, resulting in the vague, poorly organized narrative memories that trauma victims often claim to experience (Brewin, 2001b).
Additionally, Brewin (2001a, 2001b) suggests that the amygdala provides the neural basis for the SAM; since stress is less likely to affect the processing of the amygdala, expressions of the SAM system (e.g., flashbacks) are exhibited even in times of extreme stress.

According to Brewin et al. (1996), VAM and SAM operate concurrently, but whether memories are retrieved from either system is largely dependent on the trauma cues in the environment. If the trauma cues are better matched with the SAM system then the amygdala will be activated and flashbacks may occur. However, if cues are more appropriately matched to the VAM system then the hippocampus will be activated, preventing the activation of the amygdala. Brewin (2001b) argued that proper activation of the VAM system is important for controlling inappropriate fear and, subsequently, symptoms of PTSD. Accordingly it is important for people to encode as much information about the event into the VAM system either during or after the event (Brewin, 2001b; Foa & Rothbaum, 1998). Obviously, dissociating from the trauma, or avoiding thinking about the event will prevent information from being encoded in the VAM system but could leave SAM unaffected. Indeed, studies have shown that dissociation after a traumatic event predicts subsequent PTSD (Ozer, Best, Lipsey, & Weiss, 2008).

Recently, Brewin, Gregory, Lipton, and Burgess (2010) revised the dual representation theory. Acknowledging that the verbal accessibility of VAM is not its primary classifying feature, they redefined VAM as consisting of abstract, conceptually bound representations (C-reps). SAM was redefined as inflexible, low-level sensory bound representations (S-reps) that also play a role in healthy memory—sensory information of everyday experiences are also encoded.

While the dual representation theory provides a potential explanation for how the symptoms of PTSD might develop and be maintained, it does not address whether trauma
memories can be distorted. In fact, Brewin (2001b) argues that constructing a detailed, organized memory of the event is not important for therapy—a statement that appears to stand in direct contrast to the empirically validated and recommended treatment for PTSD which involves prolonged exposure to trauma-related memories (Foa, Gillihan, & Bryant, 2013). Nonetheless, constructing accurate, organized memory reports would be important for traumatized people who must testify in a court of law.

Nevertheless, we can infer from dual representation theory that people who suffer from PTSD would activate the SAM more than the VAM, thus their memory for the traumatic event would perhaps be poorly organized and vague. People with PTSD might then have a great deal of difficulty verbally expressing the event and be unable to provide a comprehensive and accurate representation of the event. However, other theories of PTSD make more direct claims regarding how memory is affected by PTSD symptoms.

The “cognitive model” of PTSD. Ehlers and Clark (2000) proposed that the symptoms of PTSD are due to how the trauma is encoded at the time of the event. For example, when asked to explain their cognitive state at the time of a traumatic experience, some trauma victims describe their thinking as extraordinarily clear and report that their cognitive resources were occupied with analyzing the situation. By contrast, others report confusion and overwhelming sensory impressions. These two types of response fit with a fundamental cognitive distinction: conceptual versus data-driven processing (Roediger, 1990). Conceptual processing involves the organized processing of the meaning of events and placing those events into an appropriate context. Alternatively, data-driven processing involves processing sensory impressions, such as sights, sounds and smells. According to Ehlers and Clark (2000), people who focus on sensory impressions are more likely to suffer from persistent PTSD in large part because the degree of conceptual processing during a
traumatic event determines the clarity of the resulting memory and thus the ability to later intentionally retrieve information from that memory. In making this point, Ehlers and Clark drew on Conway and Pleydell-Pearce’s (2000) model of autobiographical memory, which states that, when functioning normally, when an event is encoded into memory it is elaborated and integrated with our “memory library”, which allows the intentional retrieval route to be augmented and the unintentional retrieval route (in the case of PTSD, the flashbacks and intrusive thoughts) to be inhibited.

The conclusion that conceptual processing is better for memory fits with a long and rich history of experiments in cognitive psychology whereby conceptually processed material is unfailingly better remembered than data-driven material (see for example, Jacoby, 1983; Roediger, Weldon, & Challis, 1989; Roediger, 1990; Weldon & Roediger, 1987). Indeed, a series of longitudinal studies with victims of trauma have shown that the type of cognitive processing a person relies on at the time of the event, and the level of temporal disorganization in the subsequent memory of the event, improves the prediction of PTSD symptom severity over and above initial symptom severity and risk factors identified in earlier research (such as, assault severity, persistent dissociation and memory appraisals; but see Dunmore et al., 2001; Ehlers, Mayou, & Bryant, 1998; Ehring et al., 2006; Halligan, Michael, Clark, & Ehlers, 2003). For example, Halligan et al. (2002) asked participants to watch approximately twelve minutes of traumatic film footage comprised of a compilation of traffic accidents. Importantly, they instructed half of those participants to process the film footage in a data-driven manner—focusing on the things they could see, the sounds they could hear and the physical sensations the people in the film might be experiencing “instead of trying to work out what is going on” (p. 77). They instructed the other half of the participants to process the film footage in a conceptual manner—focusing on what was
happening in each scene and why; what each person in the film understood as the event unfolded. They found that participants who had processed the film in a data-driven manner remembered less about the film when given a free-recall memory test. However, it was a very small difference (0.3 per item, possible range 0–4) and Halligan et al. were unable to find support for their hypothesis that those differences in memory performance would lead to more analogue PTSD symptoms in the data-driven processing group.

There were several problems with Halligan et al.’s (2002) study, however. First, they showed participants a non-structured event—a compilation of traffic accidents. This compilation had no clear beginning, middle, or end. Everyday experiences, in contrast, do have structure. Indeed, it seems logical to suggest that the footage might have been difficult to put into a proper context without a clear beginning, middle, and end, perhaps nullifying Halligan et al.’s processing instruction. Second, the authors directed participants in the data-driven condition to avoid focusing on the meaning of the event. Past research has shown that active attempts to suppress a particular thought have the ironic effect of actually increasing those thoughts (Wegner, Schneider, Carter, & White, 1987; Wegner, 1989). Thus, this part of the instruction could have rendered the data-driven processing instructions ineffective as well. Third, Halligan et al. assert that, “coherent but factually incorrect memories are just as protective [against PTSD] as factual ones” (p. 86). However, this statement must be qualified by the type of inaccuracies people report.

In a recent study, Strange and Takarangi (2012) showed participants a graphic film depicting a fatal car accident. They broke the film down into several short clips and removed some of those clips. After a delay, they gave participants a surprise recognition test, asking them to indicate which clips they had or had not seen. Participants were good at recognizing old and control clips, but 26% falsely claimed to have seen clips that were removed from the
film. Additionally, when they did claim to have seen the traumatic missing clips, they did so with high confidence. Importantly, people who were more likely to experience intrusions of the film were also more likely to falsely remember seeing the traumatic missing clips. These results imply that—in contrast to Halligan et al.’s statement—factually incorrect memories can be detrimental to PTSD, especially if those false memories are more traumatic in nature.

Other research has also investigated Ehlers and Clark’s (2000) proposal that data-driven processing leads to more intrusions—one of the major symptoms of PTSD. Buck and her colleagues (2007) assessed data-driven/conceptual processing in ICU patients’ memory narratives for the event that placed them in the hospital, both two weeks after discharge and at a 4-month follow-up. They found that data-driven processing in these narratives predicted more post-trauma symptoms. However, the authors assumed that if the narratives contained more conceptual or data-driven information, it meant that the patients had encoded the event in the same way. Put another way, their analysis and conclusions were based on circular logic; there is simply no way to be sure how the patients encoded the original events in this naturalistic study.

In a second study, when experimentally manipulating data-driven and conceptual processing of an analogue trauma, Kindt et al. (2008) found that conceptual processing can be beneficial while data-driven processing can be detrimental to PTSD development (making it more likely for a person to develop PTSD symptoms). Kindt et al. asked participants to write about either the sensory details in an analogue trauma film or the meaning of the storyline of that same film. Participants who wrote about the sensory details—the data-driven processing condition—reported more intrusions than those that took part in conceptual processing. In a follow-up study, Kindt and her colleagues gave participants instructions on how to process the film—either in a data-driven or conceptual
manner—before watching the analogue trauma. In this study there were no differences in
the number of reported intrusions, but participants that received the conceptual processing
instruction indicated that they tried to suppress thoughts of the film less frequently than
participants that received the data-processing instruction. Thus, the authors argued that
conceptual processing has a beneficial effect rather than data-driven processing having a
detrimental effect. Indeed, the authors claimed that conceptual processing may be crucial in
that it relates the traumatic experience to other associated memory representations thereby
diminishing any adverse effects of the traumatic event (Graf & Mandler, 1984; Kindt et al.,
2008). However, the authors did not include a control condition in which participants
received no instruction; thus, we do not know the baseline for the number of intrusions or
the number of attempts to suppress thoughts. Moreover, once again, it is unclear that asking
participants to process the film in a particular way actually results in them processing the
film in that manner (e.g., Wegner et al., 1987; Wegner, 1989).

In contrast, more recent research has found the opposite effect—conceptual
processing leads to more intrusions. Pearson and his colleagues (Pearson, Ross, & Webster,
2012; Pearson, 2012) presented traumatic stimuli (graphic pictures or a traumatic film) with
or without contextual information (which provided the meaning) to their participants.
Participants recorded any spontaneous thoughts they had of the trauma stimuli in a diary
for one week. Pearson et al. found that participants that received contextual information
with the traumatic stimuli reported a higher number of intrusions. Here, Pearson et al.
argued that the contextual information might activate more associations in people’s
memory—that is, the recollection of one memory may be cueing the recollection of another
memory, leading to more involuntary thoughts of the trauma (Conway, 2001; Pearson,
2012). Thus, differences in intrusions may be more adequately explained by the differences
in strength and range of contextual association in memory, rather than data-driven processing (Pearson et al., 2012; Pearson, 2012). However, Pearson and colleagues did not examine whether participants in the no-context condition applied their own context to the stimuli. It is unlikely that a person would encode information without context unless they were prevented from doing so. Thus, Pearson et al. would have a stronger argument for their interpretation of the results if they had included a control group in which participants were prevented from applying a proper context to the stimuli.

In summary, Ehlers and Clark (2000) proposed that relying on data-driven processing over conceptual processing leads to a disorganized memory and increased PTSD symptoms. The extant research does not convincingly support this aspect of their proposal largely due to poor experimental controls and ineffective manipulations. However, it certainly seems plausible, given what we know about memory (see source monitoring discussion below), that errors are more likely to occur when people with a disorganized memory work harder to reconstruct their experiences. The corollary then is that a witness who engages in data-driven processing is likely to have a more disorganized memory, may suffer more severely from PTSD, and thus his or her recollection of the crime may be more laden with inaccuracies. Put simply, the purported disorganization of trauma memories could make it relatively easy to become confused about what did and did not happen, which would of course be a problem for testifying in a court of law.

The mnemonic model. Rubin and his colleagues (Rubin, Berntsen, & Bohni, 2008; but also see Monroe & Mineka, 2008; Rubin, Boals, & Berntsen, 2008) offer an alternative memory-based model to explain why not everyone acquires PTSD after experiencing a traumatic event. They argue that a person’s memory for a traumatic event mediates the effect of trauma. Memory for traumatic events, like other memories, is not fixed; it is
reconstructive and prone to errors and changes (e.g., van Giezen, Arensman, Spinhoven, & Wolters, 2005). These errors and changes can be due to individual differences (e.g., gender, personality, intelligence, etc.), factors related to the traumatic event (e.g., intensity, duration, etc.), and the person’s current goals, attitudes, and concerns. Thus according to Rubin et al.’s model, trauma symptoms are produced by a person’s memory for the event and not the event itself. Indeed research examining the severity of trauma shows that retrospective studies often show greater effect sizes than prospective studies (Brewin, Andrews, & Valentine, 2000). Rubin and his colleagues reason that if the event itself were the cause of a person’s symptomatic responses then effect sizes should be equivalent across these studies.

What causes these memory errors? The underlying mechanism is likely to be a source monitoring error (Johnson, Hashtroudi, & Lindsay, 1993; Lindsay, 1994).

**Source Monitoring Framework**

According to the Source Monitoring Framework, events that are experienced or simply imagined are not labeled accordingly with their source (Johnson et al., 1993; Lindsay, 1994). Instead, people have limited cognitive resources and use simple heuristics—shortcuts—to identify the origin of a memory. For example, people often use feelings of familiarity to quickly judge whether a memory is real. However, some memories may feel familiar simply because we have imagined or thought about them frequently—even if involuntarily. A person may misinterpret that feeling of familiarity as evidence of truth and judge the experience to have really happened (Alter & Oppenheimer, 2009; Johnson et al., 1993). Indeed, a large body of research has demonstrated that source monitoring errors can occur frequently. If a person has difficulty intentionally retrieving a complete and organized narrative of a traumatic crime and is also plagued with involuntary intrusions—both of which are likely to distort the original memory—he or she may not be capable of providing
reliable, accurate, testimony. Moreover, this vulnerability to memory distortion may
increase the likelihood that a person’s testimony—their initial report and their direct and
cross-examination—will contain errors.

**Memory Distortion in Trauma**

Research shows that traumatic experiences—whether a single event (e.g., assault) or
a sustained stressful experience (e.g., war)—are not always remembered consistently nor are
they remembered accurately (Engelhard, van den Hout, & McNally, 2008; Harvey & Bryant,
1999; Schwarz, Kowalski, & McNally, 1993; Southwick, Morgan, Nicolaou, & Charney,
1997). For example, Neisser and Harsch (1992) questioned people about how they heard
about the explosion of the space shuttle *Challenger* shortly after the explosion and then again
three years later. At the second interview, more than a third of people changed their
responses in significant ways. Additionally, Herlihy, Scragg, and Turner (2002) interviewed
asylum seekers about their traumatic experiences and found that those with more severe
PTSD symptoms made more changes to their initial reports when there were longer delays
between interviews. They also found that the number of interviews also increased the
number of changes to their reports, especially for the more peripheral details. Similar results
have been shown to occur with other types of trauma, such as war, motor vehicle accidents,
and school shootings (Harvey & Bryant, 1999; Schwarz et al., 1993; Southwick et al., 1997).
Taken together, these studies provide evidence for the distortion of traumatic memories
without outside influence.

Furthermore, research indicates that memory distortion for traumatic events
manifests in a particular pattern—that is, people tend to report that they experienced *more*
trauma than they really did. Importantly, this pattern of distortion has been shown to
predict greater PTSD symptom severity (e.g., Giosan, Malta, Jayasinghe, Spielman, & Difede,
In an observational example, Southwick et al. (1997) asked Desert Storm veterans whether certain traumatic events (e.g., sitting with the dying) had occurred during their Gulf War service at 1 month and 2 years after their return from the war. Eighty-eight percent of veterans gave a different response for at least one of the events at the second session; 61% changed more than one response. Most importantly, the more their responses changed, the greater the severity of the veterans’ PTSD symptoms.

In an experimental example, in a recent study (briefly discussed earlier), Strange and Takarangi (2012) adapted the traumatic film paradigm, an accepted laboratory analogue to experiencing trauma in the real world (for a review see Holmes & Bourne, 2008), to examine memory distortion for trauma. They were specifically interested in whether people could come to remember entire aspects of an event that were not originally seen. To this end, they showed participants a film depicting a graphic and fatal car accident. They split the film up into independent scenes and played those scenes to participants with two seconds of blank footage between them. Importantly they removed some of the scenes so that participants never saw them. Some of these “missing” scenes were traumatic and others were not. They hypothesized that participants would be good at recognizing what they had and had not seen during the film, but would also mistakenly say that they had seen the missing clips. Indeed, that was exactly what happened. Participants correctly recognized old clips and correctly rejected control clips at a very high rate; however, they also falsely claimed to have seen 26% of missing clips. Put another way, participants claimed to recall seeing an additional 13.5 seconds of the traumatic event. Importantly, Strange and Takarangi found that participants were more likely to confidently and falsely remember seeing the missing traumatic clips compared to the non-traumatic clips. Finally, they also found that the more
likely people were to experience intrusions—a symptom of the PTSD diagnosis—during the delay, the more likely they were to falsely remember seeing the missing traumatic material.

Given these findings, there is certainly evidence to suggest that memory for trauma can be distorted, both in the lab and in the real world, and that exhibiting symptoms of PTSD may increase that memory distortion. Or perhaps the memory distortion may even promote the symptoms in the first place (Strange & Takarangi, 2012). According to the prevailing theories of PTSD (Brewin et al., 1996; Ehlers & Clark, 2000; Rubin, Berntsen, et al., 2008), the type of encoding at the time of the event may be responsible for some of these distortions and symptoms. Therefore, a person’s experience during the trauma may cause problems for their memory—and thus later testimony—and exposure to distorting influences may exacerbate those memory problems. Importantly, those memory problems may affect other components of the judicial system.

For instance, the outcome of a court case is likely to be affected by jurors’ perceptions of the witness. If jurors do not trust a traumatized person’s testimony, they will not make judgments in his or her favor. Indeed, a vast number of research studies have focused on the jurors’ perceptions of various types of witnesses, including children, adults with intellectual disabilities, rape victims, the elderly, etc. (Golding et al., 2009; Nunez et al., 1999; Stewart & Jacquin, 2010; Stobbs & Kebbell, 2003). Jurors’ perceptions are important because they provide guidance on how jurors reach their decisions in court trials. However, there is a paucity of research on people’s views of traumatic memory and traumatized witnesses. Yet, most trials involve a trauma and it has been reported that the number of cases involving PTSD has increased over the years (Felman, 1999; Modlin, 1983; Pangia, 1998). Therefore, jurors’ perceptions of traumatized witnesses will become very important. In the following chapter, I review the literature on how jurors may be influenced by PTSD in the courtroom.
CHAPTER 3: PTSD IN THE COURTROOM

Although there is a large body of research that clearly demonstrates jurors are influenced by a wide range of witness characteristics (e.g., likability, attractiveness, displayed emotion; e.g., Chaiken & Maheswaran, 1994; Cooper, Bennett, & Sukel, 1996; Tsoudis & Smith-Lovin, 1998) there is currently no empirical research investigating jurors’ perceptions of defendants or witnesses with PTSD and the impact those perceptions might have on their decision-making. Instead, evidence supporting the influence of PTSD on jurors’ decisions can be inferred from the outcomes of actual court cases. For example, if prosecutors introduce evidence of a victim’s PTSD diagnosis it is meant to persuade a juror that the defendant is guilty. In a rape case, Allewalt v. State, the fact that the victim was suffering from PTSD was introduced as evidence to support the victim’s testimony that the sex was not consensual.

By contrast, defense lawyers tend to introduce a diagnosis of PTSD in an attempt to excuse a defendant’s actions (Stone, 1993). For instance, lawyers have argued that since PTSD is recognized by the American Psychiatric Association, defendants who suffer from PTSD should be considered legally insane and thus not legally responsible for their actions. Several trials have demonstrated the effectiveness of this strategy, especially in cases involving war veterans (e.g., State v. Head) and domestic abuse—most notably in the infamous Virginia v. Lorena Bobbit trial. PTSD has also been used to mitigate an individual’s actions, thereby reducing the penalties imposed upon them (Heath, Stone, Darley, & Grannemann, 2003; Higgins, Heath, & Grannemann, 2007). Even in mock trial studies, researchers have found that when a defendant used PTSD as an excuse defense, he was rated less guilty (Higgins et al., 2007) and received a shorter sentence (Heath et al., 2003), compared to when other excuse defenses were offered.
Taken together then, there is evidence to suggest that a diagnosis of PTSD can influence jurors’ perceptions of a defendant or witness in a more general sense, but we do not know how PTSD affects jurors’ perceptions of trauma memory reports. However, we can derive clues from other research on jurors’ perceptions of eyewitness memory.

**Juror Perceptions of Eyewitness Memory**

When evaluating evidence, jurors evaluate the source of that evidence for signs of credibility. Research suggests that people use two factors—expertise and trustworthiness—to determine witness credibility. Expertise consists of knowledge and understanding, while trustworthiness is the perceived honesty of a witness (Ross, Jurden, Linsday, & Keeney, 2003; but also see Bottoms, 1993; Goodman, Bottoms, Herscovici, & Shaver, 1989; Ross, Dunning, Toglia, & Ceci, 1990). How do jurors establish expertise and trustworthiness? First, jurors must decide whether they believe a witness is capable of providing accurate information, that is, whether the witness has the expertise to testify. One way to establish expertise is to judge the cognitive abilities of the witness. Then, jurors must assess trustworthiness by evaluating a person’s motivation to lie—jurors may see one type of witness as more likely to lie than others. Indeed, the credibility of some populations of witnesses is driven by this dichotomy.

For example, children are often judged as less cognitively able than adults because of their inferior memory ability and increased susceptibility to suggestion. Younger children, specifically, are thought to know less about the world in general and tend to remember less information than adults about their experiences. For these reasons, jurors tend to have negative perceptions of children’s eyewitness abilities (e.g., Henry, Ridley, Perry, & Crane, 2011). On the other hand, children are generally perceived as more honest than adults (Leippe & Elkin, 1987; Leippe & Romanczyk, 1989; see also Yarmey, Jones, & Rashid, 1984;
Yarmey & Jones, 1983), with fewer motives to lie. Jurors also tend to perceive adults with intellectual disabilities in a similar light. For example, Stobbs and Kebbell (2003) found that jurors viewed witnesses with intellectual disabilities as more fundamentally honest than typically developing adults; however, they were reluctant to rely on the evidence provided by witnesses with intellectual disabilities, judging them to be less capable of providing accurate information.

Children and people with intellectual disabilities are examples of groups that are perceived to be less cognitively developed and able than a typical adult (ergo they have less expertise). People are aware of their cognitive inferiorities and adjust their perceptions of credibility accordingly. Traumatized people, especially those diagnosed with PTSD, could potentially be another example of a vulnerable group. Their disorder could lead people to mistrust the details that they report in their testimony, however, their PTSD may also be taken as proof that they are not lying. Currently, little is known about what beliefs people hold about traumatized people and their memories.

**Beliefs about Trauma Memory**

Several studies have investigated people’s beliefs about traumatic memory, specifically regarding repressed and ultimately recovered memories. In the 1980s and early 1990s, a plethora of daycare sexual abuse cases (McMartin preschool case; Summit, 1994) and cases involving repressed, and then recovered, memories of childhood sexual abuse (Franklin case; Loftus, 1993) pervaded the justice system and captured the interest of the media. Early research illustrated a general acceptance of repressed and recovered memories (e.g., Garry, Loftus, & Brown, 1994), perhaps because of the popularity of these cases. However, both types of cases have now died down, at least in the U.S., and the general public has largely rejected the idea of repressed memories that are supposedly recovered in
pristine form, and instead, endorsed the idea that memories are susceptible to suggestive influences (e.g., Naka & Maki, 2006; Patihis, Ho, Tingen, Lilienfeld, & Loftus, 2013).

To illustrate the development in people’s beliefs further, Garry, Loftus, and Brown (1994) queried graduate students about their beliefs in traumatic memory and memory distortion. Interestingly, they found that the majority of participants held strong beliefs about repressed and recovered memories. Almost half of participants (42%) believed that memories of trauma can be stored in the muscles of the body and an overwhelming majority (82%) believed that painful memories can be hidden in the unconscious mind and can cause emotional damage (64%). Moreover, most participants believed that details of traumatic memories are preserved and can be recovered and remembered accurately.

Similarly, other studies demonstrated support for positive beliefs about repressed memories in court contexts (Golding, Sanchez, & Sego, 1996; Golding, Sego, Sanchez, & Hasemann, 1995; Schutte, 1994). For example, people believed that recovered memories should be admitted into court as evidence and they typically favored plaintiffs who claimed to have repressed memories of abuse (Golding et al., 1996, 1995; Schutte, 1994). However, people also tended to show greater belief in repressed memories that were more plausible and less dramatic, such as being lost in the mall as opposed to satanic rituals (Golding et al., 1995; Schutte, 1994; Van Wallendael, 1999). These beliefs contradict what is now known about actual traumatic memories (Kassin, Ellsworth, & Smith, 1989; van Giezen et al., 2005).

Interestingly, more recent research shows that people may be moving away from these beliefs. Naka and Maki (2006) polled 111 undergraduates about their memory experiences (e.g., whether they had frequent episodes of forgetting), their beliefs about general memory (e.g., memory reflects what really happened), and their beliefs about traumatic memory (e.g., whether traumatic memories can be repressed). Overall, people
tended to believe that memory is imperfect and constructive: for example, 94% agreed that what really happened is not necessarily remembered and 67% agreed that a realistic memory can be created for events that did not happen. In contrast to previous research, this sample of people did not appear to believe in repressed memories: only 21% agreed that traumatic memory can be repressed, 36% agreed that traumatic memory can be encoded precisely, and only 2% agreed that people can be directed to forget a memory. On the other hand, many people (81%) believed that memories can remain in our unconscious. Notably, Naka and Maki (2006) found that the participants who reported more episodes of forgetting and subsequent remembering in their everyday lives were more likely to believe that traumatic memories can be repressed ($r = .21$) and subsequently recovered ($r = .20$). However, it should be noted that this study was conducted in Japan and there could be differences in Eastern versus Western cultures regarding beliefs in memory.

In a more recent study, researchers compared current beliefs about repressed memories to beliefs of people from studies in the 1990s (Patihis et al., 2013). Overall, they found that there was a general shift toward greater skepticism in repressed memories compared with the 1990s. However, there was still a vast majority of people that believed in repressed memories, especially among laypeople: 78-81% among undergraduate students, 84% and 77% among the general public in the United States and the United Kingdom, respectively. Interestingly, the authors also found that research psychologists were less likely to believe traumatic memories are repressed (27%) than practitioners (60%)—that is, there was a gap in beliefs about repressed memories between research psychologists and practitioners. Patihis and his colleagues also found several differences among demographic groups, such as gender, education levels, and intelligence. These results suggest that the research on traumatic memory is being disseminated but mostly among researchers. Some
of the general public and clinicians are aware of this research, but a large majority still believes traumatic memories can be repressed.

The aforementioned studies give us important insight into people’s beliefs about traumatic memory; however, most of this research focused on beliefs regarding repressed (and later recovered) memory. These studies did not investigate people’s opinions on the credibility of traumatic memories that were never repressed and recovered. Given that most crimes are traumatic in nature and a significant percentage of people who experience crime may develop PTSD (Kilpatrick & Acierno, 2003), it is important to examine how people evaluate testimony given by traumatized witnesses. A PTSD diagnosis could conceivably impede justice in a case if, for instance, the witness is believed to have an unreliable memory due to his or her psychological impairment. Therefore, in Study 1 of my dissertation, I investigated people’s attitudes toward traumatized witnesses and general traumatic memory.
CHAPTER 4: STUDY 1 OVERVIEW

The purpose of Study 1 was to measure various aspects of people’s attitudes towards traumatic memory and traumatized individuals in the courtroom. Early research investigating people’s beliefs about traumatic memory has yielded support for the belief in repressed memories and stability of memory in general (Garry et al., 1994). More current research, however, shows that people are moving away from these beliefs, believing that memories can be imperfect and even malleable (Naka & Maki, 2006; Patihis et al., 2013). However, these studies mostly focused on repressed memories and not traumatic memories in general.

Therefore, in Study 1, I adapted questions from surveys designed to measure peoples’ attitudes toward witnesses in the courtroom (Wrightsman, Batson, & Edkins, 2004). The questions were designed to measure different characteristics of a traumatized witness that might be important to how their testimony is perceived and, therefore, valued by jurors: for example, witnesses’ competence, credibility, cognitive abilities, and suggestibility. The questionnaire was also designed to assess people’s general beliefs about trauma memory (e.g., whether memory for traumatic events is different from memory for non-traumatic events). Jury-eligible participants read 33 statements related to these domains and indicated the degree to which they agreed with each statement. I performed a factor analysis and consolidated the statements into six factors. I analyzed these factors to investigate whether they revealed any biases against witnesses who have experienced a traumatic event. Based on the extant research, I expected that people would generally have positive views toward traumatized people’s memory and their abilities to act as a witness in court.
CHAPTER 5: STUDY 1 METHOD

Participants

Participants were recruited from an online crowdsourcing system, Amazon Mechanical Turk (MTurk). MTurk allows anonymous “workers” to complete tasks (e.g., research studies) in exchange for a small amount of compensation that they can either apply towards Amazon Gift Certificates or transfer directly to their bank account. MTurk allows researchers to set acceptance criteria to restrict availability of the study to participants that meet their needs. For this study, I recruited workers located in the United States who also had a high approval rate from other researchers. MTurk has become increasingly popular with researchers and analyses suggest it yields a population diverse in age, gender, and income (Ross, Zaldivar, Irani, & Tomlinson, 2010). Moreover, the data is considered to be of high quality (Buhrmester, Kwang, & Gosling, 2011; Crump, McDonnell, & Gureckis, 2013; Paolacci, Chandler, & Ipeirotis, 2010; Sprouse, 2010).

In total, 349 adults participated for $0.75 (an amount comparable to that used by other researchers on the site for similar periods of time). A sample of at least 300 yields more reliable factor solutions even with communalities in the .05 range (Costello & Osborne, 2005; Field, 2009; MacCallum, Widaman, Zhang, & Hong, 1999). To ensure participants were jury-eligible, each person answered questions confirming that they were over 18 years old, a U.S. citizen, and had not been convicted of a felony. Additionally, participants had to pass an instructional manipulation check (described below), demonstrating that each participant paid adequate attention to the stimulus materials. Participants who did not meet the jury eligibility criteria \( n = 2 \) or did not pass the instructional manipulation check \( n = 4 \) were excluded from the final analyses. Ultimately, data from 343 participants \( (M = 35.32 \text{ years}, SD \)
= 12.24; range 19 to 74 years; 157 female) were included in the analyses. For other demographics see Table 1.

Materials

**Attitudes toward Trauma and Memory questionnaire.** The Attitudes toward Trauma and Memory (ATTM; Appendix A) questionnaire was designed for the current study and measures adults’ attitudes towards traumatized people who act as court witnesses. There were 33 statements and participants were asked to indicate, using 7-point Likert scales, how much they agreed with each statement. The questionnaire was designed to measure participants’ attitudes regarding traumatized people’s: 1) competence, 2) participation in trials as witnesses, 3) credibility, 4) cognitive abilities, and 5) suggestibility; I also asked questions to measure their beliefs regarding 6) the general characteristics of trauma memory. High scores on these subscales indicate unfavorable attitudes toward traumatized people (e.g., are not competent, should not be used as trial witnesses, not credible, etc.). High scores on the general trauma memory subscale indicate favorable attitudes toward the characteristics of traumatic memory. For instance, high scores indicate that people believe traumatic memories are different than normal memories, are unalterable, and traumatized people should be more confident about their traumatic experiences.

**Instructional manipulation check.** An instructional manipulation check (IMC; Appendix B) was included to detect any participants that were not following instructions. IMCs have been shown to reduce noise and increase statistical power (Oppenheimer, Meyvis, & Davidenko, 2009).

**Demographics.** Standard demographics were collected from each participant. Participants were asked to indicate their: race, education level, marital status, religious and political affiliation. Additionally, as described above, participants were also asked jury-
eligibility questions (i.e., Are you a U.S. citizen? Have you been convicted of a felony?), so that I could screen for jury-ineligible participants.

**Procedure**

Participants were directed via MTurk to an external study website (qualtrics.com) containing all materials and questionnaires. After reading basic instructions orienting them to the study and completing the informed consent procedures, participants read the ATTM questions (which were presented in a random order), followed by the IMC. Lastly, participants completed a standard demographic questionnaire. When they were finished, participants were compensated through MTurk. Participation lasted an average of 10 minutes.

**Hypotheses**

(1.1) Six subscales will emerge from the analysis regarding attitudes toward traumatized people’s: 1) competence, 2) participation in trials as witnesses, 3) credibility, 4) cognitive abilities, 5) suggestibility, and 6) general characteristics of trauma memory.

(1.2) Participants will report low scores on each subscale, indicating high trust in traumatized people’s testifying abilities.

(1.3) Participants will report high scores for the general characteristic of trauma memory scale. High scores on this scale demonstrate that people hold favorable attitudes about trauma memory.
### Table 1

**Study 1: Demographic Characteristics of Males and Females**

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Males (%) (n = 186)</th>
<th>Females (%) (n = 157)</th>
<th>Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>31.92 ± 10.50</td>
<td>39.34 ± 12.96</td>
<td><em>t</em> = -5.86, <em>df</em> = 341, <em>p</em> &lt; .001</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td>*χ² = 2.43, <em>df</em> = 6, <em>p</em> = .88</td>
</tr>
<tr>
<td>High School graduate or GED</td>
<td>18.3</td>
<td>16.6</td>
<td></td>
</tr>
<tr>
<td>Associate's degree</td>
<td>5.9</td>
<td>8.3</td>
<td></td>
</tr>
<tr>
<td>Some college</td>
<td>31.2</td>
<td>31.8</td>
<td></td>
</tr>
<tr>
<td>College graduate</td>
<td>33.9</td>
<td>30.6</td>
<td></td>
</tr>
<tr>
<td>Some graduate work</td>
<td>3.2</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>Graduate Degree</td>
<td>7.5</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
<td>*χ² = 53.75, <em>df</em> = 4, <em>p</em> &lt; .001</td>
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<td></td>
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<td>Single, never married</td>
<td>69.4</td>
<td>30.6</td>
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<tr>
<td>Married</td>
<td>19.9</td>
<td>43.9</td>
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</tr>
<tr>
<td>Never married, live-in partner</td>
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<td>10.8</td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>3.2</td>
<td>12.1</td>
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<td>Other</td>
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<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
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<td>Caucasian</td>
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<td>3.8</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1.6</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>Political Affiliation</td>
<td>*χ² = 3.09, <em>df</em> = 3, <em>p</em> = .54</td>
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<tr>
<td>Other</td>
<td>3.2</td>
<td>3.2</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* *a* Mean ± standard deviation is used for age.
CHAPTER 6: STUDY 1 RESULTS

I organized my results based on my hypotheses. For each hypothesis, I summarize the findings supporting or refuting the hypothesis before presenting the analyses. First, I present the findings of the factor analyses. Then, I examine people’s beliefs about traumatized people and probe any group differences among beliefs.

Hypotheses (1.1): Six subscales will emerge from the analysis regarding attitudes toward traumatized people’s: 1) competence, 2) participation in trials as witnesses, 3) credibility, 4) cognitive abilities, 5) suggestibility, and 6) general characteristics of trauma memory.

My first hypothesis was partially supported. The factor analyses yielded six subscales regarding people’s beliefs about traumatized people. However, the factors more appropriately represented people’s beliefs regarding: 1) distrust in traumatized people’s reporting accuracy, as well as their 2) honesty, 3) competence, 4) memory quality, 5) memory ability, and 6) believability. No subscale emerged for general characteristics of trauma; however, six items that related to characteristics of trauma did not load onto any of these factors and were therefore analyzed separately.

Factor Analyses

A principal component analysis (PCA) with direct oblimin rotation was conducted on the 33 questions on the ATTM questionnaire. First, to reduce the number of variables from the ATTM, the factorability of the 33 items on the questionnaire was examined. Four items (17, 20, 22, and 27) did not correlate to at least .3 with at least two other items—a rule that suggests reasonable factorability (Field, 2009)—and were removed from the analysis. Analyses were re-run with the remaining 29 questions: The Kaiser-Meyer-Olkin measure verified sampling adequacy for the analysis, KMO = .91 (‘superb’ according to Field, 2009).
Bartlett’s test of sphericity, $\chi^2 (406) = 4320.15$, $p < .001$, indicated that correlations between items were sufficiently large for PCA (Field, 2009). Moreover, the diagonals of the anti-image correlation matrix were all over .5. Finally, the communalities were all above .4, further confirming that each item shared some common variance with other items.

An initial analysis was run to obtain eigenvalues for each component in the data. Six components had eigenvalues over Kaiser’s criterion of 1 and in combination explained 60.93% of the variance. The scree plot showed inflexions that would justify retaining both components 4 and 6 (see Figure 1). Based on the large sample size, and the convergence of the scree plot and Kaiser’s criterion on six components, six components were retained in the final analysis. Inspection of the structure matrix revealed that two items (4 and 5) did not produce loadings greater than .4 and were removed. Table 2 shows the factor loadings after rotation for the remaining 27 items. Items that loaded onto more than one factor were placed in the factor on which they loaded higher. Consequently, the items that cluster on the same components suggest Factor 1 represents “Reporting Accuracy”, Factor 2 “Honesty”, Factor 3 “Competence”, Factor 4 “Memory Quality”, Factor 5 “Memory Ability”, and Factor 6 “Believability”. Scores for each factor were computed by summing the item scores that clustered to that factor.

Next, I examine scores for these subscales to probe people’s beliefs regarding the memories of traumatized people.
**Table 2**

*Study 1: Factor Loadings and Communality Scores for ATTM Questionnaire Items*

<table>
<thead>
<tr>
<th>Question (Item no.)</th>
<th>Loadings</th>
<th>Communality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconsistencies often occur (2)</td>
<td>.81</td>
<td>.64</td>
</tr>
<tr>
<td>Changes likely to occur (19)</td>
<td>.74</td>
<td>.62</td>
</tr>
<tr>
<td>Likely to accede to leading (30)</td>
<td>.70</td>
<td>.60</td>
</tr>
<tr>
<td>Contradictory explanations (24)</td>
<td>.70</td>
<td>.63</td>
</tr>
<tr>
<td>Easily lead to change answers (28)</td>
<td>.69</td>
<td>.62</td>
</tr>
<tr>
<td>Can be mistaken (7)</td>
<td>.62</td>
<td>.48</td>
</tr>
<tr>
<td>Susceptible to suggestion (11)</td>
<td>.62</td>
<td>.60</td>
</tr>
<tr>
<td>Add details did not observe (32)</td>
<td>.59</td>
<td>.65</td>
</tr>
<tr>
<td>Would believe non-T person (12)</td>
<td>.56</td>
<td>.59</td>
</tr>
<tr>
<td>More sincere (3)</td>
<td>.82</td>
<td>.62</td>
</tr>
<tr>
<td>More honest (6)</td>
<td>.79</td>
<td>.65</td>
</tr>
<tr>
<td>Can remember details (23)</td>
<td>.75</td>
<td>.70</td>
</tr>
<tr>
<td>Have greater confidence (25)</td>
<td>.54</td>
<td>.55</td>
</tr>
<tr>
<td>Competent to communicate (1r)</td>
<td>.84</td>
<td>.66</td>
</tr>
<tr>
<td>Ability to identify (26r)</td>
<td>.79</td>
<td>.60</td>
</tr>
<tr>
<td>Able to report accurately (29r)</td>
<td>.72</td>
<td>.57</td>
</tr>
<tr>
<td>Communicate with confidence (31r)</td>
<td>.71</td>
<td>.63</td>
</tr>
<tr>
<td>Remember accurately (9r)</td>
<td>.62</td>
<td>.55</td>
</tr>
<tr>
<td>Tell difference between real life and dreams (10r)</td>
<td>.56</td>
<td>.45</td>
</tr>
<tr>
<td>Not competent to testify (8)</td>
<td>.43</td>
<td>.62</td>
</tr>
<tr>
<td>Blanks = wrong (14)</td>
<td>- .81</td>
<td>.73</td>
</tr>
<tr>
<td>Memory gaps = wrong (15)</td>
<td>- .77</td>
<td>.70</td>
</tr>
<tr>
<td>Unaltered even after time (21)</td>
<td>- .42</td>
<td>.62</td>
</tr>
<tr>
<td>Blanks = can’t cope with stress (18)</td>
<td>- .68</td>
<td>.66</td>
</tr>
<tr>
<td>Ability to remember is same (13r)</td>
<td>- .44</td>
<td>.61</td>
</tr>
<tr>
<td>Not believe if contradictions (16)</td>
<td>.79</td>
<td>.66</td>
</tr>
<tr>
<td>Likely to exaggerate (33)</td>
<td>.43</td>
<td>.52</td>
</tr>
<tr>
<td><strong>Eigenvalues</strong></td>
<td>8.85</td>
<td>3.14</td>
</tr>
<tr>
<td><strong>% of variance</strong></td>
<td>30.53</td>
<td>10.82</td>
</tr>
<tr>
<td><strong>Alpha</strong></td>
<td>.89</td>
<td>.75</td>
</tr>
</tbody>
</table>

*Note. ATTM = Attitudes toward Traumatized Memory.*
Figure 1. Study 1: Scree plot for factor analysis.
Hypothesis (1.2): Participants will report low scores on each subscale, indicating high trust in traumatized people’s testifying abilities.

Hypothesis (1.3): Participants will report high scores for the general characteristic of trauma memory scale. High scores on this scale demonstrate that people hold favorable attitudes about trauma memory.

Hypothesis 1.2 was supported but 1.3 was not supported. I first examine participants’ overall opinions towards traumatized people before I turn to group differences among those opinions.

Beliefs about Trauma

Table 3 displays the descriptive statistics for each factor and the six items that did not load on any factor. Overall, participants had favorable opinions or were neutral in their stance towards traumatized people and their memories. For example, participants had somewhat favorable attitudes toward traumatized people’s memory quality (e.g., memory blanks are not bad) and competence (e.g., they mildly disagreed that traumatized people are not competent to testify). Additionally, participants did not believe traumatized people were more honest than non-traumatized people. For the remaining factors, participants’ scores fell in the neutral category, implying that they do not hold strong beliefs in either direction.

Moreover, on average, participants mildly agreed that traumatic memories were often repressed, were fundamentally different than normal memories, and that the process of investigating a crime can further traumatize a person. Also, participants moderately agreed that it is common for people to become severely distressed by traumatic events.

Demographic Differences

In order to investigate whether beliefs about traumatized people differed according to demographic differences, I conducted separate MANOVAs with gender, education, and
political affiliation as independent variables and the factors as dependent variables. Indeed, there were gender differences for distrust in reporting accuracy, competence, memory quality, and believability, $F$s $(1, 341) > 8.16$, $MSE$s $> 11.03$, $p$s $< .005$. In all instances, females had lower scores indicating more favorable views toward traumatized people (see Table 4).

Additionally, I found a significant main effect for political affiliation for competency scores, $F$ $(3, 339) = 4.02$, $MSE =$ 3.94, $p = .008$. Democrats were more likely to think that traumatized people were competent witnesses ($M =$ 3.11, $SD =$ 0.99) than people who identified themselves as Independent ($M =$ 3.45, $SD =$ 0.92), $p =$ .03, $d =$ 0.36, 95% CI [0.29, 0.43]. There were no statistically significant differences between Republicans and any other political affiliation, $p$s $> .12$.

Finally, I found significant differences on distrust in reporting accuracy and competence among education levels, $F$s $(3, 345) > 4.12$, $MSE$s $> 4.02$, $p$s $< .007$. Tukey’s post-hoc analyses indicated that participants who reported having some college experience (but no degree) had more distrust in traumatized people’s reporting accuracy ($M =$ 4.65, $SD =$ 1.03) compared to participants who had at least an associate degree ($M =$ 4.17, $SD =$ 1.05) or a college degree ($M =$ 4.31, $SD =$ 0.99), $p$s $= .005, .05$; $d$s $= 0.46, 0.34$, 95% CIs [0.32, 0.61], [0.21, 0.47], respectively. Participants who had some college experience were also more likely to think traumatized people were not competent to testify ($M =$ 3.50, $SD =$ 0.99) compared to participants with a college degree ($M =$ 3.10, $SD =$ 0.93) and participants with graduate experience ($M =$ 2.99, $SD =$ 1.00), $p$s $= .02, .03$; $d$s $= 0.41, 0.52$, [0.29, 0.54], [0.36, 0.67], respectively. There were no other differences between education levels in distrust in reporting accuracy or competence or any other factor, $p$s $> .06$. 

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Table 3

Study 1: Descriptive Statistics for ATTM Factors (N = 343)

<table>
<thead>
<tr>
<th>Factor/Variable</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1: Reporting Accuracy</td>
<td>4.37</td>
<td>1.02</td>
</tr>
<tr>
<td>F2: Honesty</td>
<td>3.74</td>
<td>1.04</td>
</tr>
<tr>
<td>F3: Competence</td>
<td>3.35</td>
<td>1.00</td>
</tr>
<tr>
<td>F4: Memory Quality</td>
<td>3.38</td>
<td>1.23</td>
</tr>
<tr>
<td>F5: Memory Ability</td>
<td>4.29</td>
<td>1.20</td>
</tr>
<tr>
<td>F6: Believability</td>
<td>4.29</td>
<td>1.28</td>
</tr>
<tr>
<td>Using traumatized people as witnesses is a form of abuse.</td>
<td>3.40</td>
<td>1.53</td>
</tr>
<tr>
<td>Testimony from traumatized people is emotionally laden.</td>
<td>4.00</td>
<td>1.53</td>
</tr>
<tr>
<td>Traumatic memories are often repressed.</td>
<td>4.94</td>
<td>1.31</td>
</tr>
<tr>
<td>Traumatic memories are fundamentally different than normal memories.</td>
<td>4.88</td>
<td>1.43</td>
</tr>
<tr>
<td>It is common to become severely distressed by traumatic events.</td>
<td>6.01</td>
<td>1.01</td>
</tr>
<tr>
<td>Criminal investigations can further traumatize a person.</td>
<td>5.38</td>
<td>1.10</td>
</tr>
</tbody>
</table>

Note. ATTM = Attitudes toward Traumatic Memory; Participants responded to each statement on a 7-point Likert scale with the following anchors: 1 = strongly disagree, moderately disagree, mildly disagree, 4 = neutral, mildly agree, moderately agree, and 7 = strongly agree. For the six factors, higher scores indicate unfavorable views. High scores on Factors F1-F6 indicate unfavorable views toward that factor.
Table 4

*Study 1: Descriptive Statistics for Attitudes toward Traumatized People Factors among Males and Females*

<table>
<thead>
<tr>
<th>Factor</th>
<th>Males</th>
<th>Females</th>
<th>d, [95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>F1: Reporting Accuracy***</td>
<td>4.58</td>
<td>0.99</td>
<td>4.12</td>
</tr>
<tr>
<td>F2: Honesty</td>
<td>3.75</td>
<td>0.99</td>
<td>3.73</td>
</tr>
<tr>
<td>F3: Competence ***</td>
<td>3.41</td>
<td>1.03</td>
<td>3.05</td>
</tr>
<tr>
<td>F4: Memory Quality**</td>
<td>3.55</td>
<td>1.15</td>
<td>3.17</td>
</tr>
<tr>
<td>F5: Memory Ability</td>
<td>4.32</td>
<td>1.14</td>
<td>4.24</td>
</tr>
<tr>
<td>F6: Believability***</td>
<td>4.54</td>
<td>1.22</td>
<td>4.00</td>
</tr>
</tbody>
</table>

*Note.** p < .01, *** p < .001. Anchors were set at 1 = strongly disagree, 4 = neutral, and 7 = strongly agree. Higher scores indicate unfavorable views.*
CHAPTER 7: STUDY 1 DISCUSSION

In Study 1, I devised a questionnaire to evaluate people’s views towards traumatized people and trauma memory in court contexts. I hypothesized that overall people would hold positive beliefs towards traumatized people, having trust in their testifying abilities. I also hypothesized that people would have favorable views toward general characteristics of trauma memory. The data obtained from this study supported these hypotheses.

In general, I found that people do hold favorable views of traumatized people and their memories. Indeed, participants generally agreed that traumatized people had good quality memories and were competent to testify. Additionally, participants did not believe that traumatized people were more honest than non-traumatized people. These results are in line with past research examining views of traumatized people in the courtroom. For instance, Golding and others have shown that people tend to favor plaintiffs who claimed to have repressed memories of abuse (Golding et al., 1996, 1995; Schutte, 1994).

In regards to traumatized memory in general, participants’ views were parallel to research on repressed memory conducted in Western cultures. In Patibis et al.’s (2013) study, up to 81% of participants agreed traumatic memories are often repressed. In Garry et al.’s (1994) much earlier study — conducted at the height of the “memory wars,” — a large majority of people (88%) believed painful experiences can be hidden in the unconscious. In my study, 67% of participants at least mildly agreed that traumatic memories were often repressed. Taken as a whole, these results suggest that the existence of repression is still a widely held view in Western cultures; the rate obtained in this study was more than triple the rate obtained in Japan (Naka & Maki, 2006). However, results also point to a downward trend in the belief in the existence of repression. It is important to note that in the Patibis et al. (2013) and Garry et al. (1994) studies the researchers did not allow participants to choose
a neutral option on their questionnaires. In this study, 21.1% of participants chose the neutral option for the repression question, indicating they did not hold views in either direction. Thus it is possible that the endorsement rates in earlier research were inflated as participants were forced to agree or disagree with each statement. That is, there may have been some people that were not sure or did not know whether memories were repressed.

My results also showed that participants believe traumatic memories are fundamentally different from more mundane memories, that it is common for someone to become distressed as a result of a traumatic experience, and that the act of investigating a crime can further traumatize a person. However, regardless of these views, participants still held favorable views of traumatized people’s ability to testify. Perhaps then, the questionnaire did not probe enough to ascertain how these differences may affect people’s views of a traumatized person.

Furthermore, people’s views of traumatized people in the courtroom differed among demographic groups. Notably, women tended to have more favorable views of traumatized people than men. Additionally, participants with some college education distrusted traumatized people’s reporting accuracy compared to participants who had an associate’s or college degree. Other research has shown that people with more years of college were more skeptical about repressed memory (Patihis et al., 2013). In this study, the more education participants had the more likely they were to disagree that traumatized people were incompetent to testify. But beliefs about repression did not differ among education levels. These results suggest that perhaps people with more education are aware that memory for traumatic events are equivalent to more mundane memories, and thus would not affect a person’s ability to testify.
Certainly, there are several limitations with this study. A large number of responses for each factor fell into the neutral category—thus I can only infer that participants did not feel strongly one way or another about traumatized people, or perhaps they did not know enough to make a judgment (e.g., they were not sure how traumatized people’s memories would be affected). Or perhaps participants today are more aware of research on memory and trauma and have heard conflicting stories about the relationship between them. Perhaps most importantly, I did not query participants on whether or not they had ever experienced a traumatic event or whether they had ever been severely distressed by a traumatic event. It is highly probable that some participants may have been involved in a distressing crime (e.g., mugging, car accident) and thus, their responses could have been affected by their experiences.

Despite these shortcomings, Study 1 helped us gain insight into people’s current views on traumatic memory and their perceptions of traumatized people. One of the most important issues in court cases is the jury’s perception of a witness. Results from this study suggest that people hold somewhat favorable views of traumatized people and their ability to testify; thus, these data may be useful to legal professionals and psychologists as they determine an appropriate strategy when they have a client diagnosed with PTSD. Nevertheless, results from this study also suggest that there is a need for dissemination of the experimental findings of memory research, particularly regarding repressed memories. Differences in these views among demographic groups may signify that some groups may need to be educated more than others and these differences should be considered when crafting dissemination efforts, especially in courts of law.

Before these dissemination efforts can take place, however, we must first learn how a person’s memory is actually affected by a traumatic event. Do the public’s views fit with the
reality of trauma victims’ memory reports? Study 2 examined the effect of posttraumatic stress disorder symptomatology on memory accuracy.
CHAPTER 8: STUDY 2 OVERVIEW

The purpose of my second study was to clarify the relationship between PTSD symptomatology and a person’s ability to later provide an accurate report concerning a traumatic event. Recall that the dominant theories of PTSD posit that incomplete processing of a trauma results in memories that are more disorganized, fragmented, or likely to be missing significant detail compared to non-traumatic memories (Brewin et al., 1996, 2010; Ehlers & Clark, 2000; Horowitz, 1976). However, studies that have employed objective measures of narrative disorganization, or have included appropriate comparison memories (e.g., most important memory, most positive memory) and groups (e.g., a diagnosis of PTSD vs. No PTSD), have failed to demonstrate that such disorganization or fragmentation actually exists in people’s trauma narratives. Yet, people tend to self-report a sense of disorganization in their trauma narratives (for comprehensive reviews see: O’Kearney & Perrott, 2006; Rubin, 2011). This sense of disorganization has been shown to be associated with higher symptom severity and peritraumatic dissociation (Engelhard, Van Den Hout, Kindt, Arntz, & Schouten, 2003; O’Kearney, Hunt, & Wallace, 2011). Thus, even if actual disorganization does not matter, I wondered whether a sense of disorganization might make people work harder to extract the meaning out of a traumatic event and establish coherence in their memory. If so, then a sense of disorganization might exert other potentially adverse effects on traumatic memory and, subsequently, people’s memory reports.

Accordingly, this study was designed to investigate the following research question: Does a disorganized trauma memory produce more memory distortion, and thus more symptoms of PTSD, compared to an organized memory?

Briefly in this study, participants viewed a short film depicting a fatal car accident. I manipulated how they processed the film: either by focusing on the meaning of the film or
the sensory information (i.e., conceptual vs. data-driven processing). I also manipulated how they encoded the event by controlling the temporal organization of the film (in temporal order or out of temporal order). These manipulations were designed to simulate the theorized impact of differences in the processing of traumatic events. I asked participants to record any intrusive thoughts about the film over the course of a week and to complete standard measures of their analogue PTSD symptoms. Finally, one week after the initial visit to the lab, participants were asked to provide a free recall report of the event and to complete a surprise recognition test.
CHAPTER 9: STUDY 2 METHOD

Participants

A total of 213 participants (115 females) were recruited from New York City via advertisements posted on Craigslist.com. This sample size is adequate to obtain power of .95 to detect a small to medium ($d = 0.25$) effect size with alpha set at .05. All were 18 years or older (actual age was not recorded). No other demographic information was collected. Participants received $45 for their time. I excluded two participants because they failed to pass a manipulation check (recalling their processing instruction). Thus, my analyses focused on 211 participants.

Design

The design of this study was a 2 (Film Organization: Organized, Disorganized) x 3 (Processing Instruction: Control, Data-driven, Conceptual) between subjects design. The first independent variable was the order of the film clips. In the Organized condition, participants viewed the film in a typical temporally organized manner from beginning to end. In the Disorganized condition, however, participants viewed the clips in a pre-determined random order. Both versions of the film were the same length. Table 5 reveals that pilot participants ($N = 38$) considered the disorganized film to be less clear, cohesive, and coherent; they claimed to understand less of what happened in the film and thought it made less sense than participants who viewed the organized film. Notably, the two films were considered equally traumatic.
Table 5

Study 2: Pilot Testing Means (SDs) and ANOVA Results for Each Film

<table>
<thead>
<tr>
<th>Variable</th>
<th>Film</th>
<th>M (SD)</th>
<th>95% CI</th>
<th>F (1, 36)</th>
<th>p</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>Organized</td>
<td>6.68 (.48)</td>
<td>[6.45, 6.91]</td>
<td>10.84</td>
<td>.002</td>
<td>1.06</td>
</tr>
<tr>
<td></td>
<td>Disorganized</td>
<td>5.79 (1.08)</td>
<td>[5.27, 6.31]</td>
<td>10.84</td>
<td>.002</td>
<td>1.06</td>
</tr>
<tr>
<td>Cohesive</td>
<td>Organized</td>
<td>5.74 (1.10)</td>
<td>[5.21, 6.27]</td>
<td>4.57</td>
<td>.04</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td>Disorganized</td>
<td>4.95 (1.17)</td>
<td>[4.38, 5.51]</td>
<td>4.57</td>
<td>.04</td>
<td>0.69</td>
</tr>
<tr>
<td>Coherent</td>
<td>Organized</td>
<td>6.05 (.78)</td>
<td>[5.68, 6.43]</td>
<td>14.06</td>
<td>.001</td>
<td>1.21</td>
</tr>
<tr>
<td></td>
<td>Disorganized</td>
<td>5.00 (.94)</td>
<td>[4.55, 5.45]</td>
<td>14.06</td>
<td>.001</td>
<td>1.21</td>
</tr>
<tr>
<td>Understood</td>
<td>Organized</td>
<td>6.42 (.77)</td>
<td>[6.05, 6.79]</td>
<td>6.18</td>
<td>.02</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>Disorganized</td>
<td>5.58 (1.26)</td>
<td>[4.97, 6.19]</td>
<td>6.18</td>
<td>.02</td>
<td>0.80</td>
</tr>
<tr>
<td>Makes sense</td>
<td>Organized</td>
<td>6.47 (.84)</td>
<td>[6.07, 6.88]</td>
<td>8.58</td>
<td>.01</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>Disorganized</td>
<td>5.26 (1.59)</td>
<td>[4.50, 6.03]</td>
<td>8.58</td>
<td>.01</td>
<td>0.95</td>
</tr>
<tr>
<td>Traumatic</td>
<td>Organized</td>
<td>5.68 (1.00)</td>
<td>[5.20, 6.17]</td>
<td>.20</td>
<td>.66</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td>Disorganized</td>
<td>5.53 (1.17)</td>
<td>[4.96, 6.09]</td>
<td>.20</td>
<td>.66</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Note. Each measure was on a 1 (not at all) to 7 (completely) scale.
The second independent variable was the processing instruction (adapted from Halligan et al., 2002). Control participants received no instruction about how they should process the film. However, participants in the data-driven condition received the following instruction prior to viewing the film:

Become absorbed in the images and sounds. Try to let yourself be carried away by the things you are going to see, the sounds you will hear and the physical sensations you might experience. See each scene as a series of unconnected snapshots and let the images and sounds impress themselves upon you.

Participants in the conceptual processing condition were told:

Concentrate on the story. Ask yourself what happened to the people in each scene and why. Try to figure out what is going on and what each person in the film might understand as the event unfolds.

The key dependent variables were: a) memory accuracy: the proportion of Old and New clips participants correctly identified; b) memory distortion: the proportion of Missing “cruxes”—scenes rated as crucial to the event and traumatic in prior pilot testing (Strange & Takarangi, 2012)—and “non-cruxes”—not crucial and not traumatic—misidentified as coming from the original film (i.e., called ‘old’); c) memory phenomenology for the experience of remembering clips (i.e., ‘Remember’ or ‘Know’); and d) analogue symptoms of PTSD as described below.

Materials

The film. The 3m 49s film depicted a graphic multi-fatality car accident (see Strange & Takarangi, 2012). Briefly—distracted by a text message—a young female driver and her female passengers cross the center line of a road, causing a head-on collision with multiple other vehicles. The film continues to depict the arrival of emergency services and their
rescue efforts. It ends with the driver of the vehicle being airlifted to a hospital. The film was
split into 22 clips, each separated by 2s of blank screen.

**Individual differences measures.** Prior research has determined that PTSD is
associated with depression, anxiety, and dissociation (e.g., Halligan et al., 2003; Kessler,
Sonnega, Bromet, & Hughes, 1995). Thus, we assessed whether depression, dissociation, and
anxiety scores were matched across groups with the following measures: (1) The Beck
Depression Inventory (BDI; Beck, Steer, & Brown, 1996); (2) the trait version of the State and
Trait Anxiety Inventory for adults (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs,
1983); (3) the Trait Dissociation Questionnaire (Murray, Ehlers, & Mayou, 2002).

Additionally, we included the Beliefs About Memory Questionnaire (BAMQ; Bennett &
Wells, 2010) and the Data-driven Processing Questionnaire (DPQ; Halligan, Clark, & Ehlers,
2002) to assess participants’ views on memory in general and their normal cognitive
processing strategies.

The BDI is a 21-item inventory that identifies overt behavioral characteristics of
depression. Items are scored on four-point Likert scales ranging from 0 to 3 (range 0-63) with
higher scores indicating more severe symptoms. It has high internal consistency (Cronbach’s
alpha = .91; Beck et al., 1996). The STAI-T measures adults’ long-standing anxiety:
participants respond to statements about how they generally feel (e.g., “I feel pleasant,” “I’m
inclined to take things hard”) on a 4-point scale (1 = almost never; 4 = almost always; range =
20-80). The STAI-T is reliable with Cronbach’s alpha ranging from .85 to .95 (Tanaka-
Matsumi & Kameoka, 1986). The Trait Dissociation Questionnaire is a 38-item questionnaire
developed to measure people’s dissociative tendencies (such as detachment from others and
the world, sense of split self, emotional numbing, and amnesia for important life events) on
a 6-point Likert scale (0 = never; 5 = always; range: 0-190). Higher scores on this
questionnaire indicate a greater tendency to dissociate. Past studies have shown it to have high internal consistency (Cronbach’s alpha = 0.96; Murray et al., 2002).

The BAMQ was designed to measure positive beliefs about the need for a complete memory of a trauma (e.g., “I need to have a perfect memory of the event because I need to find answers”) and negative beliefs about the consequences of not having a complete memory for the trauma (e.g., “Having memory blanks means something is seriously wrong with me”). Participants indicated the degree to which they agreed with each belief on a 4-point Likert scale (1 = do not agree, 4 = agree very much). The positive subscale consisted of eight items and scores can range from 0 to 32. The negative subscale consisted of seven items and scores can range from 0 to 28. For this study, the internal consistency for the positive subscale (Cronbach’s alpha = 0.92) and negative subscale (Cronbach’s alpha = 0.71) were adequate and were similar to the reliability of past studies (e.g., Bennett & Wells, 2010). The DPQ is an 8-item scale that assesses the degree to which participants primarily process surface, perceptual aspects of an event (e.g., “It was like a stream of unconnected impressions following each other”). Participants indicated the extent to which they felt the statements applied to them when they experienced a prior traumatic event, using a 5-point Likert scale (0 = not all; 4 = very strongly; range: 0-32). In this study, the scale had good reliability (Cronbach’s alpha = 0.90).

Mood measures. To test whether participants’ mood changed as a result of watching the film, we administered the Positive and Negative Affect Schedule (PANAS; Watson & Clark, 1994) before and after they watched the film. The PANAS measures state mood and consists of two independent 10-item subscales measuring positive and negative affect, respectively. Participants respond to affect-related adjectives (sad, happy, afraid), rating how they feel at the time of responding (1 = very slightly or not at all to 5 = extremely; range
Reliability scores for the positive and negative subscales were adequate for Time 1 (Cronbach’s alphas = .92, .80, respectively) and Time 2 (Cronbach’s alpha = .90 for each subscale).

**Self-reported memory disorganization.** I was also interested in whether the disorganized film created a feeling of disorganization for participants. Thus, I included the Disorganization subscale of the Trauma Memory Questionnaire (TMQ; Halligan et al., 2003), which asked participants to describe the quality of their trauma memory (e.g., “I cannot get what happened during the accident straight in my mind”) on a five-point Likert scale which ranged from 1 (not at all) to 5 (very strongly). Higher means indicated that participants felt their memory for the film was more disorganized or incomplete (range: 1-5). Reliability for this study was adequate (Cronbach’s alpha = .85).

**Analogue trauma symptoms.** To gauge the frequency of participants’ analogue PTSD symptoms I included the Impact of Event Scale (IES; Horowitz et al., 1979) and an online daily diary. The IES assesses the frequency of *intrusions* and *avoidance* in relation to a traumatic event. Participants respond to 15 statements such as, “I thought about it when I didn’t mean to” and “I tried not to talk about it” on a 4-point Likert scale (0 = not at all; 1 = rarely; 3 = sometimes; 5 = often). The IES yields a total score (range 0-75) and subscale scores for Intrusions (range 0-35) and Avoidance (range 0-40), respectively. I altered the instructions to refer to the traumatic film (see also Monds, Paterson, Kemp, & Bryant, 2013; Takarangi, Segovia, Dawson, & Strange, 2013), and to symptoms experienced during the week between sessions. In the current study, both subscales of the IES had high internal reliability: Cronbach’s alpha = .87 (Intrusions) and .80 (Avoidance).

In an online diary, I asked participants to follow their processing instruction every time they thought about the film during the following week. I asked participants to
complete a diary daily for seven days between sessions tracking any thought or image related to the film that was not deliberately retrieved. I sent participants a link to the online diary at the beginning of the week and I asked them to record the date, time, and where they were for every intrusion they experienced. In addition, I asked them to identify whether the intrusion was best described as a thought, an image, or a combination, as well as to rate how distressed they were by the intrusion (1 = not at all; 10 = extremely), and to describe the intrusion in detail to the best of their ability.

Recognition memory test. The recognition memory test was comprised of 18 clips: six clips participants saw (Old), six clips they did not see (New/Control) and six Missing clips that I had removed from the film (see also Strange & Takarangi, 2012). The New clips were selected from online sources and also depicted the precursors to traffic accidents, actual accidents and their aftermath. However, they clearly depicted city streets or accidents involving young men (not women). Missing clips were scenes that were removed from the original film and that participants did not see during encoding—half “cruxes,” half “non-cruxes.” Again, cruxes (n = 3) were scenes rated in pilot testing to be critical to the action; they depicted scenes such as a female passenger’s neck snapping when her car gets hit by another oncoming car. Non-cruxes (n = 3) were scenes rated to be less critical to the action and depicted scenes such as a rescue helicopter taking off from the scene of the accident. (See Figure 2 for example screenshots of Missing clips.) Importantly, in pilot testing, participants’ ratings of how crucial the clip was to the plot of the film (the variable used to distinguish cruxes from non-cruxes) were highly correlated with how traumatic they found the clip, \( r = .95, p < .01 \).

---

1 To ensure that participants did not enter all diary entries as the same time, the online diary recorded the date and time each entry was made. Indeed, every participant that filled out the diary completed their entries on separate days.
Participants were asked to: (1) identify whether the clip was Old or New, (2) rate how confident they were about their decision (1 = not at all, 5 = extremely), (3) consider their phenomenological experience of clips they judged Old and label them as Remembered—that is, participants could specifically remember the context in which they viewed the clip—Known—they knew the clip was presented but could not remember in which context—or Neither, and (4) rate how confident they were about that decision. I had two versions of the recognition test to control for order effects.

**Procedure**

Before attending the first session, I asked participants to complete the BDI, STAI-T, and the Trait Dissociation Questionnaire. I also asked them to complete the BAMQ and DPQ at this time so they would be less likely to connect these questionnaires with the experimental manipulations. All measures were completed online (using surveymonkey.com).

**Session 1.** During this session, participants completed the PANAS to establish baseline mood. Then, they were introduced to the processing instruction: the experimenter read the processing instruction then played a practice clip of a neutral non-related event. The experimenter only moved on to the main film when participants confirmed that they understood their instruction and what was required of them. Then, the experimenter repeated the processing instruction and presented the traumatic film. After the film, participants recalled their processing instruction and rated how easy it was to follow that instruction (1 = not at all; 7 = completely). Note that control participants did not need to recall their processing instructions since they did not receive one. Finally, participants completed the PANAS a second time and then the TMQ. In the 7-day interval between Session 1 and 2, participants recorded their daily intrusions in their online diaries.
Session 2. After seven days, participants returned to the lab and were told that the driver of the car has been indicted with criminal negligent homicide and that they had been called upon by the court to act as a witness to the accident. The experimenter then asked them to provide a written free recall account of the material from the trauma film, describing everything that they could remember. Importantly, the experimenter asked them to pay particular attention to the correct temporal sequence of events (that is, what actually occurred beginning to end, rather than the order of events as disorganized participants saw). Participants typed directly onto a computer and research assistants scored these event descriptions for chronological accuracy and content accuracy. After the free recall report, participants completed the surprise memory test and the IES. At the end of Session 2, participants were fully debriefed, compensated, and thanked for their time.

Hypotheses

(2.1) There will be a main effect of organization on memory. People who view the disorganized film will have difficulty intentionally retrieving a complete memory, and therefore will be less accurate regarding what they did and did not seen in the film (i.e., Old v New clips).

(2.1b) I also expect that participants in the disorganized condition will report that they “remember” old clips rather than “know” they were in the film.

(2.2) There will be an interaction between processing instruction and organization on memory distortion. When the film is organized, memory distortion will be equal across processing conditions; however, when the film is disorganized, memory distortion will be greatest for participants who processed the film in a data-driven manner.

(2.2b) I also expect that participants in the disorganized/data-driven condition will report that they “remember” missing clips rather than “know” they were in the film.
(2.3) There will be an interaction between processing instruction and organization on analogue PTSD symptoms. When the film is organized, the rate of PTSD symptoms will be equal across processing conditions; however, when the film is disorganized, the rate of PTSD symptoms (e.g., higher IES scores and more intrusions) will be greatest for those participants who processed the film in a data-driven manner.

(2.4) There will be a positive correlation between PTSD symptoms (as measured by the IES) and memory distortion. As previously mentioned, research has shown that PTSD is associated with depression, anxiety, and dissociation, thus I will use the self-report measures completed in Session 1 as moderators in my analyses. Participants with a higher rate of PTSD symptoms are expected to exhibit greater memory distortion (i.e., less accurate details recalled and more errors on the memory test) than those with a lower rate of PTSD symptoms.
Figure 2. Study 2 screenshots of example Missing clips: (Top) Crux clip: female passenger’s neck snapping after collision with an oncoming car. (Bottom) Non-crux Clip: helicopter lifting off the ground.
CHAPTER 10: STUDY 2 RESULTS

I first examined the individual difference measures to ensure that there were no differences between groups on depression, anxiety, and dissociation scores. Then, to check whether the traumatic film and the film organization had their desired effects, I examined participants’ mood, and participants’ self-reported degree of memory disorganization, respectively. Finally, I tested each of my hypotheses regarding participants’ accurate and inaccurate memories for the film and their analogue symptoms of PTSD. Note that, unless otherwise specified, all ANOVAs were 2 (Film Organization: Organized, Disorganized) X 3 (Processing Instruction: Conceptual, Data-driven, None) between-subject factorials.

**Preliminary Analyses**

**Individual difference measures.** To determine whether BDI, STAI-T, BAMQ, DPQ or Trait Dissociation Questionnaire scores differed across conditions, I conducted separate factorial ANOVAs for each measure. There was a significant Film Organization x Processing Instruction interaction for DPQ scores, $F(2, 200) = 3.97, MSE = 54.95, p = .02$. That is, of the participants who did not receive a processing instruction (minus the control condition), those who saw the organized film had higher DPQ scores ($M = 14.32, SD = 7.07$) than those who watched the disorganized film ($M = 8.17, SD = 7.45$), $d = 0.85$, 95% CI [-0.82, 2.54]. Thus, it is important to keep this difference in mind when interpreting results (Miller & Chapman, 2001). There were no other between-group differences for DPQ scores. Table 6 shows that there were no differences across groups among the other individual measures.
Table 6  
*Study 2: Individual Differences Measure Means (SDs), Confidence Intervals, & ANOVA Results*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Instruction</th>
<th>Organized Film</th>
<th>Disorganized Film</th>
<th>ANOVA F</th>
<th>Instruction (I)</th>
<th>Film (F)</th>
<th>I x F</th>
<th>MSE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M (SD)</td>
<td>95% CI</td>
<td>M (SD)</td>
<td>95% CI</td>
<td>I</td>
<td>F</td>
<td></td>
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<tr>
<td>STAI-Trait</td>
<td>None</td>
<td>36.86 (9.18)</td>
<td>[33.62, 40.09]</td>
<td>34.33 (11.25)</td>
<td>[31.14, 37.52]</td>
<td>0.10</td>
<td>0.07</td>
<td>1.44</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>35.83 (10.02)</td>
<td>[32.59, 39.06]</td>
<td>34.48 (8.13)</td>
<td>[31.15, 37.82]</td>
<td>0.12</td>
<td>0.07</td>
<td>1.45</td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>34.48 (7.84)</td>
<td>[31.15, 37.82]</td>
<td>37.28 (11.02)</td>
<td>[34.09, 40.47]</td>
<td>0.11</td>
<td>0.07</td>
<td>1.46</td>
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<tr>
<td>BDI</td>
<td>None</td>
<td>6.63 (7.97)</td>
<td>[4.45, 8.80]</td>
<td>5.50 (7.68)</td>
<td>[3.36, 7.65]</td>
<td>0.43</td>
<td>0.98</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>6.20 (7.37)</td>
<td>[4.03, 8.38]</td>
<td>3.87 (3.85)</td>
<td>[1.60, 6.15]</td>
<td>0.11</td>
<td>0.98</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>5.21 (5.23)</td>
<td>[2.97, 7.45]</td>
<td>5.97 (5.74)</td>
<td>[3.83, 8.12]</td>
<td>0.11</td>
<td>0.98</td>
<td>0.97</td>
</tr>
<tr>
<td>Trait Dissociation</td>
<td>None</td>
<td>27.61 (22.33)</td>
<td>[19.70, 35.51]</td>
<td>26.86 (20.92)</td>
<td>[19.18, 34.53]</td>
<td>0.35</td>
<td>0.10</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>26.83 (22.81)</td>
<td>[19.15, 34.50]</td>
<td>24.75 (17.45)</td>
<td>[16.72, 32.78]</td>
<td>0.35</td>
<td>0.10</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>29.18 (30.32)</td>
<td>[21.28, 37.09]</td>
<td>29.00 (26.29)</td>
<td>[21.43, 36.57]</td>
<td>0.35</td>
<td>0.10</td>
<td>0.03</td>
</tr>
<tr>
<td>DPQ</td>
<td>None</td>
<td>14.32 (7.07)</td>
<td>[11.81, 16.83]</td>
<td>8.17 (7.45)</td>
<td>[5.73, 11.01]</td>
<td>1.53</td>
<td>2.98</td>
<td>5.23</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>8.54 (7.41)</td>
<td>[6.07, 11.01]</td>
<td>10.50 (6.56)</td>
<td>[7.92, 13.08]</td>
<td>1.53</td>
<td>2.98</td>
<td>5.23</td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>12.18 (8.25)</td>
<td>[9.64, 14.73]</td>
<td>11.03 (7.58)</td>
<td>[8.59, 13.46]</td>
<td>1.53</td>
<td>2.98</td>
<td>5.23</td>
</tr>
<tr>
<td>BAMQ negative</td>
<td>None</td>
<td>10.21 (2.42)</td>
<td>[9.25, 11.18]</td>
<td>9.51 (3.35)</td>
<td>[8.58, 10.45]</td>
<td>0.97</td>
<td>0.95</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>9.51 (2.80)</td>
<td>[8.58, 10.45]</td>
<td>9.31 (2.69)</td>
<td>[8.34, 10.29]</td>
<td>0.97</td>
<td>0.95</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>9.33 (2.82)</td>
<td>[8.37, 10.30]</td>
<td>9.08 (2.63)</td>
<td>[8.16, 10.01]</td>
<td>0.97</td>
<td>0.95</td>
<td>0.16</td>
</tr>
<tr>
<td>BAMQ positive</td>
<td>None</td>
<td>18.33 (6.17)</td>
<td>[16.10, 20.57]</td>
<td>15.14 (6.64)</td>
<td>[12.97, 17.31]</td>
<td>0.32</td>
<td>1.53</td>
<td>1.64</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>15.57 (6.81)</td>
<td>[13.40, 17.74]</td>
<td>16.44 (6.35)</td>
<td>[14.17, 18.71]</td>
<td>0.32</td>
<td>1.53</td>
<td>1.64</td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>16.45 (6.36)</td>
<td>[14.22, 18.69]</td>
<td>15.39 (6.67)</td>
<td>[13.25, 17.53]</td>
<td>0.32</td>
<td>1.53</td>
<td>1.64</td>
</tr>
</tbody>
</table>

Note. *p ≤ .05. STAI = State-Trait Anxiety Inventory, BDI = Beck Depression Inventory, DPQ = Data-processing Questionnaire, BAMQ = Belief about Memory Questionnaire.
**Mood measures.** After watching the traumatic film, all participants experienced a significant decrease in positive mood (Time 1: \( M = 31.76, SD = 9.03; \) Time 2: \( M = 27.55, SD = 8.64 \)) and a significant increase in negative mood (Time 1: \( M = 12.31, SD = 3.29; \) Time 2: \( M = 17.94, SD = 7.11 \)), \( t(209) = 9.27, \) -12.35, \( p < .001, \) \( d = 0.48, [-0.36, .1.32], 1.02 [0.49, 1.55] \), respectively. Additionally, an ANOVA revealed that there were no effects of Film Organization or Processing Instruction on mood change, \( Fs < 1.27. \)

**Self-reported memory disorganization.** Next, I analyzed how participants viewed the quality of their trauma memory via the TMQ\(^2\). The film organization manipulation successfully elicited feelings of event disorganization and a sense that participants’ memories were incomplete. That is, I found a significant main effect for Film Organization, \( F(1, 203) = 20.41, MSE = 0.06, p < .001. \) Participants who viewed the disorganized film had higher TMQ scores (\( M = 1.76, SD = .80 \)) than those who viewed the organized film (\( M = 1.36, SD = .46, \) \( d = 0.61, 95\% \) CI [0.52, 0.70]). I also asked participants who received a processing instruction (\( n = 138 \)) to rate how easy it was to follow that instruction. Overall, participants felt that the instruction was fairly easy to follow (\( M = 5.75, SD = 1.50 \)). Indeed, the ANOVA results revealed no effect for Processing Instruction, \( F(1, 134) = 1.25, MSE = 2.72, p = .27. \) However, participants who watched the organized film (\( M = 6.06, SD = 1.27 \)) found the instruction easier to follow than those who watched the disorganized film (\( M = 5.46, SD = 1.66 \)). That is, there was a main effect for Film Organization, \( F(1, 134) = 5.74, MSE = 12.47, p = .02, d = 0.41, [0.16, 0.65] \). Taken together, these results show that disorganized film participants felt that their memories were indeed impoverished relative to those who saw the organized film. Thus, I next turned to my primary interest: would that sense of

\(^2\)There was heterogeneity of variance on the TMQ Disorganization ratings, with higher variance for the disorganized film; thus, we calculated the log of the scores to stabilize that variance. However, we report the original descriptive statistics for the significant results.
Hypothesis (2.1) There will be a main effect of organization on memory. People who view the disorganized film will have difficulty intentionally retrieving a complete memory, and therefore be less accurate regarding what they did and did not see in the film (i.e., Old v New clips).

(2.1b) I also expect that participants in the disorganized condition will report that they “remember” old clips rather than “know” they were in the film.

Hypotheses 2.1 and 2.1b were not supported. I discuss the details of these analyses below. Overall, however, participants were highly accurate regarding what they had and had not seen regardless of film organization. Interestingly, the conceptual processing instruction was effective for participants who saw the disorganized film, that is, they were more accurate than participants who saw the organized film. Moreover, in general, participants claimed to “remember” rather than “know” the clips were in the film regardless of their condition. Lastly, all participants were highly confident in their answer choices regardless of condition.

Memory

Old vs. New accuracy. I first examined participants’ accuracy for what they had and had not seen in the film. Recall that Ehlers and Clark’s (2000) theory suggests that people with disorganized memories should have difficulty with intentional remembering. Thus I calculated the proportion of the time each participant claimed a clip was “old” when evaluating Old and New clips. Overall, participants correctly recognized Old clips ($M = .89; SD = .15$) and correctly rejected New clips at high rates ($M = .04; SD = .09$). I conducted separate ANOVAs on Old and New clip recognition rates. For New clips, participants across
conditions performed equally well, $F_s < 0.88$. For Old clips, however, I found that participants who watched the organized film were less accurate ($M = .87, SD = .17$) than those who saw the disorganized film but only in the conceptual processing condition ($M = .95, SD = .10$), $d = 0.58$, 95% CI [0.55, 0.61]. That is, there was a significant Processing Instruction by Film Organization interaction for Old clips, $F(2, 205) = 4.12$, $MSE = 0.02$, $p = .02$. There were no other differences (see Table 7). This result suggests that the conceptual instruction was effective. When the film was disorganized participants appeared to have followed the instruction, ultimately processing the film more effectively and enhancing memory. However, there is no evidence here for an overall deficit in intentional remembering as a result of a disorganized memory because rates for remembering were high across conditions (possibly exhibiting a ceiling effect).

**Phenomenological experience.** To evaluate participants’ phenomenological experience when they claimed a clip was Old, I calculated the proportion of the time each participant claimed to “remember” or “know” that Old clips were in the film. Overall, participants claimed to Remember ($M = .69, SD = .29$) more often than Know, ($M = .24, SD = .28$), $t(210) = 11.94$, $p < .001$, $d = 1.58$, 95% CI [1.56, 1.61] that the clips were in the film. To determine whether my independent variables affected Remember or Know proportions, I conducted separate ANOVAs for each rating. There were no differences for Remember ratings; nor were there any effects for Know ratings, $F_s < 3.35$. Using the independence assumption (IRK familiarity: $F = K / (1 – R)$; Jacoby, 1998), I also determined that familiarity estimates for Old clips did not differ across conditions, $F_s < 1.01$.

**Confidence.** Participants were highly confident in their responses to Old ($M = 4.29; SD = .53$) and New ($M = 4.46; SD = .60$) clips. Neither Processing Instruction nor Film Order or their interaction affected confidence ratings for either Old or New clips, $F_s < 3.04$. 

60
Table 7

**Study 2: Recognition Proportion Rates: Means (SDs), Confidence Intervals, & ANOVA Results**

<table>
<thead>
<tr>
<th>Clip Type</th>
<th>Instruction</th>
<th>Organized Film</th>
<th>Disorganized Film</th>
<th>ANOVA F</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M (SD)</td>
<td>95% CI</td>
<td>M (SD)</td>
<td>95% CI</td>
<td>Instruction (I)</td>
</tr>
<tr>
<td>Old</td>
<td>None</td>
<td>.89 (.16)</td>
<td>[.84, .94]</td>
<td>.91 (.14)</td>
<td>[.86, .96]</td>
<td>1.08</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>.87 (.17)</td>
<td>[.82, .91]</td>
<td>.95 (.10)</td>
<td>[.90, 1.00]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>.90 (.13)</td>
<td>[.85, .95]</td>
<td>.84 (.15)</td>
<td>[.80, .89]</td>
<td></td>
</tr>
<tr>
<td>New</td>
<td>None</td>
<td>.04 (.08)</td>
<td>[.01, .07]</td>
<td>.05 (.11)</td>
<td>[.02, .08]</td>
<td>0.73</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>.02 (.06)</td>
<td>[.00, .05]</td>
<td>.03 (.08)</td>
<td>[.01, .06]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>.04 (.07)</td>
<td>[.01, .07]</td>
<td>.05 (.10)</td>
<td>[.02, .08]</td>
<td></td>
</tr>
</tbody>
</table>

*Note. *p ≤ .05.*
Hypothesis (2.2): There will be an interaction between processing instruction and organization on memory distortion. When the film is organized, memory distortion will be equal across processing conditions; however, when the film is disorganized, memory distortion will be greatest for participants who processed the film in a data-driven manner.

(2.2b): I also expect that participants in the disorganized/data-driven condition will report that they “remember” missing clips rather than “know” they were in the film.

Hypotheses 2.2 and 2.2b were not supported by these data. As I detail below, there were no significant main or interaction effects. The results only revealed statistically significant differences between missing clip type. In essence, participants falsely claimed to have seen crux missing clips more often than non-crux missing clips. Participants also claimed to have “remembered” crux clips more often than non-crux missing clips. Additionally, if participants did claim to have seen a missing clip, they were more confident in their decision regarding crux clips rather than non-crux clips.

Memory Distortion

To investigate the effects of Film Organization and Processing Instruction on memory distortion, I calculated the proportion of Missing Crux and Non-Crux clips that participants claimed were actually in the film. Then I ran a 2 (Film Organization: Organized, Disorganized) x 3 (Processing Instruction: Conceptual, Data-driven, None) x 2 (Clip Type: Crux, Non-Crux) repeated measures ANOVA. As Table 8 shows, I replicated prior research (Strange & Takarangi, under review, 2012). That is, participants falsely reported seeing Crux clips at a higher rate than Non-Crux clips, $F(1, 205) = 41.47, MSE = 2.60, p < .001, d = 0.44, 95\% CI [0.41, 0.47]$. However, neither the Film Organization or Processing Instruction, nor the interaction of those variables, affected the rate of memory distortion, $Fs < 2.03$. 
Phenomenological experience. Providing further evidence that participants experience the Crux and Non-Crux clips differently, Table 8 shows that participants falsely claimed to Remember Crux clips more often than Non-Crux clips, $F(1, 148) = 33.62$, $MSE = 3.39$, $p < .001$, $d = 0.50$, 95% CI [0.45, 0.54]. However, there were no other significant effects on Remember ratings, $Fs < 1.65$. Additionally, participants claimed to Know Crux clips less often ($M = .26$, $SD = .36$) than Non-Crux clips ($M = .37$, $SD = .42$), $F(1, 148) = 8.26$, $MSE = 1.01$, $p = .005$, $d = 0.28$, [0.23, 0.33]. There were no other effects for Know ratings, or familiarity ratings, $Fs < 2.95$.

Confidence. Participants were somewhat confident in their responses to Crux clips ($M = 3.81$, $SD = .78$), but significantly less so for Non-Crux missing clips ($M = 3.57$, $SD = .85$), $F(1, 202) = 15.30$, $MSE = 5.94$, $p < .001$, $d = 0.29$, 95% CI [0.21, 0.37]. Moreover, if participants exhibited memory distortion (i.e., called a missing clip “old”), they were more confident in their responses for Crux clips ($M = 3.77$, $SD = 1.23$) than Non-Crux clips ($M = 2.70$, $SD = 1.74$), $F(1, 205) = 79.87$, $MSE = 122.01$, $p < .001$, $d = 0.71$, [0.57, 0.86]. However, the 2 x 3 x 2 repeated measures ANOVA revealed that neither Processing Instruction nor Film Organization affected overall confidence ratings for Crux and Non-Crux clips, for all ratings $Fs < 1.35$, or in cases where participants exhibited memory distortion, $Fs < 2.15$.

Self-reported disorganization. Finally in relation to memory distortion, I investigated whether self-reporting more memory disorganization was associated with falsely recognizing more Missing Cruxes. It was: $r(207) = .16$, 95% CI [.03, .27], $p = .03$, and people who did falsely recognize more Missing Cruxes were also highly confident in those decisions, $r(207) = -.21$, [-.34, -.06], $p = .003$. By contrast, there was no such relationship with the proportion of Missing Non-Cruxes, $r(207) = .10$, $p = .17$, but there was with confidence, $r(205)= -.25$, [-.37, -.11], $p < .001$. Thus, self-reported disorganization had an effect on the type
of errors participants made in this paradigm: people tended to over-remember the trauma, falsely recognizing more trauma scenes than they actually experienced.

Additionally, I examined whether metacognitive beliefs, particularly the negative BAMQ scores, might moderate or mediate the relationship between remembering Missing Crux clips and Film Order. They did not, $F_s < 1.00$. 
Table 8

*Study 2: Proportions & Repeated Measures ANOVA Results for Missing Crux and Non-Crux Clips Reported as “Old” and “Remembered”*

<table>
<thead>
<tr>
<th>Response by Clip Type</th>
<th>Instruction</th>
<th>Organized Film</th>
<th>Disorganized Film</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M (SD)</td>
<td>95% CI</td>
</tr>
<tr>
<td>Old – Crux</td>
<td>None</td>
<td>.54 (.33)</td>
<td>[.44, .64]</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>.63 (.29)</td>
<td>[.53, .73]</td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>.66 (.28)</td>
<td>[.56, .76]</td>
</tr>
<tr>
<td>Old - Non-Crux</td>
<td>None</td>
<td>.50 (.30)</td>
<td>[.38, .61]</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>.49 (.36)</td>
<td>[.37, .60]</td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>.48 (.37)</td>
<td>[.37, .60]</td>
</tr>
<tr>
<td>Remember - Crux</td>
<td>None</td>
<td>.57 (.45)</td>
<td>[.42, .72]</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>.74 (.37)</td>
<td>[.60, .88]</td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>.64 (.43)</td>
<td>[.50, .78]</td>
</tr>
<tr>
<td>Remember - Non-Crux</td>
<td>None</td>
<td>.41 (.44)</td>
<td>[.26, .57]</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>.48 (.42)</td>
<td>[.31, .64]</td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>.53 (.43)</td>
<td>[.36, .70]</td>
</tr>
</tbody>
</table>

**Repeated Measures ANOVA F**

<table>
<thead>
<tr>
<th>Clip Type (C)</th>
<th>C x Instruction (I)</th>
<th>C x Film (F)</th>
<th>C x I x F</th>
<th>MSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old</td>
<td>41.47***</td>
<td>1.88</td>
<td>2.03</td>
<td>.41</td>
</tr>
<tr>
<td>Remember</td>
<td>33.62***</td>
<td>.21</td>
<td>.01</td>
<td>1.65</td>
</tr>
</tbody>
</table>

*Note. ***p < .001*
Hypothesis (2.3): There will be an interaction between processing instruction and organization on analogue PTSD symptoms. When the film is organized, the rate of PTSD symptoms will be equal across processing conditions; however, when the film is disorganized, the rate of PTSD symptoms (e.g., higher IES scores and more intrusions) will be greatest for those participants who processed the film in a data-driven manner.

Hypothesis (2.4): There will be a positive correlation between PTSD symptoms (as measured by the IES) and memory distortion. As previously mentioned, research has shown that PTSD is associated with depression, anxiety, and dissociation, thus I will use the self-report measures completed in Session 1 as moderators in my analyses. Participants with a higher rate of PTSD symptoms are expected to exhibit greater memory distortion (i.e., less accurate details recalled and more errors on the memory test) than those with a lower rate of PTSD symptoms.

Again, Hypotheses 2.3 and 2.4 were not supported. Neither processing instructions nor film organization affected analogue PTSD symptoms. Moreover, the rate of analogue PTSD symptoms and memory distortions were not significantly correlated. However, there was a significant positive correlation between analogue symptoms of PTSD and self-reported disorganization. Specifically, participants who reported having more incomplete memories and feelings of disorganization were also more likely to report that they tried to avoid thinking about the film.

Analogue Symptoms

Participants’ scores on the IES were comparable to other studies employing traumatic films (e.g., Holmes, Lang, & Shah, 2009). Notably, total scores of 9-25 suggest that participants were affected by the film’s content (Horowitz et al., 1979). However, ANOVAs
on participants’ overall IES scores and the Intrusions and Avoidance subscales, as well as
my measures of the number of intrusions\(^3\) and average distress rating for those intrusions,
revealed no significant differences across groups, all \(F_s < 2.40\) (see Table 9).

Nevertheless, the more participants reported feeling that the event was disorganized
and that their memories were incomplete, the more likely they were to report Avoidance
symptoms. That is, I found a correlation between the TMQ and the Avoidance subscale of
the IES, \(r (207) = .16, 95\% \text{ CI } [.02, .30], p = .03\), but not Intrusions, \(r (207) = .08, [-.06, .21], p = .27\).

\(^3\) For analyses on number of intrusions and intrusion ratings, I only included data from participants
who completed the diary for at least three days \((n = 181)\).
Table 9

Study 2: Analogue PTSD Symptom Means (SDs), Confidence Intervals, & ANOVA Results

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Instruction</th>
<th>Organized Film</th>
<th>Disorganized Film</th>
<th>ANOVA F</th>
<th>Instruction (I)</th>
<th>Film (F)</th>
<th>I x F</th>
<th>MSE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M (SD)</td>
<td>95% CI</td>
<td>M (SD)</td>
<td>95% CI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IES total</td>
<td>None</td>
<td>14.83 (14.12)</td>
<td>[10.36, 19.30]</td>
<td>11.76 (11.78)</td>
<td>[7.41, 16.11]</td>
<td>1.79</td>
<td>0.81</td>
<td>0.48</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>17.09 (13.30)</td>
<td>[12.61, 21.56]</td>
<td>18.00 (14.81)</td>
<td>[13.46, 22.54]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IES Avoidance</td>
<td>None</td>
<td>7.46 (6.90)</td>
<td>[4.79, 10.13]</td>
<td>6.49 (7.28)</td>
<td>[3.89, 9.08]</td>
<td>2.28</td>
<td>1.45</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>10.00 (8.51)</td>
<td>[7.33, 12.67]</td>
<td>9.68 (8.74)</td>
<td>[6.97, 12.39]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>9.98 (9.27)</td>
<td>[7.26, 12.68]</td>
<td>7.28 (7.19)</td>
<td>[4.65, 9.91]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IES Intrusion</td>
<td>None</td>
<td>7.37 (8.18)</td>
<td>[5.10, 9.64]</td>
<td>5.27 (5.52)</td>
<td>[3.06, 7.48]</td>
<td>0.74</td>
<td>0.12</td>
<td>1.07</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>7.09 (6.08)</td>
<td>[4.82, 9.36]</td>
<td>8.32 (7.86)</td>
<td>[6.02, 10.63]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>7.23 (6.56)</td>
<td>[4.93, 9.54]</td>
<td>7.11 (6.38)</td>
<td>[4.87, 9.35]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Intrusions</td>
<td>None</td>
<td>2.91 (4.07)</td>
<td>[1.71, 4.11]</td>
<td>1.88 (2.75)</td>
<td>[0.70, 3.07]</td>
<td>0.72</td>
<td>1.27</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>3.31 (3.32)</td>
<td>[2.03, 4.59]</td>
<td>2.96 (3.65)</td>
<td>[1.61, 4.32]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>2.76 (4.06)</td>
<td>[1.48, 4.04]</td>
<td>2.37 (3.01)</td>
<td>[1.11, 3.63]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrusion Rating</td>
<td>None</td>
<td>4.06 (2.10)</td>
<td>[3.13, 4.99]</td>
<td>4.61 (2.02)</td>
<td>[3.56, 5.67]</td>
<td>1.88</td>
<td>2.40</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td>Conceptual</td>
<td>4.65 (2.04)</td>
<td>[3.80, 5.51]</td>
<td>5.91 (2.93)</td>
<td>[4.88, 6.94]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data-driven</td>
<td>4.72 (2.08)</td>
<td>[3.77, 5.51]</td>
<td>4.79 (1.96)</td>
<td>[3.73, 5.85]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: IES = Impact of Events Scale.
CHAPTER 11: STUDY 2 DISCUSSION

Recall that the purpose of Study 2 was to examine whether a disorganized memory might promote memory distortion, and thus more symptoms of PTSD, compared to an organized memory. Ehlers and Clark (2000) suggested that people with disorganized memories have difficulty with “intentionally retrieving a complete memory” (p. 324). Thus, I posited that participants who viewed the disorganized film would be less accurate, especially if they were given the data-driven processing instruction, because disorganized trauma memories should make it difficult for people to establish coherence in their memory (Conway & Pleydell-Pearce, 2000). In line with dominant theories of PTSD (e.g., Brewin & Holmes, 2003; Brewin, 2001b; Ehlers & Clark, 2000), I also predicted that these participants would exhibit more analogue symptoms of PTSD. However, I found no support for these proposals.

Overall, I observed a high degree of memory distortion: collapsing across conditions, and crux and non-crux clips, participants falsely claimed to have seen 52% of missing clips. However, although the film organization manipulation successfully increased ratings of memory disorganization and incompleteness (i.e., TMQ ratings), it had no impact on the number of memory errors participants made. Overall, the proportion of memory errors did not differ as a function of whether participants encoded the film in a temporally organized or disorganized manner and/or whether participants received an instruction to process the film’s content in a particular manner. Furthermore, I saw no difference in the frequency of participants’ analogue symptoms of PTSD as a function of the experimental manipulations.

Why did these manipulations not affect memory distortion? The most obvious explanation is that the proposed mechanism regarding the conceptual versus data-driven processing distinction is simply wrong. However, these data do suggest an alternative
explanation. Indeed, if we consider the memory distortion rates in the control condition, the manipulations do appear to be having some effect on the type of memory errors participants make.

In prior research, participants completed the recognition memory test after only a 24-hour delay (Strange & Takarangi, under review, 2012). In those studies, the weighted average error rate was .34 for cruxes and .24 for non-cruxes. After a week’s delay, the comparable figures in this study (Organized Film, No Processing Instruction) were .54 and .50, respectively. That is, the typical “over-remembering” effect—where participants are more likely to falsely remember missing cruxes (the more traumatic scenes) than non-cruxes—disappeared in the control condition, \( t(34) = .90, p = .38, d = .13, 95\% \text{ CI } [.06, .20] \).

This finding suggests that, over time, in the absence of any encoding or processing manipulations, people tend to demonstrate a general increase in memory distortion rather than over-remembering the more traumatic aspects of an event (e.g., Engelhard et al., 2008; Giosan et al., 2009; Southwick et al., 1997). By contrast, when participants received an encoding or processing manipulation (the remainder of the conditions) the typical pattern of results was demonstrated. Thus, while there is no evidence for my proposed hypotheses, something about the conditions at encoding and the processing manipulation is exerting an adverse effect on participants’ memory: they persist in over-remembering the trauma.

Of course, although over-remembering trauma was evident in all but the control condition, there was no corresponding increase in either the frequency of analogue symptoms or participants’ distress as a result of any intrusions. Instead, it appears that how participants felt about their memories was more important to the development of analogue symptoms. I found that self-reporting more memory disorganization was associated with experiencing more avoidance symptoms. These results are similar to others in the literature.
(e.g., Bennett & Wells, 2010; Engelhard, Van Den Hout, Kindt, Arntz, & Schouten, 2003; O’Kearney, Hunt, & Wallace, 2011; Rubin, Feldman, & Beckham, 2004). Additionally, self-reported disorganization was associated with falsely remembering missing cruxes but not non-cruxes. Taken together, these results suggest that self-reported disorganization may be more important to the malleability of people’s trauma memories than any objective test of disorganization.

Of course, my study has several limitations that warrant consideration. As with all analogue trauma research, I did not measure memory for real trauma, nor did I measure PTSD. Aside from self-report, I also cannot know whether people followed the processing instruction while they were experiencing the event or when they thought about the event over the delay. I must also acknowledge that there is considerably heterogeneity in the definition and measurement of disorganization in the literature (see O’Kearney & Perrott, 2006; Rubin, 2011). Thus, my results may be restricted to temporal disorganization. In addition, as far as the measurement of memory distortion is concerned, I restricted myself to recognition memory. However, people’s free recall may present a wealth of useful information, particularly regarding other distortions that my memory test does not reveal—an avenue I explore in the next study.

Nevertheless, there are important implications of these results. First, this study is further evidence of the malleability of trauma memories, a fact not explicitly acknowledged in the prevailing theories (Brewin et al., 1996, 2010; Ehlers & Clark, 2000). Indeed, I have added to the literature by demonstrating that people’s feelings regarding the disorganization of their memories not only affect their assessment of the severity of their PTSD symptoms, but also the kinds of memory errors they make. In particular, self-reported disorganization appears to be related to over-remembering trauma. This finding has
potentially serious consequences. Victims of trauma are frequently called upon to testify to
their experiences in court. If they feel their memory is impoverished for a traumatic event,
might they be more likely to succumb to cross-examination? Cross-examination is
considered a safeguard of our justice system; however, it is frequently pitched as an
opportunity to get witnesses to alter their testimony with the use of suggestive, misleading
questions. Thus people who do experience a sense of disorganization in their memories
might be more suggestible on the witness stand. I investigated this possibility in the
following study.
A plethora of research has demonstrated that interactions with other people can influence the content and accuracy of memory reports (Lindsay, Ross, Read, & Toglia, 2007; Toglia, Read, Ross, & Lindsay, 2007). In the legal system, witnesses frequently interact with other witnesses, police officers, lawyers, and so on. They can be subjected to constant interviewing, beginning with the initial report to the police (or 9-1-1 operator) and ending with their testimony, and later cross-examination, in court. These interactions can expose a person to misinformation—false or incorrect post-event information—which can be integrated into his or her memory report (Loftus & Palmer, 1974; Scoboria, Mazzoni, & Kirsch, 2006). In the laboratory, we know that this phenomenon occurs with a variety of events: from incorrectly recalling objects in scenes that were not there (the “misinformation effect” studies) to falsely remembering whole autobiographical events (Loftus & Pickrell, 1995; Nourkova, Bernstein, & Loftus, 2004). The extent to which a person allows internal and external factors to influence his or her memory report is termed their suggestibility (see for example, Block, Segovia, & Goodman, 2009). Put another way, suggestibility is the ease with which a person is persuaded or influenced to accept and change their own judgments in accordance with incorrect post-event information (Drukteinis, 2005).

The Misinformation Effect in Trauma

The studies conducted on the misinformation effect have tended to focus on seemingly neutral (i.e., non-traumatic) events. Although scarce, there have been a series of studies that have attempted to examine whether traumatic events are also susceptible to alteration from misinformation (Crombag, Wagenaar, & van Koppen, 1996; Morgan III, Southwick, Steffian, Hazlett, & Loftus, 2013; Neisser & Harsch, 1992; Nourkova et al., 2004). Crombag and colleagues (1996) were one of the first to examine the effect of misinformation
on a public traumatic effect. In 1992, an El Al Boeing 747 crashed into an apartment building in Amsterdam. Although there was no film of the actual impact of the plane into the apartment building, there was film of the resulting fire that was widely publicized. Ten months after the incident, Crombag et al. questioned Dutch participants about what they remembered about the crash. Importantly, they included one leading question in their study, “Did you see the television film of the moment the plane hit the apartment building?” Over half of the participants (55%) claimed to have seen the impact and even provided details on how long it took the fire to start. In a second study, a higher proportion of participants claimed to have seen the impact (66%) and elaborated on their memories giving highly specific details (e.g., the plane hit the building horizontally, the plane was already burning when it hit). Crombag et al. were repeatedly able to create false memories with a single misleading question, demonstrating that traumatic events are susceptible to misinformation. Later research replicated Crombag et al.’s (1996) finding with other public traumatic events (Granthag, Stromwall, & Billings, 2003; Nourkova et al., 2004; Ost, Vrij, Costall, & Bull, 2002). For example, Nourkova et al. (2004) asked their Russian participants to write about their memories of the 1999 Moscow apartment bombings (two years before the study was conducted). Six months later, the authors suggested to their participants that they had mentioned a wounded animal in their initial reports. Indeed, Nourkova et al. convinced 12.5% of their Russian participants that they had witnessed a wounded animal in the film footage of the aftermath of the bombings. In summary, these studies reveal that even newsworthy traumatic events are not immune to suggestive influences. However, these naturally occurring traumatic events do not afford a great deal of experimental control.

More recently, Morgan and colleagues (2013) examined whether the misinformation effect was present for recent, highly stressful events. They experimentally manipulated
misinformation that was introduced to over 800 military personnel enrolled in U.S. Navy Survival School training. During this training, military personnel are exposed to highly stress-inducing experiences that are modeled from the experience of actual prisoners of war (e.g., evasion, capture, interrogation). Briefly, Morgan et al. manipulated the type of misinformation their participants received in three ways: in one condition, misinformation was introduced in a questionnaire with leading questions (e.g., was the uniform worn by your interrogator green with red boards or blue with orange boards; p. 14). In another condition, the authors presented participants with photographs of interrogators that were not present during the training. In the third misinformation condition, the authors presented participants with doctored video recordings. Some participants were in a control condition that received no misinformation. Their results showed that all types of misinformation elicited false memories: up to 85% of participants reported incorrect details in the questionnaire (e.g., reported the wrong color uniform worn by the interrogator), 84% of participants falsely identified their interrogator in the misinformation photo condition, and 51% of participants in the misinformation video condition falsely reported that the instructors were carrying weapons. The results of this study demonstrate that highly stressful experiences are also vulnerable to different types of misinformation, even with military personnel that are trained to resist that misinformation. Indeed, Morgan et al. posited that the true risk of, and prevalence of, false memories may be under-represented, especially for traumatic experiences. What this body of research does not tell us is whether there are particular factors that are likely to make certain people more susceptible to suggestion for traumatic events.
Suggestibility

In a forensic context, a person’s suggestibility is usually exhibited by changes in their memory reports due to suggestive questioning by an interviewer. Gudjonsson and Clark (1986) state that suggestibility involves the personal acceptance of the proposition offered by the “interrogator.” Suggestibility differs from compliance in that compliance is the “tendency of the individual to go along with propositions, requests or instructions, for some instrumental gain” (Gudjonsson, 2003, p. 370). Suggestibility requires that the individual incorporate the proposition into his or her own beliefs. Studies indicate that individual difference variables are more likely than situational differences to influence the degree to which people are suggestible (Gudjonsson, 1994). Indeed, we know that there are several traits that might make an individual more susceptible to suggestive questioning: self-monitoring style, IQ, memory capacity, field dependence (reliance on information from external referents), and age (Bain, Baxter, & Ballantyne, 2007; Singh & Gudjonsson, 1992). With regard to age, we know that both adults and children are susceptible to suggestive questioning, but younger children tend to be especially vulnerable to suggestive interviewing techniques (Ceci & Bruck, 1993, 1995; Chae, Goodman, Eisen, & Qin, 2011; Eisen, Qin, Goodman, & Davis, 2002). These age differences can usually be explained by differences in cognitive development between older and younger children. That is, children may have difficulty accurately answering suggestive questions because they may not have the cognitive or social skills to identify that they do not know the answer and do not have to choose an answer, or to reject information that is incorrect.

Several laboratory and field studies have examined children’s memory of and suggestibility about events that are negative and even traumatic (Chae et al., 2011; Eisen & Goodman, 1998; Toth & Cicchetti, 1998). Results from these studies have been mixed in
terms of whether children are more suggestible about stressful than neutral events, or less so. Some research indicates that trauma victims are especially attentive to trauma-related stimuli and remember their trauma experiences quite well (Field et al., 2001; Paunovic, Lundh, & Öst, 2002). When suggestibility has been studied in actual child abuse victims, their performance is generally comparable to that of nonabused control children, although some forms of psychopathology may be associated with greater error (Chae et al., 2011). For example, certain symptoms of PTSD, such as dissociation, were shown to be associated with greater inaccuracy (Chae et al., 2011; Eisen, Goodman, Qin, Davis, & Crayton, 2007).

Researchers and legal scholars are aware of the increased suggestibility of children and often advise investigators to be more careful when interviewing children. By contrast, research on the suggestibility of traumatized adults is less abundant, and it is unclear whether legal professionals should also exhibit a similar degree of caution concerning their memory reports. If caution is required there may be a need to remedy mistakes made by highly suggestible people. To date, the legal system has relied on cross-examination to weed out false information and correct inaccuracies in a person’s testimony.

**Cross-Examination**

Cross-examination is the process used in adversarial court systems where attorneys for the opposing side question witnesses in an attempt to elicit favorable facts or impeach the credibility of the witness (Ehrhardt & Young, 1996). Cross-examination has also been touted as “the greatest legal engine ever invented for the discovery of the truth” (Wigmore, 1974, p. 32). The assumption is that cross-examination boosts the credibility of an honest witness, while diminishing the credibility of a dishonest witness (Kassin, Williams, & Saunders, 1990). However, because it is also presumed that witnesses for the opposing side are likely to be hostile, leading questions are allowed during cross-examination (Ehrhardt &
And leading questions are inherently suggestive. Indeed, research has shown that cross-examination questions usually contain leading questions that are highly suggestive (Zajac & Cannan, 2009; Zajac, Gross, & Hayne, 2003). Moreover, results of several studies examining the effect of cross-examination on memory reports have demonstrated that cross-examination adversely affects accuracy (Fogliati & Bussey, 2013; Kassin et al., 1990; Zajac et al., 2003; Zajac & Hayne, 2003, 2006).

For example, Zajac and Hayne (2003) examined the accuracy of children’s memory reports under cross-examination. Children experienced the same memory event (a trip to a police station) and later underwent direct and cross-examination. Importantly, some of the children were exposed to misinformation before direct-examination. Consistent with other research, Zajac and Hayne found that children made several changes in their memory reports whether or not they received misinformation. Moreover, children were just as likely to move away from the truth as they were to move towards the truth—that is, cross-examination did not improve the inaccurate children’s testimony contrary to its purpose. Perhaps just as importantly, cross-examination actually lead children who were originally accurate to become inaccurate.

Another study conducted by Fogliati and Bussey (2013) found similar results. They had children take part in a staged event (a healthy eating lesson) where the instructor of the lesson performed a transgression (ripped a “special” poster). Children in the study were interviewed twice: The first interview consisted of a direct examination. For the second interview, half the children underwent direct examination again, while the other half underwent cross-examination. The authors found that children who were cross-examined were less accurate in the second interview than in the first. Children who underwent direct examination twice did not differ in their accuracy. Thus, the authors showed that cross-
examination is more detrimental to memory report accuracy than mere repeated interviewing. Overall, these studies illustrate the ineffectiveness of cross-examination in discovering the truth of events with vulnerable populations.

In Study 3, I investigated whether people who witness an analogue traumatic event are more susceptible to misinformation and suggestion (thus prone to providing more errors in their memory reports) and if cross-examination causes them to change their original memory report.
CHAPTER 13: STUDY 3 OVERVIEW

The purpose of Study 3 was twofold: First, I was interested in how misinformation presented during questioning affects a traumatized person’s memory report. Second, I was interested in whether cross-examination—considered a safeguard of our judicial system—can improve the accuracy of traumatized people’s memory reports. Past research has shown that vulnerable populations (e.g., children, adults with intellectual disabilities) are more susceptible to suggestive questions and perform worse during cross-examination than typically functioning adults (see Block et al., 2009). Here I also tested whether people subjected to an analogue trauma may be vulnerable to suggestibility and cross-examination and whether laypeople’s beliefs about their suggestibility (as reported in Study 1) matched their actual performance.

Briefly, in this study, participants watched the trauma film (organized or disorganized) as described in Study 2. The disorganized film was designed to mimic the way a traumatized person might feel about their memory (that it is missing details and feels disorganized). Then an interviewer asked questions pertaining to the film (direct examination). These questions included free recall, cued free recall, specific yes/no questions, and misleading questions that introduced incorrect but relevant information. Consistent with other cross-examination studies and legal procedures (Fogliati & Bussey, 2013; Zajac et al., 2003; Zajac & Hayne, 2003), all participants were later cross-examined by a different interviewer. The study ended after a surprise recognition test that examined suggestibility versus compliance.

Study 3 was designed to answer two research questions. First, does event organization and/or misinformation affect whether people change their original reports when interviewed in a style consistent with cross-examination? Second, does the accuracy of
people’s direct examination predict whether or not they will change their responses during cross-examination?
CHAPTER 14: STUDY 3 METHOD

Participants

I recruited participants from New York City through an online advertisement posted on Craigslist.com. Eighty-three adult participants (46 females) completed Phase 1. Two people failed to show for their second appointment, thus the sample at Phase 2 was comprised of 81 adult participants ($M = 37.15$ years, $SD = 14.43$; range 19 to 69 years; 46 females). Sample size is adequate for a 2 x 2 mixed factorial design to obtain power of .95 to detect a small to medium ($d = 0.25$) effect size with alpha set at .05. Participants received $15 per session for their time (total $30), which I paid at the end of the second session. For other demographics, see Table 10.

Design

The design for this study was a 2 (Film Organization: organized vs. disorganized) x 2 (Question Type: specific v. misleading) mixed factorial design. Half of the participants viewed the film in its normal temporally organized order. During direct examination, the interviewer asked both specific and misleading questions (counterbalanced) of all participants.

The dependent variables in this study were a) people’s accuracy in direct examination, b) accuracy after cross-examination, c) the number of changes made to initial responses during cross-examination, and d) performance on the recognition task.

Materials

The film. I used the same film described in Study 2.

Measures. I used all the individual differences measures, mood measures, and self-reported disorganization measures as described in Study 2. In this study, only the IES was used to measure analogue trauma symptoms.
**Direct examination.** The direct examination consisted of free recall questions (e.g., tell me everything that you remember about the film), cued recall questions (e.g., what color car were they driving? How many people were in the car?), and specific yes/no questions (e.g., were there oncoming cars on the road?). The specific yes/no questions were designed to yield approximately the same number of correct yes and no answers, respectively. The interviewer asked all of the specific questions listed in Appendix C. The direct examination also included misleading yes/no questions that presupposed incorrect but relevant details of the film (e.g., did you see the passenger’s neck snap in the collision?). The specific and misleading questions probed participants about both traumatic and non-traumatic details of the film. Moreover, half of the misleading questions probed about content that would appear in the missing clips of the recognition task. The interviewer asked each participant half of the misleading questions in Appendix C, and they were counterbalanced across participants.

**Cross-examination.** Similar to Zajac’s cross-examination studies (Jack & Zajac, 2014; Zajac & Hayne, 2003, 2006), the purpose of the cross-examination was to get participants to change their yes/no answers originally provided in direct examination. If the interviewer could not get the participant to change his or her answer, then the secondary goal was to get the participant to admit that his or her original answer might be wrong. Per the method used in Zajac and Hayne (2003), each participant was asked seven sets of eight questions related to the topics discussed in the direct examination: Three sets pertained to the misinformation, while the other four pertained to specific questions. Additionally, the interviewer intermixed three questions repeated verbatim from the direct examination (i.e., they were not presented in a leading manner). See Appendix D for further explanation of the questions and some examples.
Recognition memory test. I used the same recognition memory test as described in Study 2.

Procedure

As in Study 2, participants completed the BDI, the TDQ, the CPQ, the STAI, and the BAMQ online (using qualtrics.com) before coming in for the study. To allow for a record of the interviews, participants’ responses were audio recorded in both Phase 1 and Phase 2.

Phase 1. For this session, after participants completed the consent form, the interviewer asked participants to first complete the PANAS to establish baseline mood. Then participants watched the organized or disorganized trauma film (depending on their experimental condition). Participants then completed the PANAS a second time. After watching the film and completing the questionnaires, participants waited quietly for five minutes. Finally, an interviewer conducted the direct examination.

Phase 2. 48 hours later, participants returned to the lab. An experimenter not present during Phase 1 conducted the cross-examination. She then asked participants to complete the recognition memory test. Subsequently, she asked each participant to rate their own abilities as a witness (i.e., rate how confident they were that they gave an adequate report and if they thought they would make a good eyewitness), to complete the IES and, finally, to provide some basic demographic information. At the end of Phase 2, the experimenter debriefed participants and compensated them for their participation.

Coding

Direct Examination Scores.

Free recall. Independent raters broke down participants’ free recall and cued recall responses from the direct examination into units of information. A coding scheme similar to that of Jack, Leov, and Zajac (2014) was used to quantify the amount, type, and accuracy of
the information provided by participants. Raters categorized each detail as pertaining to a person, behavior, surrounding, time, or sound (for details on how each of these categories differed see Jack et al., 2014). Next, each detail was judged to be correct, incorrect, or possible. A detail could be judged as possible if it was reasonable speculation about things not shown on the clip but could have been correct (“The mom wasn’t shown, but she was probably in the car).

Ten randomly selected free recall reports were coded independently by three raters. Agreement between raters was adequate: ICCs(2, 3) > .80. Disagreements were resolved through discussion and the remaining reports were divided equally among the three raters.

*Yes-No questions.* For yes-no questions, raters gave 2 points for correct responses, -2 points for incorrect responses, and 0 points for “don’t know” or “can’t remember” responses (Jack & Zajac, 2014). If participants gave hesitant or ambiguous responses—“e.g., I think...”—then raters gave 1 point for the response (positive or negative depending on veracity). Scores could range from -30 to 30 overall. Specific questions scores could range from -24 to 24 and misleading question scores could range from -6 to 6.

*Cross-examination scores.* Raters coded responses to the last two cross-examination questions in a similar fashion to direct examination questions. That is, if the participant acquiesced to correct information, positive points were assigned; if he or she acquiesced to incorrect information then negative points were assigned. The numerical value of the score (0, 1, 2) reflected certainty with which the response was given as above (Jack & Zajac, 2014; Zajac & Hayne, 2003).

I was also interested in whether the cross-examination style of questioning led participants to change their answers. Participants were deemed to have changed their response if their score for a given question changed sign between interviews (e.g., from +2 to
-1), or changed to or from 0. The maximum number of changes for each question type was 3, 4, and 3 for misleading, specific, and repeated questions, respectively.

**Hypotheses**

I predicted that there would be a main effect of question type on accuracy in direct examination, number of changes to initial response made, and performance on the recognition task.

(3.1) Participants who view the disorganized film will be less accurate in free recall and cued recall.

(3.2) There will be a main effect of question type in which participants will make more errors to misleading questions than specific questions.

(3.2b) Participants will also make more errors to traumatic misleading questions than non-traumatic misleading questions.

(3.3) There will be a question type by film organization interaction in which participants who view the disorganized film will be less accurate in responses to misleading questions than specific questions.

(3.3b) There will be a trauma type by film organization interaction in which participants who view the disorganized film will be less accurate in responses to traumatic misleading questions than non-traumatic misleading questions.

I also predicted that there would be a main effect of event organization on all dependent variables, such that:

(3.4) Participants who view the disorganized film will acquiesce to more incorrect information during cross-examination, making their accuracy during cross-examination worse than participants who view the organized film.
(3.5) Participants will make more changes to misleading questions than specific questions or repeated questions.

(3.6) Participants who view the disorganized film will make more changes to their answers during cross-examination.

(3.7) Based on results obtained in Study 2, I expect all participants will be highly accurate in identifying old and new clips across conditions.

(3.7b) All participants will also be highly confident in their decisions for old and new clips.

(3.8) Participants will have higher false alarm rates for missing crux clips than non-crux clips in the recognition task.

(3.8b) Participants will have higher false alarm rates for missing clips that pertained to misleading questions than for misleading clips that were not probed about in the misleading questions.

(3.9) Participants who view the disorganized film will be less confident in their abilities to give an adequate report of what they saw, and they will not think they would make good witnesses in court.

(3.10) Participants that view the disorganized film will also have higher rate of analogue PTSD symptoms.
Table 10

**Study 3: Demographic Characteristics of Males and Females**

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Males (%; n = 35)</th>
<th>Females (%; n = 46)</th>
<th>Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td>38.54 ± 14.25</td>
<td>36.09 ± 14.45</td>
<td>(t = .76, \ df = 79, \ p = .45)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td>(\chi^2 = 4.65, \ df = 4, \ p = .17)</td>
</tr>
<tr>
<td>Caucasian</td>
<td>25.7</td>
<td>28.3</td>
<td></td>
</tr>
<tr>
<td>African-American</td>
<td>45.7</td>
<td>32.6</td>
<td></td>
</tr>
<tr>
<td>Hispanic/ Latino/a</td>
<td>17.1</td>
<td>19.6</td>
<td></td>
</tr>
<tr>
<td>Asian-American</td>
<td>8.6</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2.9</td>
<td>15.2</td>
<td></td>
</tr>
</tbody>
</table>

*Note. Mean ± standard deviation is used for age.*
CHAPTER 15: STUDY 3 RESULTS

I first examined the individual difference measures, any effects of the traumatic film on participants’ mood, and participants’ self-reported degree of memory disorganization before I turn to my primary measures of interest: participants’ direct- and cross-examination scores, change scores, and memory test performance.

Preliminary Analyses

**Individual difference measures.** I conducted separate one-way ANOVAs with each of the individual difference scores as dependent measures (see Table 11). Note that four participants completed these measures after their Phase 1 appointment and their data were not used in these analyses. No differences were found between film conditions among BDI, STAI-T, Trait Dissociation Questionnaire, or BAMQ scores. However, there were statistically significant differences in DPQ scores, \( F(1, 77) = 4.75, \text{MSE} = 200.15, p = .03 \). Participants in the disorganized film group reported that they processed surface, perceptual aspects of a previous traumatic event (\( M = 12.59, SD = 6.22 \)) more often than participants in the organized film group (\( M = 9.40, SD = 6.72 \)), \( d = 0.50, 95\% \text{CI} [-0.51, 1.50] \). While participants were assigned to condition randomly this difference must be kept in mind when interpreting results (Miller & Chapman, 2001).

**Mood measures.** After watching the traumatic film, all participants experienced a significant decrease in positive mood (Time 1: \( M = 32.54, SD = 8.35 \); Time 2: \( M = 28.77, SD = 8.60 \)) and a significant increase in negative mood (Time 1: \( M = 12.28, SD = 3.81 \); Time 2: \( M = 17.59, SD = 7.17 \)), \( ts (82) = 5.62, -7.59, p < .001, ds = 0.45, 95\% \text{CIs} [-0.83, .1.72], 0.93 [0.06, 1.80] \), respectively. Additionally, MANOVAs revealed that there were no effects of Film Organization on mood change, \( Fs < 0.91 \).

**Self-reported memory disorganization.** Next, similar to Study 2, I found that the
film organization manipulation successfully elicited feelings of event disorganization and a sense that participants’ memories were incomplete. That is, there was a significant main effect for Film Organization, $F(1, 81) = 7.87, MSE = 3.85, p = .006$. Participants who viewed the disorganized film had higher TMQ scores ($M = 1.89, SD = 0.78$) than those who viewed the organized film ($M = 1.46, SD = .61$), $d = 0.62, 95\% \text{ CI } [0.51, 0.72]$, indicating that disorganized film participants felt that their memories were more impoverished relative to those who saw the organized film.

I now turned to my research questions of interest: does misinformation and/or suggestibility affect a traumatized person’s memory report and does cross-examination improve the accuracy of these reports?

**Interviews**

My analyses for this section primarily involved repeated-measures ANOVAs and post-hoc simple effects tests. I performed separate repeated-measures ANOVAs to examine the contribution of disorganization to memory accuracy during direct examination for specific and misleading questions, number of changes to responses in cross-examination, and accuracy during cross-examination. Additionally, I also conducted repeated-measures ANOVAs to examine the variables’ effect on performance on the recognition task. All effects are reported as significant at $p < .05$.

**Direct-examination.** For the direct examination, I first analyzed participants’ free recall responses as a manipulation check to verify that they adequately attended to the film. Then, I focused on the accuracy of their responses to yes-no questions asked during direct examination.

The following hypotheses were posited regarding the direct examination:
Hypothesis (3.1): Participants who view the disorganized film will be less accurate in free recall and cued recall.

Hypothesis 3.1 was not supported. Overall, participants were extremely accurate in free recall. Neither the number of details participants reported nor their overall accuracy differed between film conditions. There were also no differences in the types of details participants reported.

Free and cued recall. For these analyses, I focused on the number of total details participants reported and the proportion of correct details they reported for each type of information category. Details about sound were rare and were thus omitted from analyses. On average, participants reported about 55 details per free recall report (\(M = 55.29, SD = 27.93\)) and they were highly accurate on these details, \(M = .94, SD = .06\). Results from a one-way ANOVA on the number of overall details reported showed that there was no difference in number of details reported, \(F = 0.22\), or overall accuracy, \(F = 0.04\), as a function of film organization.

Next, I investigated whether film organization affected what types of details participants reported in their free recall. I divided the total number of correct details falling into each category by the total number of overall details reported. Table 12 shows the mean number of details for each type of information category. I analyzed these proportions using a one-way multivariate ANOVA. There were no differences in proportion of details reported for behaviors, surroundings, people, or time, \(Fs < 2.39\).

Hypothesis (3.2): There will be a main effect of question type in which participants will make more errors to misleading questions than specific questions.
(3.2b) Participants will also make more errors to traumatic misleading questions than non-traumatic misleading questions.

Hypothesis (3.3) There will be a question type by film organization interaction in which participants who view the disorganized film will be less accurate in responses to misleading questions than specific questions.

(3.3b) There will be a trauma type by film organization interaction in which participants who view the disorganized film will be less accurate in responses to traumatic misleading questions than non-traumatic misleading questions.

I did find a main effect of question type and misleading question trauma type, supporting Hypothesis 3.2. Overall, participants were less accurate in their responses to misleading questions than specific yes-no questions. They also made more errors with traumatic than non-traumatic misleading questions. This pattern of results—over-remembering traumatic details—was only evident for responses to misleading questions and not specific questions. However, Hypothesis 3.3 was not supported as the pattern of responses did not differ between participants who viewed the film in an organized or disorganized manner.

Yes-No questions. Overall, participants were somewhat accurate with their responses to specific questions: the average score across conditions was 13.39 (SD = 5.27; possible range = -24 to 24). In order to better compare rates between specific and misleading questions, scores for misleading questions were multiplied by four4. Conversely, participants were not accurate in their responses to misleading questions (M = -1.54, SD =

4 The average score for misleading questions without this transformation was, M = -0.39, SD = 3.06, possible range = -6 to 6. Indeed, a repeated measures ANOVA with this score showed that there was significant main effect of question type, F(1, 81) = 389.76, MSE = 7868.17, p < .001, d = 3.33, 95% CI [2.68, 3.98]. There was also no statistically significant main effect of film organization or a significant interaction between film organization and question type, Fs < 0.54.
12.29; possible range = -24 to 24). Indeed, a repeated measures ANOVA showed that there was significant main effect of question type, $F(1, 81) = 96.99, MSE = 9237.01, p < .001, d = 1.59, 95\%$ CI [0.17, 3.02]. There was no main effect of film organization nor was there a significant interaction between film organization and question type, $Fs < 0.38$ (see Table 13). That is, accuracy on yes-no questions was not affected by the film participants saw.

Next, I was interested in whether participants’ responses to misleading questions depended on whether they were probed about non-traumatic or traumatic details. Participants were less accurate on traumatic misleading questions ($M = -1.20, SD = 2.14$) than non-traumatic misleading questions ($M = 0.71, SD = 2.29$), $d = 0.87, 95\%$ CI [0.52, 1.22]. Namely, I found a significant main effect of trauma type, $F(1, 73) = 25.45, MSE = 135.21, p < .001$. Again, however, accuracy among misleading questions did not differ significantly as a function of film organization nor was there an interaction with film organization and trauma type, $Fs < 2.33$. I was curious to see whether this pattern of over-remembering trauma was also evident for specific questions; thus I conducted a separate repeated-measures ANOVA with trauma type for responses to specific questions as the within-subjects factor and film organization as the between-subject factor. There were no significant main or interaction effects, $Fs < 2.19$. That is, participants’ accuracy rates for traumatic and non-traumatic specific yes-no questions were equivalent.

**Self-reported disorganization.** In Study 2, there was a significant correlation between self-reported disorganization (i.e., TMQ scores) and memory distortion. Thus, I computed whether TMQ scores were associated with accuracy on Yes-No questions. They were not for either specific questions or misleading questions, $ps > .21$. TMQ scores were also not associated with traumatic or non-traumatic misleading questions, $ps > .22$. 93
Next, I examine whether cross-examination affects subsequent memory for an analogue traumatic event. The following hypotheses were posited regarding the cross-examination:

**Hypothesis (3.4)** Participants that view the disorganized film will acquiesce to more incorrect information during cross-examination, thus making their accuracy during cross-examination worse than participants that view the organized film.

**Hypothesis (3.5):** Participants will make more changes to misleading questions than specific questions or repeated questions.

**Hypothesis (3.6)** Participants who view the disorganized film will make more changes to their answers during cross-examination than participants who view the organized film.

None of these hypotheses were supported by the data. Participants typically changed their answers to match the experimenter’s suggestion or at least agreed that the suggestion could be possible. Participants made these changes regardless of which film they saw or whether the suggestion was correct or incorrect. Interestingly, participants made changes to specific and misleading questions at the same rate. Only when questions were merely repeated, as opposed to re-asked in a leading manner, did participants not change their original answer.

**Cross-examination accuracy.** Here I examine participants’ accuracy during cross-examination (see Table 14). Cross-examination scores were calculated by adding their points for specific, misleading, and repeated questions. Scores for cross-examination could range from -20 to 20. Overall, participants were not very accurate during cross-examination, $M = 4.54$, $SD = 5.12$. However, I calculated the scores for specific, misleading, and repeated questions respectively and ran a 2 (Film Organization: Organized, Disorganized) x 3
(Question Type: Specific, Misleading, and Repeated) repeated measures ANOVA. I found that participants’ accuracy was worse on misleading questions ($M = -0.28, SD = 2.47$) compared to both specific ($M = 1.53, SD = 3.36$) or repeated questions ($M = 3.30, SD = 2.57$), $F_{(1, 79)} = 14.61, 90.14, ps < .001, ds = -0.62, -1.43, 95\%$ CIs $[-1.07, -0.16], [-1.82, -1.04]$, respectively. Moreover, participants were more accurate on repeated questions than specific questions, $F (1, 79) = 15.89, MSE = 252.78, p < .001, d = 0.60, [.14, 1.05]$. That is, I found a significant main effect of question type, $F (2, 158) = 34.11, MSE = 259.49, p < .001$. Once again, however, film organization did not affect participants’ cross-examination scores, $F = 0.61$.

As mentioned above, cross-examination is touted as essential for discovering the truth. Did cross-examination improve participants’ accuracy? To answer this question, I compared participants’ total direct examination score (sum of specific and misleading scores) to their total cross-examination score. A paired-sample $t$-test analysis showed that participants’ scores worsened after cross-examination (Direct: $M = 12.84, SD = 5.88$; Cross: $M = 4.51, SD = 5.21$), $t (79) = 9.79, p < .001, d = 1.51, 95\%$ CI $[0.65, 2.36]$.

**Cross-examination changes.** Here I explore whether cross-examination led participants to change their responses and whether the number of changes varied by film organization condition. Although these are count data, I treated the number as continuous data and conducted a $2 \times 3$ repeated measures ANOVA. There was a significant main effect for question type, $F (2, 158) = 173.35, MSE = 101.05, p < .001$. Within–subjects contrasts showed that participants made significantly fewer changes to repeated questions ($M = 0.59, SD = 0.70$) compared to specific questions ($M = 2.54, SD = 1.11$) and misleading questions ($M = 2.51, SD = 0.59$), $Fs > 199.85, ds = 2.12, 2.98, 95\%$ CIs $[1.97, 2.26], [2.88, 3.08]$, respectively. The average changes to specific and misleading questions did not differ from each other, $F = 0.09$. 
**Self-reported disorganization.** Self-reported disorganization was not associated with cross-examination scores of any type (specific, misleading, or repeated), $ps > .48$, or with change scores, $ps > .22$.

Taken together, these results suggest that cross-examination-style questioning adversely affected participants’ memory reports. While repeating a question did not lead participants to change their answers, cross-examination led participants to change their answers regardless of whether participants were initially accurate or not; consequently, their accuracy suffered.
Table 11

*Study 3: Individual Differences Measures: Means (SDs), Confidence Intervals, & ANOVA Results*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Organized Film (n = 42)</th>
<th></th>
<th>Disorganized Film (n = 37)</th>
<th></th>
<th>ANOVA F</th>
<th>Film</th>
<th>MSE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>95% CI</td>
<td>M (SD)</td>
<td>95% CI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAI-Trait</td>
<td>37.10 (8.37)</td>
<td>[34.65, 39.54]</td>
<td>40.51 (7.47)</td>
<td>[37.91, 43.12]</td>
<td>3.63</td>
<td>229.85</td>
<td></td>
</tr>
<tr>
<td>BDI</td>
<td>6.98 (6.23)</td>
<td>[4.97, 8.98]</td>
<td>8.11 (6.87)</td>
<td>[5.97, 10.25]</td>
<td>0.59</td>
<td>25.20</td>
<td></td>
</tr>
<tr>
<td>Trait Dissociation</td>
<td>29.17 (21.16)</td>
<td>[22.61, 35.73]</td>
<td>34.89 (21.57)</td>
<td>[27.90, 41.88]</td>
<td>1.41</td>
<td>644.78</td>
<td></td>
</tr>
<tr>
<td>DPQ</td>
<td>9.40 (6.72)</td>
<td>[7.41, 11.40]</td>
<td>12.59 (6.22)</td>
<td>[10.47, 14.72]</td>
<td>4.75*</td>
<td>200.15</td>
<td></td>
</tr>
<tr>
<td>BAMQ negative</td>
<td>9.67 (3.47)</td>
<td>[8.70, 10.64]</td>
<td>9.89 (2.77)</td>
<td>[8.86, 10.93]</td>
<td>.10</td>
<td>.99</td>
<td></td>
</tr>
<tr>
<td>BAMQ positive</td>
<td>17.88 (6.44)</td>
<td>[15.82, 19.94]</td>
<td>19.97 (7.01)</td>
<td>[17.78, 22.17]</td>
<td>1.91</td>
<td>86.09</td>
<td></td>
</tr>
</tbody>
</table>

*Note. *p* < .05. STAI = State-Trait Anxiety Inventory, BDI = Beck Depression Inventory, DPQ = Data-processing Questionnaire, BAMQ = Belief about Memory Questionnaire.*
Study 3: Mean Proportions of Details Reported (SDs) and Confidence Intervals for Each Category Type

<table>
<thead>
<tr>
<th>Category</th>
<th>Organized Film (n = 41)</th>
<th></th>
<th>Disorganized Film (n = 41)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>95% CI</td>
<td>M (SD)</td>
<td>95% CI</td>
</tr>
<tr>
<td>Behavior</td>
<td>.30 (.06)</td>
<td>[.28, .32]</td>
<td>.28 (.07)</td>
<td>[.27, .31]</td>
</tr>
<tr>
<td>Person</td>
<td>.40 (.08)</td>
<td>[.35, .41]</td>
<td>.41 (.10)</td>
<td>[.38, .44]</td>
</tr>
<tr>
<td>Surroundings</td>
<td>.23 (.07)</td>
<td>[.21, .26]</td>
<td>.21 (.09)</td>
<td>[.19, .24]</td>
</tr>
<tr>
<td>Time</td>
<td>.04 (.02)</td>
<td>[.03, .05]</td>
<td>.04 (.03)</td>
<td>[.03, .05]</td>
</tr>
</tbody>
</table>
Table 13

**Study 3: Direct Examination Score Means (SDs) and Confidence Intervals for Specific and Misleading Questions**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Organized Film</th>
<th>Disorganized Film</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$ (SD)</td>
<td>95% CI</td>
</tr>
<tr>
<td>Specific Qs</td>
<td>13.26 (5.21)</td>
<td>[11.63, 14.89]</td>
</tr>
<tr>
<td>Misleading Qs</td>
<td>-0.57 (2.99)</td>
<td>[-1.52, 0.37]</td>
</tr>
</tbody>
</table>

*Note. Scores for specific questions could range from -24 to 24. Scores for misleading questions could range from -6 to 6.*
Table 14

**Study 3: Cross-Examination Score Means (SDs) and Confidence Intervals for Specific, Misleading, and Repeated Questions**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Organized Film (n = 41)</th>
<th>Disorganized Film (n = 40)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>95% CI</td>
</tr>
<tr>
<td>Specific Qs</td>
<td>1.37 (3.74)</td>
<td>[0.31, 2.42]</td>
</tr>
<tr>
<td>Misleading Qs</td>
<td>-0.44 (2.74)</td>
<td>[-1.21, 0.33]</td>
</tr>
<tr>
<td>Repeated Qs</td>
<td>3.17 (2.57)</td>
<td>[2.37, 3.97]</td>
</tr>
</tbody>
</table>

*Note.* Scores for specific questions could range from -8 to 8. Scores for each misleading and repeated question type could range from -6 to 6.
Hypothesis (3.7): Based on results obtained in Study 2, I expect all participants will be highly accurate in identifying old and new clips across conditions.

(3.7b) All participants will also be highly confident in their decisions for old and new clips.

Indeed, these hypotheses were supported by the data. Overall, participants were highly accurate in identifying both old and new clips. They were also highly confident in both types of responses. Accuracy and confidence ratings were not affected by which film participants saw.

Memory

Old vs. New accuracy. As in Study 2, I calculated the proportion of the time each participant claimed a clip was “old” when evaluating Old and New clips. Data for these clips are reported in Table 15. Overall, participants correctly recognized Old clips ($M = .84; SD = .15$) and correctly rejected New clips at high rates ($M = .04; SD = .09$). I conducted separate ANOVAs on Old and New clip recognition rates. For Old and New clips, participants across conditions performed equally well, $F$s < 0.88.

Confidence. Participants were highly confident in their responses to Old ($M = 4.51; SD = .63, 95\% CI [4.37, 4.65]$) and New ($M = 4.38; SD = .53, [4.26, 4.50]$) clips. Film Organization did not affect confidence ratings for either Old or New clips, $F$s < 0.07.

Next, I look at whether the cross-examination affected false alarm rates for the missing clips. I proposed the following hypotheses:

Hypothesis (3.8): Participants will have higher false alarm rates for missing crux clips than non-crux clips in the recognition task.
(3.8b): Participants will have higher false alarm rates for missing clips that pertained to misleading questions than for misleading clips that were not probed about in the misleading questions.

Hypothesis 3.8 was not supported: contrary to Study 2, I did not find a difference in memory distortion between missing crux and non-crux clips. Nor was memory distortion affected by film condition or self-reported feelings of disorganization. However, participants were more confident in their responses to crux clips than non-crux clips, and they reported to have “remembered” these clips more than non-crux clips.

On the other hand, Hypothesis 3.8b was supported by these data. If participants were asked about details pertaining to a missing clip in cross-examination, then they falsely recognized that clip as being in the original film more so than if the clip was not asked about in cross-examination. However, participants’ confidence ratings and phenomenological experience did not differ among these clips.

Memory Distortion

First I examined participants’ overall performance on missing clips. As in Study 2, I calculated the proportion of Missing clips that participants claimed were actually in the film and ran a 2 (Film Organization: Organized, Disorganized) x 2 (Clip Type: Crux, Non-Crux) repeated measures ANOVA. Although the false alarm rates for crux missing clips ($M = .46$, $SD = .34$) was higher than non-crux missing clips ($M = .41$, $SD = .38$), this difference did not reach statistical significance; there was no main effect of missing clip type, $F (1, 77) = 2.40$, $p = .13$. In this instance, I did not replicate prior research or my findings from Study 2 (Strange & Takarangi, under review, 2012). Additionally, Film Organization did not affect the rate of memory distortion, $F = 0.75$ (see Table 16).

Next, I turned to the question of whether misinformation increased the likelihood of
memory distortion. That is, when participants were asked a misleading question, were they more likely to false alarm to missing clips pertaining to that question. I ran a 2 (Film Organization: Organized, Disorganized) x 2 (Probe Type: Asked, Not Asked) repeated measures ANOVA. There was a statistically significant main effect for Probe Type, $F(1, 77) = 7.17, MSE = 0.44, p = .009$, such that participants false alarmed to missing clips that were inquired about in cross-examination ($M = .49, SD = .36$) at a higher rate than missing clips that were not ($M = .38, SD = .35$), $d = 0.31, 95\% CI [.26, .37]$. There was no significant main effect for Film Organization or significant interaction, $Fs < 0.49$.

**Confidence.** Participants were confident in their responses to Crux clips ($M = 4.14, SD = 0.76$), significantly more so for Non-Crux missing clips ($M = 3.81, SD = 0.90$), $F (1, 77) = 15.08, MSE = 3.96, p < .001, d = 0.39, 95\% CI [0.27, 0.53]$. Moreover, if participants exhibited memory distortion (i.e., called a missing clip “old”), they were more confident in their responses for Crux clips ($M = 4.23, SD = 0.99$) than Non-Crux clips ($M = 3.72, SD = 1.12$), $F (1, 43) = 12.85, MSE = 6.22, p < .001, d = 0.49, [0.27, 0.70]$. However, the 2 x 2 repeated measures ANOVA revealed that Film Organization did not affect confidence ratings for Crux and Non-Crux clips, for all ratings $F = 0.75$, or only when participants exhibited memory distortion, $Fs < 0.32$.

Participants were equally confident in their responses to missing clips that were inquired about in cross-examination ($M = 3.98, SD = 0.88$) and missing clips that were not inquired about in cross-examination ($M = 4.03, SD = 0.74$), $F = 0.22$. Confidence rates did not differ between Film Organization conditions either, $F = 0.41$, and there was no interaction, $F = 0.002$.

**Phenomenological experience.** Although there were no differences in false alarms rates between Crux and Non-Crux clips, there was evidence that participants experienced
the Crux and Non-Crux clips differently. Table 16 shows that participants falsely claimed to Remember Crux clips more often than Non-Crux clips, $F(1, 77) = 20.16, MSE = 2.54, p < .001, d = 0.84$, 95% CI [0.74, 0.92]. However, there were no other significant effects on Remember ratings, $F_s < 0.78$. Additionally, participants claimed to Know Crux clips less often ($M = .31, SD = .38$) than Non-Crux clips ($M = .44, SD = .45$), $F(1, 43) = 3.96, MSE = 0.48, p = .05$, $d = 0.32$, [0.23, 0.40]. There were no other effects for Know ratings, or familiarity ratings, $F_s < 3.57$. Moreover, being asked about missing clips in cross-examination did not affect Remember or Know ratings, $F_s < 0.96$.

**Self-reported disorganization.** Finally in relation to memory distortion, I investigated whether self-reporting more memory disorganization was associated with falsely recognizing more Missing Cruxes or Non-Cruxes. It was not for either type of missing clip, $p_s > .34$. Self-reported memory disorganization was also not associated with falsely recognizing more clips that were or were not inquired about in cross-examination, $p_s > .08$. Thus, contrary to Study 2, self-reported disorganization did not have an effect on the type of errors participants made in this paradigm: participants falsely recognized traumatic and non-traumatic scenes at similar rates, regardless of whether were probed about those scenes in cross-examination.
Table 15

Study 3: Recognition Proportion Means (SDs), Confidence Intervals, & One-way ANOVA Results for New and Old Clips

<table>
<thead>
<tr>
<th>Clip Type</th>
<th>Organized Film</th>
<th>Disorganized Film</th>
<th>ANOVA F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>95% CI</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Old</td>
<td>.83 (.16)</td>
<td>[.78, .88]</td>
<td>.85 (.14)</td>
</tr>
<tr>
<td>New</td>
<td>.04 (.10)</td>
<td>[.01, .07]</td>
<td>.05 (.09)</td>
</tr>
</tbody>
</table>
### Table 16

*Study 3: Proportions & Repeated Measures ANOVA Results for Missing Crux and Non-Crux Clips Reported as “Old” and “Remembered”*

<table>
<thead>
<tr>
<th>Response by Clip Type</th>
<th>Organized Film</th>
<th>Disorganized Film</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>95% CI</td>
</tr>
<tr>
<td>Old – Crux</td>
<td>.43 (.31)</td>
<td>[.44, .64]</td>
</tr>
<tr>
<td>Old - Non-Crux</td>
<td>.38 (.38)</td>
<td>[.38, .61]</td>
</tr>
<tr>
<td>Remember – Crux</td>
<td>.69 (.38)</td>
<td>[.50, .88]</td>
</tr>
<tr>
<td>Remember - Non-Crux</td>
<td>.27 (.38)</td>
<td>[.08, .46]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Repeated Measures ANOVA F</th>
<th>Clip Type (C)</th>
<th>Film (F)</th>
<th>C x F</th>
<th>MSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old</td>
<td>2.40</td>
<td>0.39</td>
<td>0.00</td>
<td>.06</td>
</tr>
<tr>
<td>Remember</td>
<td>20.16***</td>
<td>0.15</td>
<td>0.78</td>
<td>2.54</td>
</tr>
</tbody>
</table>

*Note.***p < .001*
Hypothesis (3.9): Participants who view the disorganized film will be less confident in their abilities to give an adequate report of what they saw, and they will not think they would make good witnesses in court.

This hypothesis was not supported. Overall, all participants were somewhat confident that they gave an adequate report of what they saw. Moreover, the majority of participants felt they would make good witnesses in court if they had to testify. There were no differences among either eyewitness self-assessment measure between groups. However, participants were more confident in their eyewitness abilities when they made fewer changes in cross-examination, regardless of actual accuracy.

Eyewitness Self-Assessment

Next, I examined whether participants’ self-assessment of their ability to perform as an eyewitness in court would be affected by which film they viewed in this study. First, I asked participants whether they thought they would make a good witness if they had to testify about this case. Overall, 71.6% of participants though they would make a good witness. Participants who saw the organized film (65.9%) were less likely to believe they would make a good eyewitness than participants who viewed the disorganized film (77.5%). These differences, however, were not statistically significant according to a logistic regression, $p = .25$.

Next, I examined participants’ confidence in their eyewitness abilities. Overall, participants were somewhat confident that they gave an adequate report of the film they viewed ($M = 3.95, SD = .80$). Results from a one-way ANOVA showed that eyewitness confidence did not differ between film organization groups, $F(1, 79) = 2.78, p = .10$. Confidence ratings from participants that viewed the organized film, $M = 3.80, SD = .87$, did
not statistically differ from ratings from participants that viewed the disorganized film \((M = 4.10, SD = .71)\).

Finally, I examined whether eyewitness confidence was related to participants’ cross-examination accuracy. There was no significant correlation between cross-examination scores and eyewitness confidence, \(r (79) = .03, [-.16, .21], p = .81\). However, there was a significant negative correlation between eyewitness confidence and the number of changes made during cross-examination, \(r (79) = -.35, [-.50, -.19], p < .001\). Eyewitness confidence was not related to participants’ accuracy; rather participants were more confident when they made fewer changes to their answers in cross-examination. That is, participants were more confident in their abilities when they stuck to their original answers.

**Hypothesis (3.10): Participants who view the disorganized film will also have higher rate of analogue PTSD symptoms.**

Finally, my last hypothesis was also not supported. In fact, results exhibited the opposite of the predicted pattern. Participants who saw the organized film reported more intrusion symptoms than participants who viewed the disorganized film. No differences among avoidance symptoms were found. These results suggest that the disorganization actually protected participants from analogue PTSD symptoms, at least with intrusions.

In spite of this finding, participants’ self-reported feeling of disorganization was, once again, associated with analogue symptoms. Specifically, the more disorganized and incomplete the film felt to participants, the more likely they were to report avoidance and intrusion symptoms after a two-day delay. Again, these results suggest that how a person feels about their experiences is more important than the actual experience itself. However,
the above findings contradict one another, demonstrating that the effect of disorganization of analogue PTSD symptoms is still unclear.

**Analogue Symptoms**

Participants’ scores on the IES were comparable to Study 2 and other studies employing traumatic films (e.g., Holmes, Lang, & Shah, 2009) (see Table 17). Results from ANOVAs on participants’ overall IES scores and Avoidance\(^5\) subscales revealed no significant differences across groups, all \(F_s < 1.05\). However, participants in the organized group reported more intrusion symptoms (\(M = 11.41, SD = 3.61\)) than participants in the disorganized group (\(M = 9.90, SD = 3.07\)). That is, there was a statistically significant difference across groups on the Intrusion subscale, \(F(1, 79) = 4.13, MSE = 46.45, p = .05, \ d = 0.45, 95\% \ CI [-0.06, 0.97]\).

Moreover, the more participants reported feeling that the event was disorganized and that their memories were incomplete, the more likely they were to report Avoidance and Intrusion symptoms. That is, I found a correlation between the TMQ and the Avoidance subscale of the IES, \(r (81) = .35, [.14, .52], p = .002\), and the Intrusion subscale, \(r (81) = .44, [.24, .60], p < .001\).

---

\(^5\) There was heterogeneity of variance on the Avoidance subscale scores, with higher variance for the disorganized film; however, transformations did not fix this violation. Nonparametric tests (Mann-Whitney) showed that there were no differences across groups, \(U = 764.50, p = .59\). Yet, ANOVA results are reported.
Table 17

*Study 3: Analogue PTSD Symptom Means (SDs), Confidence Intervals, & ANOVA Results*

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Organized Film</th>
<th>Disorganized Film</th>
<th>ANOVA F</th>
<th>MSE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD) 95% CI</td>
<td>M (SD) 95% CI</td>
<td>Film</td>
<td>MSE</td>
</tr>
<tr>
<td>IES total</td>
<td>23.61 (8.12) [21.34, 25.88]</td>
<td>21.95 (6.33) [19.66, 24.25]</td>
<td>1.05</td>
<td>55.78</td>
</tr>
<tr>
<td>IES Avoidance</td>
<td>12.71 (6.06) [11.10, 14.32]</td>
<td>12.23 (4.09) [10.59, 13.86]</td>
<td>0.18</td>
<td>4.71</td>
</tr>
<tr>
<td>IES Intrusion</td>
<td>11.41 (3.61) [5.10, 9.64]</td>
<td>9.90 (3.07) [3.06, 7.48]</td>
<td>4.13*</td>
<td>46.45</td>
</tr>
</tbody>
</table>

*Note. *p ≤ .05. PTSD = Post-traumatic Stress Disorder. IES = Impact of Events Scale.*
CHAPTER 16: STUDY 3 DISCUSSION

Recall that I had two research questions for this study: First, does misinformation affect the memory of people who have been exposed to an analogue traumatic event? Second, can cross-examination improve the accuracy of these people’s memory reports? I predicted that misinformation would adversely affect people’s memory reports, especially if they were exposed to the disorganized traumatic event. Additionally, I predicted that cross-examination would not improve the accuracy of people who saw the disorganized film. These hypotheses parallel findings of past research on misinformation and cross-examination in vulnerable populations (e.g., children; Fogliati & Bussey, 2013; Zajac & Hayne, 2003, 2006). Overall, my hypotheses were partially supported—misinformation and cross-examination affected memory reports in the pattern I predicted, but their effects were equal across conditions.

First, I observed a high degree of memory distortion in the direct examination, indicating that misinformation adversely affected participants’ memory reports. Participants were less accurate on misleading questions, especially if those questions probed about traumatic details of the film. This pattern of over-remembering trauma was not evident for specific (non-leading) questions. These results suggest that participants are adept at identifying what they have seen, but they give in to suggestions of details that did not happen.

Second, I found that cross-examination adversely affected subsequent memory for an analogue traumatic event. Overall accuracy dropped significantly during cross-examination because participants acquiesced to the interviewer’s suggestions (either completely changing their answer to match the suggestion, or agreeing that the suggestion could be true). This was true for both specific and misleading questions and regardless of whether the
participant was initially correct or incorrect. However, merely repeating a question did not lead participants to change their answers, which suggests that participants can remember (and stick to) their original answers. Thus it seems likely that the misleading and suggestive nature of the cross-examination injects enough doubt into their minds to have them change their answers. Indeed, some participants even vocalized during the interview that they were confident in their answers until the interviewer asked if they were sure. These results are consistent with findings from past research showing that cross-examination is detrimental to accuracy (Jack & Zajac, 2014; Kassin et al., 1990; Zajac & Hayne, 2003), and more so than repeating questions (Fogliati & Bussey, 2013; Jack & Zajac, 2014).

The recognition memory test provides further evidence that cross-examination adversely affected participants’ memory for the film. Again, as in Study 2, participants were, overall, quite adept at identifying clips that they had and had not seen (e.g., old and new clips). However, participants still misremembered missing clips frequently. Moreover, participants were more likely to misremember missing clips whose details were introduced in the earlier interviews. Past research suggests that information that is easily retrieved from memory—when it is cognitively available— is often categorized as familiar, frequent, and true (Sanna & Schwarz, 2006). Researchers have manufactured this feeling of easy retrieval in the lab, and they have found that it can lead people to mis-categorize information as true when it’s not (Sanna & Schwarz, 2003, 2006). Hence, in my study, introducing details of missing clips in prior interviews could be inducing feelings of familiarity in participants, leading them to falsely recognize the clips as old. Ergo, participants are making a source monitoring error, incorporating the source of familiarity to the actual film instead of the cross-examination (Johnson et al., 1993; Lindsay, 1994). Therefore, I suggest participants exhibited suggestibility rather than compliance to the interviewer.
Interestingly, even though participants’ memory report accuracy suffered as a result of cross-examination, a majority of participants were highly confident that they had given adequate reports of the event. They also felt that they would make good witnesses if they were actually asked to testify in court. Participants’ confidence was negatively associated with the number of changes they made during cross-examination—they were more confident when they made fewer changes, regardless of actual accuracy. These results are disconcerting for two reasons. One, these participants were not aware of their errors, suggesting that they would happily disseminate incorrect information to others. Two, their high confidence may make them appear more credible as witnesses to fact-finders, perhaps leading jurors or judges to believe their (incorrect) testimony (Brewer & Burke, 2002; Penrod & Cutler, 1995; Wells, Ferguson, & Lindsay, 1981; Whitley & Greenberg, 1986).

Lastly, although film organization successfully increased feelings of disorganization and incompleteness, it had no impact on memory errors in either type of interview. Overall, people’s accuracy and proportion of memory errors did not differ as a function of whether participants saw the film in its correct temporal order or in a disorganized temporal order. Notably, however, the organized film elicited more intrusion symptoms than the disorganized film. These findings correspond with more recent research on the effect of cognitive processing on trauma memory. For instance, in Pearson’s studies (Pearson et al., 2012; Pearson, 2012), he found that presenting traumatic stimuli with contextual processing (i.e., conceptual meaning) lead participants to report a higher number of intrusions. He argued that the context triggered activation in memory leading to involuntary thoughts. In my study, the organized film arguably had more conceptual meaning than the disorganized film, leading participants to experience more intrusions.
Additionally, self-reported feelings of disorganization and incompleteness of the event also led participants to report more analogue symptoms of PTSD, giving further support to the notion that self-reported disorganization may be more important to the development of PTSD than the actual trauma event (as in Study 2). Recall that Rubin and his colleagues proposed that trauma symptoms are a result of a person’s memory for the event, rather than the event itself (Rubin, Berntsen, et al., 2008; Rubin, Boals, et al., 2008). In this study, it appears that it was participants’ memory for how fragmented and incomplete the film felt that lead to increased analogue symptoms rather than any objective sense of disorganization. However, we do not know from this study why some participants felt more disorganization. Further research needs to be conducted to investigate who is more predisposed to have these feelings of disorganization and incompleteness.

Of course, this study is not without its limitations. As mentioned in Study 2, I used an analogue traumatic event, thus did not measure memory for real trauma. Nor did I measure real PTSD symptoms or use a population diagnosed with PTSD. Although the PANAS scores imply that participants’ negative moods increased after watching the film, it is unlikely that they were affected to the point where they would be equivalent to someone who was actually diagnosed with PTSD: Certainly, it would unethical to do so. Moreover, in this study, I only tested the temporal disorganization portion of existing PTSD theories—although, recall that the results from Study 2 suggest that processing style would not affect results. Additionally, we told participants that they were witnesses to a crime (negligent vehicular homicide) and they were to act as witnesses. Despite this instruction, I cannot be certain that participants took the task as seriously as they would if they were real witnesses testifying in a court of law. In addition, during the cross-examination, the only people present in the room were the participants and the interviewer. In a real court of law, the
cross-examination occurs in front of jurors, judges, and other members of the court. The absence of these court members could have eliminated pressure on participants to not change their answers or agree with the likelihood of another possible answer. Further research should attempt to re-create true courtroom conditions, perhaps with interviewers that are more experienced in cross-examination (such as lawyers).

Nevertheless, results from this study have important implications. First, as with Study 2, this study provides further evidence for the malleability of trauma memories. The over-remembering of trauma was present in direct examination, replicating results from past research (Strange & Takarangi, 2012). People seem to be inclined to believe more traumatic details happened when they actually didn’t. This finding has potentially serious consequences. In this study, we told participants that the driver in the film was being charged with negligent vehicular homicide and their reports were going to be used in the case against her. Reporting more traumatic details (especially when they didn’t happen) could affect trial outcomes, perhaps increasing prison sentences for defendants or monetary compensation to the victims. Interestingly, this effect was present even after a very short 5-minute delay. In the real world, delays between witnessing of the event and reporting of the event are much longer. Future research should investigate whether ecologically valid delays would exacerbate the over-remembering of trauma.

The over-remembering of trauma effect was not evident in the recognition task. It is possible that because the cross-examination led participants to misremember all clips that were probed about in the interview, it eliminated the over-remembering of trauma effect. All the same, these results add to the literature showing that cross-examination may lead to more errors in memory reports, even in instances when people are initially correct (Chae et al., 2011; Fogliati & Bussey, 2013; Zajac & Hayne, 2003, 2006). Based on the results of this
study, we can now conclude that cross-examination also has adverse effects on trauma memory. Cross-examination was introduced to the courtroom to boost the credibility of honest witnesses, while diminishing the credibility of dishonest witnesses (Kassin et al., 1990)—however, results from this study and past studies suggest that it does not serve its purpose.
CHAPTER 17: GENERAL DISCUSSION

Taken together, I found that the general public agreed with the proposition that traumatized people are credible witnesses. They believed that they were competent to testify, they were honest, and that their memory quality was good compared to non-traumatized people. These beliefs were most likely to be endorsed by women, those with less education, and Democrats. A majority of participants also believed that traumatized memories can be repressed and that traumatized memories are different from mundane memories. However, the results from the latter two studies suggest that these beliefs are unfounded—the “traumatized” participants in my analogue studies were not more accurate than the “non-traumatized” participants and both groups were similarly adversely affected by cross-examination.

In Studies 2 and 3, I found that participants were highly adept at remembering old and new clips. However, participants still exhibited a high degree of memory distortion. A cognitive processing instruction did not affect memory; nor did a manipulation of the temporal order of the film. Nevertheless, memory distortion manifested itself in a particular pattern—participants reported seeing more trauma than they actually witnessed. Participants also reported to “remember” that additional trauma rather than “know” it happened, indicating that participants could specifically remember the context in which they viewed these clips.

However, the relationship between trauma memory and PTSD symptomology is still not clear. The cognitive processing instruction or temporal order did not affect the number of symptoms reported in Study 2, but in Study 3 temporal order did affect symptoms—participants who saw the organized film reported more analogue PTSD symptoms. In addition, in Studies 2 and 3, PTSD symptoms were not associated with memory distortion.
However, higher feelings of disorganization were associated with more memory distortion, but only in Study 2. Why was the relationship between feelings of disorganization and memory distortion apparent in Study 3? The delay in Study 3 (48 hours) was significantly shorter than in Study 2 (one week). Thus, it is possible that not enough time went by in Study 3 to allow the memory to deteriorate enough for those who had high feelings of disorganization. Notably, those feelings of disorganization were also associated with analogue symptoms of PTSD: higher feelings of disorganization were correlated with more avoidance symptoms (Study 2 and 3) and intrusions (Study 3). Thus, this feeling of disorganization might be important to the development of PTSD. However, how or why it manifests is not readily apparent.

Results from Study 3 imply that interviewing is detrimental to memory report accuracy. Participants’ free recall reports were extremely accurate immediately after watching the film; Participants did not spontaneously offer incorrect details. But this accuracy suffered when they were exposed to misleading questions even five minutes after watching the film. Moreover, contrary to its intended purpose, cross-examination reduced accuracy for all participants. Questions asked in a leading manner, typical of cross-examination, lead participants to doubt their original answers and consequently change those answers. Simply repeating a question did not cause participants to change their answers, highlighting the detrimental effects of cross-examination on memory reports. Additionally, if the interviewer asked about details pertaining to a missing clip, participants were more likely to falsely remember that clip as being in the original film. These results were apparent for all participants; thus, results from this study suggest that people exposed to trauma may be a vulnerable population—in the same respects as, for example, children—whether or not they exhibit symptoms of PTSD. Furthermore, participants were not
cognizant of their reporting mistakes and believed they would make good witnesses in a court of law.

Taken together, these results suggest that trauma memory is malleable, just like more mundane memories. All memories change over time; they are susceptible to misinformation and suggestive questioning. What’s more, the general public does not seem to be aware of these flaws in trauma memory, implying that there is a need to disseminate research on this issue.

Limitations & Future Directions

There were several limitations to these studies. In Study 1, the questionnaire inquired about “traumatized people” and not specifically people diagnosed with PTSD. People’s opinions could vary depending on how severely a person has been affected by a traumatic event. It is possible that participants in the first study could have interpreted “traumatized” as merely being distressed but not to the extent that it would require one to be diagnosed with an anxiety or stress disorder. Of course, people are not adroit at recognizing how they would actually act in real instances (Nisbett & Ross, 1980; Nisbett & Wilson, 1977), such as actually seeing a traumatized person testify in court, and their actual perceptions could vary from those they reported on the questionnaire. Would mock jurors’ perceptions towards traumatized witnesses in court be affected by actually witnessing a traumatized witness testify? How would these perceptions affect decision-making? Future research should investigate these questions.

Additionally, while Study 1 gives us insight into what demographic groups need to be targeted to disseminate proper information about traumatized people, it does not tell us what disseminating strategies are best to properly convey this information. People whose beliefs fall into the neutral category may be more easily persuaded; however, those who
held more unfavorable views may need more targeted methods (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012). Clearly, this is an avenue of research that needs further investigation.

Furthermore, as mentioned before, Studies 2 and 3 did not measure memory for actual trauma. Thus, the present research only represented an initial step in investigating trauma memory. The traumatic stimulus used was a United Kingdom public service announcement warning against the dangers of texting while driving. Although it is graphic and depicts a fatal car accident, it is publically available and has been shown on public television. Hence, its traumatic impact might have been limited. Future research should develop stimuli that can, ethically, deliver a traumatic impact so that we can determine whether our results generalize to other traumatic events.

Moreover, the latter two studies attempted to simulate the memory of a person who is suffering from PTSD. In the disorganized film condition, clips were removed from the film to imitate the gaps and incompleteness people with PTSD often complain about and the existing clips were randomly ordered to imitate the typically reported feeling of disorganization (Amir et al., 1998; Foa et al., 1995, 1993; Koss et al., 1996; van der Kolk & Fisler, 1995). Indeed my measures showed that participants in the disorganized condition did report feelings of disorganization and incompleteness, but perhaps those feelings were not strong enough to elicit the predicted effects. Future studies could focus on creating traumatic stimuli that increase feelings of disorganization by, for instance, having participants recall the event in out-of-order sequence. Perhaps it is this juxtaposition in encoding and recalling traumatic events that exacerbates the feelings of disorganization.

Finally, Study 3 also had its limitations. Efforts were made to make this study ecologically valid by only using jury-eligible participants, but the methodology did not
completely mirror U.S. trial procedures. The direct-examination and cross-examination were conducted with each participant individually without the presence of others. Also, interviewers were not actual legal professionals trained in questioning eyewitnesses and the protocol required that they follow a rather artificial structure. Participants were easily persuaded to change their answers or agree to the possibility that the interviewer’s suggestion could be true, suggesting that they might have not taken the task as seriously as they would if they were actual eyewitnesses to a traumatic crime—indeed; there was no oath requirement in this study as opposed to real trials. Additionally, real witnesses are likely to be interviewed more than once, likely in suggestive manners (and with long delays in between interviews), which could affect their accuracy. Real witnesses are also likely to be trained by lawyers on how to testify and may be given instructions to not change their answers, which could affect the rate of changes they would be likely to make. Finally, this study used the minimal number of participants that was required to obtain enough statistical power, but low effect sizes and lack of replication of some results from Study 2 may imply that the study could have benefited from more participants.

Taken together, then, there is a need to replicate these results in order to obtain a better understanding of the effects of trauma on memory. Results are still mixed even within this project. Future studies should focus on addressing the aforementioned limitations. Direct replications of these studies, in particular, are necessary to add to the reliability of these results. Moreover, accuracy could be affected by third variables, such as self-confidence (see Zajac, Jury, & O’Neill, 2009). Thus, it is important to test moderators or other influences that could affect these results.
Conclusions

Although additional research is needed, the present studies provide important insight into the mechanisms of traumatic memory. The results of this research suggest that trauma memories, like more mundane memories, are malleable: They can contain errors even immediately after the event is witnessed. Importantly, people seem to be predisposed to over-remember traumatic details and be more confident about those details. What’s more, the procedures that people are exposed to during a crime investigation can lead people to make more memory errors. My participants succumbed to misinformation presented during direct-examination, affecting their accuracy. Additionally, the safeguard put in place by the judicial system to protect honest witnesses’ credibility failed—participants’ accuracy plummeted after cross-examination. Additionally, results from the first study imply that people are still not properly educated about the research on traumatic memory. Many believed that memory reports from traumatized people would be credible. Legal professionals should be cognizant of the beliefs of the general population so that they can appropriately educate jurors during trials. Moreover, they should also be aware that witnesses may confidently testify to more trauma than actually happened.
Appendix A: Attitudes toward Traumatic Memory Questionnaire

(Questions with R were reverse-coded)

1. People traumatized by an event are competent to communicate about that experience. (R)
2. Inconsistencies in the details of an event often occur when traumatized people describe the traumatic event.
3. Traumatized people are more sincere compared to non-traumatized people when they communicate an eyewitness account of what they saw. (R)
4. Using traumatized people as witnesses in a trial is a form of abuse to the traumatized person.
5. Testimony from traumatized people is too emotionally laden.
6. In general, traumatized people are more honest compared to non-traumatized people. (R)
7. Traumatized people who are highly confident during a trial can be mistaken about what happened.
8. Traumatized people are not competent to provide testimony in a trial.
9. Traumatized people have the ability to remember events accurately. (R)
10. Traumatized people are able to tell the difference between what happened in their dreams and what happened in real life. (R)
11. Traumatized people are more susceptible to suggestion in a court trial compared to non-traumatized people.
12. I would be more likely to believe the testimony of a non-traumatized person compared to the testimony of a traumatized person.
13. A traumatized person’s ability to remember a traumatic event is equal to that of a non-traumatized person. (R)
14. Having memory blanks means something is seriously wrong with a traumatized person.
15. If a traumatized person has gaps in their memory for the event then their memory is not normal.
16. I would not believe a traumatized person’s testimony if it contained a lot of changes or contradictions.
17. Traumatic memories are often repressed.
18. If a traumatized person has memory blanks for the event, it means he or she can’t cope with stress associated with that event.
19. Changes in a traumatized person’s memory report are likely to occur. (R)
20. Traumatic memories are fundamentally different than normal memories.
21. Traumatized people should be able to remember the distressing event unaltered even after a long time has passed.
22. It is common for people to become severely distressed by traumatic events. (R)
23. In general, a traumatized person can remember events in more detail than a non-traumatized person. (R)
24. Traumatized people are more likely to give contradictory explanations about the event compared to non-traumatized people.
25. Traumatized people should have greater confidence about what happened in the distressing event compared to non-traumatized individuals.
26. Traumatized people have the ability to accurately identify their offender. (R)
27. The process of investigating a crime can further traumatize a traumatized person.
28. Traumatized people can be easily led to change their answers during questioning. 
29. A traumatized person should be able to accurately report elements of the traumatic event. (R) 
30. Traumatized people are more likely to accede to leading questions about the event compared to non-traumatized people. 
31. Traumatized people have the ability to communicate details of the traumatic event with certainty and confidence. (R) 
32. Traumatized people are more likely to add details they did not actually observe during an event after suggestive questioning about that event compared to non-traumatized people. 
33. Traumatized people are more likely to exaggerate the severity of events. (R)
Appendix B: Instructional Manipulation Check

For the next task, we would like you to think back to the questions and consider the sources that you think most influenced your decisions. Please select the top three factors that influenced your opinions from the list provided below. If you are paying attention to this question, instead of following the instructions just provided, please just type the word "Brain" into the space "other" provided below and stop reading these instructions. Although this is not an exhaustive list, it covers many of the factors that influence people’s opinions.

- Personal experience
- News (television or print)
- Internet
- Education
- Other: ________________
### Appendix C: Direct Examination Questions

<table>
<thead>
<tr>
<th>Question Type</th>
<th>Correct Answer</th>
<th>Traumatic (T) / Non-traumatic (NT)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Free Recall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Tell me everything you remember about the video you viewed. What happened?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. What else happened? I need to know everything that happened.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cued Recall (4)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. How many people were in the first vehicle?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. What color was the car that the girls were driving?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Who was driving the car?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. What caused the accident?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Specific Yes/No Example Questions (Total n = 12)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Were there oncoming cars on the road?</td>
<td>Yes</td>
<td>NT</td>
</tr>
<tr>
<td>2. Was the one of the girls' names Cassie?</td>
<td>Yes</td>
<td>NT</td>
</tr>
<tr>
<td>3. Did anyone arrive at the scene to help?</td>
<td>Yes</td>
<td>NT</td>
</tr>
<tr>
<td>4. Did the passenger in the main car hit her head on the steering wheel?</td>
<td>Yes</td>
<td>T</td>
</tr>
<tr>
<td>5. Was the driver of the main car upset after the collision?</td>
<td>Yes</td>
<td>T</td>
</tr>
<tr>
<td>6. Were there any fatalities in the accident?</td>
<td>Yes</td>
<td>T</td>
</tr>
<tr>
<td>7. Were the girls texting a boy named Anthony?</td>
<td>No</td>
<td>NT</td>
</tr>
<tr>
<td>8. Did the firemen use an ax to get the driver out of the car?</td>
<td>No</td>
<td>NT</td>
</tr>
<tr>
<td>9. Did the driver of the main car stay on her side of the road?</td>
<td>No</td>
<td>NT</td>
</tr>
<tr>
<td>10. Did the driver have a gash on her neck?</td>
<td>No</td>
<td>T</td>
</tr>
<tr>
<td>11. Did the car hit a dog on the road?</td>
<td>No</td>
<td>T</td>
</tr>
<tr>
<td>12. Did the baby in the other vehicle have his eyes closed?</td>
<td>No</td>
<td>T</td>
</tr>
<tr>
<td><strong>Misleading Yes/No Example Questions (Total n = 6)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Did you notice the man in the helicopter taking pictures?</td>
<td>No</td>
<td>NT</td>
</tr>
<tr>
<td>2. Did you notice the helicopter lifting off the ground?</td>
<td>No</td>
<td>NT</td>
</tr>
<tr>
<td>3. Did you see an emergency respondent tapping on the front of the car?</td>
<td>No</td>
<td>NT</td>
</tr>
<tr>
<td>4. Did you see the driver of the main car being taken away in the gurney?</td>
<td>No</td>
<td>T</td>
</tr>
<tr>
<td>5. Did you notice the passenger’s neck snap in the collision?</td>
<td>No</td>
<td>T</td>
</tr>
<tr>
<td>6. Did you hear the young girl in the back of the car say, “Why won’t mommy and daddy wake up”?</td>
<td>No</td>
<td>T</td>
</tr>
</tbody>
</table>
Appendix D: Cross-examination Questions

Question 1

The first question will clarify the answer given in the direct examination interview. For example, “You said last time that you saw the passenger’s neck snap?” Invariably, participants should answer this question positively.

Questions 2–5

Although not specifically designed to get participants to retract their original answer, these questions will include types (and proportions of these types) of questions common to cross-examination, for example, complex, ambiguous, irrelevant, leading, and closed questions.

Question 6

This question will challenge the participant’s certainty about the topic in question. For example, “Are you sure that you saw the passenger’s neck snap?”

Question 7

This question will express disbelief at the participant’s original answer and will suggest a reason for disbelief. This question will also be leading. For example, “But other participants told me that they did see the passenger’s neck snap, they would be right about that, wouldn’t they?” A variety of different reasons for disbeliefs will be used in Question 8 in order to maximize external validity of the cross-examination.

Question 8

The final question will only be used if participants do not acquiesce to Question 9, or if they expressed uncertainty to it. It will consist of another leading question, asking the participant to consider whether the reason for disbelief was possible. For example, “But they might be right about that, don’t you think?”
Sets of Sample Cross-Examination Questions

Target Activity 1 (Passenger’s neck snapping): Initially Inaccurate Participant:

Last time you said you saw the passenger’s neck snap in the collision, didn’t you?

2. Can you tell me why you think that?

3. Was the driver upset after the collision? (repeated question)

4. Was there anything else on the road except cars?

5. There were lots of people upset, weren’t there?

6. Are you sure you saw the passenger’s neck snap?

7. I think you didn’t actually see it snap, but that’s another thing you weren’t paying attention to, right?

8. But there’s a possibility that you might be wrong, don’t you think?

Target Activity 2 (Driver taken away in gurney): Initially Accurate Participant:

1. You also said didn’t see the driver being taken away in a gurney, didn’t you?

2. Can you explain your answer?

3. Do you remember news reporters at the scene?

4. Do you remember anyone talking about the car crash?

5. There were paramedics, right?

6. But you’re certain that the driver was never taken away in a gurney?

7. The other participants told me that they did see the driver being taken away in a gurney, they would be right about that, wouldn’t they?

8. But they might be right, couldn’t they?
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