Abstract

According to cognitive theorists, intrusive memories of traumatic events have their origin in how information during the event is processed. In order to investigate functional cognitive strategies during medical crises, two studies were conducted. The first study consisted of interviews with 20 health care professionals. Results from the interviews highlighted the use of strategies designed to maintain a medical orientation towards the event. Placing such strategies in the context of cognitive theories of peritraumatic processing, an experimental study using the distressing film paradigm was conducted with 68 psychology and 68 nursing undergraduates. The study examined the effect of adopting a medical cognitive strategy on intrusion development, memory disorganization, and anxiety. The results suggested that it was possible to manipulate a functional cognitive strategy. Participants in the experimental condition reported fewer intrusions than those in the control group. The manipulation did not affect memory disorganization or anxiety, and psychology and nursing students were comparable on all dependant variables. Discussion focuses on implications for cognitive theories of intrusion development.
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Posttraumatic stress disorder (PTSD) is classified as an anxiety disorder that can arise after experiencing or witnessing traumatic events. Examples of such events include physical and sexual assault, motor vehicle accidents, war exposure, torture, and natural or manmade disasters. PTSD as a diagnostic category is relatively new, arriving in the DSM-III in 1980. Before this, PTSD-like symptoms had been documented under various names, such as shell shock, rape-trauma syndrome, and railway spine, but PTSD had not entered into the official psychiatric taxonomy (Schnurr, Friedman, & Bernardy, 2002). PTSD consists of three main symptom clusters: 1. reexperiencing (e.g. intrusive images of the event, nightmares), 2. numbing and avoidance (e.g. feeling detached from others, avoiding talking about the trauma) and 3. hyperarousal (e.g. difficulty sleeping, exaggerated startle response). The symptoms must persist for at least one month, and create clinically significant impairment in important areas of the individual’s life functioning, such as social or occupational impairment (American Psychiatric Association, 1994).

The lifetime prevalence of PTSD is approximately eight percent in adults in North America (APA, 1994). While the duration of PTSD can vary, the National Comorbidity Study (a large nationally representative sample) reported that 90% of those with PTSD continued to suffer from it for more than three months, and 70% for more than one year. Moreover, in excess of one third never recovered (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). These startling statistics highlight the need for a better understanding of this prevalent and incapacitating disorder.

PTSD is a puzzling condition in that although the traumatic event is over, individuals with PTSD continue to have high levels of anxiety. Recent models of PTSD have highlighted cognitive processes to explain this phenomenon. In this dissertation I will examine the role of
cognitive processing, that is, how the person processes information during the traumatic event. This introduction will begin by outlining two contemporary cognitive models of PTSD and intrusions. The introduction will end with a critical examination of research conducted on key cognitive processes related to intrusion development.

Cognitive models of posttraumatic stress disorder

**Ehlers and Clark's cognitive model of PTSD**

Ehlers and Clark (2000) proposed a cognitive model of PTSD in which they asserted that PTSD arises when individuals process traumatic events in a way that leads to a sense of current, serious threat. The sense of threat arises from two avenues: 1. inordinately negative appraisals of the trauma and/or its sequelae, and 2. disturbances in autobiographical memory. I will begin by discussing the appraisal aspect of the theory.

**Negative appraisal**

Appraisal refers to how individuals interpret, or ascribe meaning to, an event. Two types of negative appraisals were implicated in the Ehlers and Clark model. The first type is appraisal of the event itself. Examples of negative appraisals include believing the event has global negative implications for their present and future lives, and that there are long-term threatening implications stemming from how they either felt or acted during the event. Research supports the importance of trauma appraisal in persistent PTSD. Dunmore, Clark and Ehlers (1997; 1999) found that participants with persistent PTSD had excessively negative appraisals of the traumatic event. Feelings of alienation, and perceived negative and permanent change as a result of the trauma have also been associated with persistent PTSD, and impeded PTSD treatment (Dunmore et al., 1997; Ehlers, Clark, et al., 1998; Ehlers, Maercker & Boos, 2000). Other studies support the importance of trauma appraisal in PTSD severity. For example, negative appraisals of the
initial PTSD symptoms and others' responses, negative beliefs about the self, about the world, and self-blame for the trauma were associated with PTSD severity (e.g. Dunmore, Clark, & Ehlers, 2001; Ehlers, Mayou & Bryant, 1998; Laposa & Alden, 2003).

The second appraisal process is the person's interpretation of intrusive thoughts or images that occur subsequent to the traumatic event. Not realizing that initial intrusive recollections are common after trauma, victims may interpret them as indicators that they are going crazy, or that they are inadequate and cannot cope. Ehlers and Clark (2000) argued that negative appraisal of intrusions determines the severity of PTSD, as well as how distressing the recollections are. Several studies support these propositions (e.g. Clohessy & Ehlers, 1999; Ehlers, Mayou et al., 1998; Ehlers, Mayou & Bryant, 2003; Laposa & Alden, 2003; Steil & Ehlers, 2000). Ehlers and Clark posited that negative appraisals also determine the extent to which maladaptive cognitive strategies (e.g. rumination, suppression and dissociation) are used to control the intrusive recollections. Dissociation, rumination and suppression have been linked to negative appraisals of the intrusions, and to more severe PTSD symptomology (e.g. Clohessy & Ehlers, 1999; Ehlers, Mayou et al., 1998; Ehlers et al., 2003; Laposa & Alden, 2003; Steil & Ehlers, 2000). In summary, multiple studies across different trauma types support the relationship between inordinately negative appraisals of the trauma and/or its sequelae, and PTSD.

Disturbances in autobiographical memory

Less work has focused on Ehlers and Clark's second tenet, disturbances in autobiographical memory. There is a paradox in PTSD: there can be vivid intrusive, unwanted recollections of the trauma coinciding with total or partial failure to recall details of the event. The distinction here is between intentional and involuntary recall. Individuals with PTSD may
have difficulty intentionally recounting coherent narratives of their traumatic experience. For example, Tromp, Koss, Figueredo and Tharan (1995) reported that in contrast to non-rape memories, rape memories were less clear, vivid, meaningfully ordered, well remembered, thought and talked about. Other studies showed less detailed and fragmented intentional trauma recall (e.g. Koss, Figueredo, Bell, Tharan & Tromp, 1996; van der Kolk & Fisler, 1995). However, at the same time, individuals with PTSD are often plagued with involuntary intrusive memories of the trauma (e.g. Ehlers et al., 2002).

Ehlers and Clark (2000) offered one explanation for this memory paradox. They argued that the trauma memory is poorly elaborated and not adequately incorporated into the autobiographical memory base, which stores contextual information about place, time, and prior and subsequent information. If the trauma memory is not elaborated and placed into context alongside other autobiographical information, intentional recall of the trauma would be problematic. Regarding involuntary recall, Ehlers and Clark posited that perceptual priming, a type of implicit memory, is particularly strong in PTSD, and leads to a decreased perceptual threshold for stimuli associated with the trauma. This renders trauma cues more noticeable, which in turn can trigger reexperiencing. Strong S-S and S-R associations for trauma material can also readily trigger reexperiencing symptoms. Thus, poor elaboration and contextualism, strong perceptual priming and associative memory would explain the memory disturbances evident in PTSD. Their proposition that cognitive processing during the traumatic event influences memory and PTSD symptoms is of primary interest for this dissertation. Studies examining these relationships will be discussed in subsequent sections.
Dual representation model of PTSD

The second cognitive model of PTSD was proposed by Brewin, Dalgleish, and Joseph (1996). These writers put forth a memory-based theory of PTSD, labeled the dual representation model. Brewin et al. suggested that there are two memory systems, one based on verbal and one based on sensory processing. These two systems create two types of memory representations: verbally accessible memories (VAMs) and situationally accessible memories (SAMs). The VAM system forms intentionally retrievable memories of the trauma. This type of memory is linked contextually in the autobiographical memory base. In contrast, the SAM system involves information that receives little conscious processing during the trauma. In SAM, the memory is encoded with lower level sensory processing (e.g. bodily responses, visuospatial information), without being linked to other contextual information. External sensory attentional focus is postulated to occur at the expense of verbal processing, thereby leading to sensory intrusions (e.g. Brewin et al., 1996; Brewin, 2001; Holmes, Brewin & Hennessy, 2004). When sensory cues that were present during the trauma appear after the trauma, involuntary, spontaneous sensory laden intrusions are triggered. The notion of VAM and SAM systems provides one explanation for the odd memory phenomena seen in PTSD. Brewin (2001) relied largely on existing conditioning studies and cognitive neuroscience findings for empirical support of his model. Formal tests of the model are just emerging. Recent studies that provide evidence for this model (e.g. Holmes et al., 2004) will be reviewed later.

What are intrusions?

A key feature in both models is the presence of intrusive phenomena. Intrusions, a form of reexperiencing the trauma, are often considered the hallmark of PTSD. Intrusions have been operationalized as intruding images, thoughts, feelings, memories, recollections, and flashbacks
Intrusions are typically defined as recollections of the trauma that occur when the individual is not purposely trying to recall the event (e.g. Clohessy & Ehlers, 1999; Holmes et al., 2004). Intrusions are described as vivid, distressing, fragmented, sensory laden, and triggered by internal or external sensory cues (e.g. Ehlers & Steil, 1995). Intrusions primarily take a visual form, but can be experienced across all sensory modalities (e.g. tactile, auditory, somatosensory) or take the form of thoughts (Ehlers et al., 2002). Some researchers argue that the most parsimonious explanation for the symptom clusters of PTSD is that avoidance, numbing, and hyperarousal are a consequence of the reexperiencing processes. Moreover, McFarlane (1992) reported that among firefighters, intrusion scores alone accounted for the etiological link between disaster and PTSD. Despite this, relatively little is known about how people develop intrusive recollections following a traumatic event.

Intrusions are a predominant and distressing component of PTSD, therefore it is crucial to determine how they arise. Several cognitive theorists proposed that intrusions develop through a sequence of events that begins with malfunctions in encoding the trauma memory. For example, Siegel (1995) hypothesized that stress, divided focal attention, and perceptual and emotional flooding during the trauma result in impaired explicit memories, but intact implicit memories. As outlined above, Brewin et al. (1996) posited that non-verbal processing (i.e. SAM encoding) leads to situationally accessible memories. Foa and Riggs (1993) asserted that maladaptive processing leads to fragmented or disorganized trauma memory, which is readily primed by multiple external and internal cues, resulting in reexperiencing symptoms that repeatedly invade working memory. Conway and Pleydell-Pearce (2000) argued that appraisal of the trauma as an overwhelming threat leads to encoding of disconnected details that are not incorporated into the autobiographical memory base, and this results in intrusions. Drawing from such theories, Ehlers
and Clark (2000) postulated that maladaptive cognitive processing during the trauma impairs encoding, which produces a disorganized and fragmented memory for the event that is poorly elaborated within the autobiographical memory store, and therefore is vulnerable to being triggered by matching sensory cues. Fragmentary intrusions then involuntarily intrude into awareness when individuals are confronted with stimuli similar to those that were present during the trauma.

Thus, according to cognitive theorists, a number of cognitive processes play a role in intrusion development. In particular, theorists highlight the crucial role of how information is processed during the traumatic event. I am especially interested in the associations between the three elements that such theories have in common, namely cognitive processing during the traumatic event, memory for the event, and intrusions about the event. Cognitive writers believe these variables are related to each other, although they differ in their hypotheses about how these variables are involved (e.g. Brewin et al., 1996; Ehlers & Clark, 2000). The importance of studying cognitive processing is further underscored by the fact that peritraumatic processing may be modifiable, a characteristic that distinguishes it from other risk factors for traumatic stress, such as gender or a family history of psychopathology.

Despite the multiple cognitive theories of intrusion development, there is a paucity of research investigating the relationships between the three common key elements that they highlight. Recent research efforts have tried to establish specific links between maladaptive cognitive processing, memory disorganization/fragmentation, and intrusions and/or reexperiencing symptoms. In keeping with cognitive theories of intrusion development we would expect to find positive relationships between cognitive processing, memory and intrusive
phenomena. Before discussing this research I will first define concepts used to describe cognitive processing, then memory, and finally intrusions.

**Definitions**

*Cognitive processing*

The research literature can be fully comprehended only if one understands the varied ways that dysfunctional cognitive processing has been conceptualized. The terms peritraumatic dissociation and detachment have been used by a number of writers (e.g. Ehlers & Clark, 2000; Foa & Hearst-Ikeda, 1996). *Peritraumatic dissociation* refers to a cluster of symptoms, such as derealization, memory disturbances, depersonalization, and altered body image experiences and time sense experienced at the time of the trauma (Marmar, Weiss, Metzler, Ronfeldt, & Foreman, 1996). *Detachment* is defined as shutting off from what was happening during the trauma (both thoughts and emotions).

Ehlers and colleagues put forth the concepts of mental confusion and mental defeat, which are proposed to be markers of maladaptive processing. *Mental confusion* refers to an inability to focus on what was happening during the event. *Mental defeat* is operationalized as a giving up of psychological autonomy during the traumatic event. Ehlers and colleagues also allude to concepts used by researchers in perception and cognitive psychology: self-referent processing, data driven processing, and conceptual processing. *Self-referent processing* refers to the individual's ability to process information in a self-referent manner. This variable was proposed as potentially relevant following research indicating that autobiographical memory is arranged around one's sense of self (Howe & Courage, 1993; Wheeler, Stuss, & Tulving, 1997). Lack of self-referent processing is seen to hinder the trauma memory's integration with other autobiographical memories (Ehlers & Clark, 2000). *Data-driven processing* refers to surface
level perceptual processing, such that the individual processes perceptual and sensory features as opposed to the broader meaning of the situation. This type of processing has been found to lead to memory traces that are perceptually encoded and poorly elaborated (Roediger, 1990). 

*Conceptual processing* is defined as the opposite of data driven, namely organized and contextualized processing of the situation's meaning. Readers should note that there are problems in the way many of these variables have been operationalized in the PTSD literature. These problems will be discussed below under limitations.

*Memory disorganization/fragmentation*

Multiple methods have been used to measure memory disorganization/fragmentation. Subjective measures include self-report, and global experimenter ratings of a trauma narrative (e.g. Murray, Ehlers & Mayou, 2002; Halligan, Michael, Clark & Ehlers, 2003). Self-report measures can consist of single items such as “are your memories of the accident in any way unclear or jumbled” (Murray et al., 2002), “how much does your memory of the event exist of fragmented pieces as opposed to a whole entity” (Engelhard, van den Hout, Kindt, Arntz & Schouten, 2003), “are there parts of the accident you cannot remember” (Stallard, 2003), or groups of items asking about memory disorganization (e.g. Halligan et al., 2003). More objective measures include narrative coding (e.g. Foa, Molnar, & Cashman, 1995; Harvey & Bryant, 1999; Halligan et al., 2003; van Minnen, Wessel, Dijkstra & Roelofs) and reading indices (e.g. Amir, Stafford, Freshman, & Foa, 1998; Gray & Lombardo, 2001; Zoellner, Alvarez-Conrad, & Foa, 2002). Narrative coding consists of content coding of trauma narratives for indices of disorganization and fragmentation, such as repetitions, unfinished thoughts and disorganized thoughts. Reading indices are computer software generated indices of the readability of a trauma narrative. As will be discussed later, a new study shows that reading indices largely reflect
intelligence level. All of the measures outlined above were used in studies that assessed memory of traumatic events (e.g. sexual assault, motor vehicle accidents, etc).

In an attempt to approximate traumatic events, analogue studies have participants view traumatic films, and assess characteristics of memories of those films. Analogue studies have also used subjective measures, including single items, e.g. “indicate the ‘snap-shot’ character of your recollection of the film” (Kindt & van den Hout, 2003; Kindt, van den Hout & Buck, 2004 Study 1; Study 2), groups of items asking about memory disorganization (Halligan, Clark, & Ehlers, 2002), and global experimenter ratings of the narrative’s disorganization/fragmentation (Kindt et al., 2004 Study 1; Study 2). Cued recall of certain scenes has been coded for various characteristics, regardless of the degree of correctness of what participants recalled (Kindt et al., 2004 Study 1). In addition, analogue studies offer the advantage of being able to directly compare recollections of the film to objective veridical indices from the film itself. Examples of these memory measures include number of events in the trauma video a) remembered (content), and b) remembered in the correct order (coherence) (e.g. Halligan et al., 2002; Kindt & van den Hout, 2003; Kindt et al., 2004 Study 1).

Intrusions

Intrusive phenomena have been operationalized in various ways. Some studies examine reexperiencing symptoms (e.g. Harvey & Bryant, 1999; Laposa & Alden, 2003; Weiss, Marmar, Metzler, & Ronfeldt, 1995), which typically refer to how many of, or how frequently, people experienced the five symptoms that form the reexperiencing symptom cluster in the DSM-IV PTSD diagnostic criteria. These symptoms include intrusive thoughts/images of the event (intrusions), nightmares, feeling as though the event is happening again (flashback), psychological distress when reminded of the event, and physiological reactivity when reminded...
of the event (APA, 1994). Other studies measured intrusive memory qualities, for example, that
the intrusions are vivid, emotional, and easily triggered (e.g. Halligan et al., 2002). Finally, some
studies addressed intrusion or flashback frequency, which is the number of intrusions or
flashbacks that occur over a given time period (e.g. Bremner & Brett, 1997; Holmes et al., 2004;
Kindt et al., 2004). These terms dance around the same concept, but there are subtle differences
in what they measure.

Research on cognitive processing, intrusions, and memory

Before discussing research on cognitive processing, intrusions and memory, two
preliminary observations are in order. First, the majority of studies to address relationships
between these variables were conducted on people who experienced physical or sexual assault.
The few studies that examined other trauma populations, however, revealed no systematic
differences in findings related to type of trauma. Therefore, I will combine studies across trauma
types when examining this research.

Second, studies with analogue, i.e. not clinical, samples are unique in terms of
methodology and population characteristics. These are the only studies to attempt to manipulate
cognitive processing. In addition, non-clinical samples are by definition less impaired and
experience less emotional distress. Therefore, studies in clinical and analogue samples will be
examined independently.

I begin this review by discussing studies that relate cognitive processing and memory
disorganization/fragmentation to PTSD. Note that these studies do not specifically address the
relationships that cognitive theorists proposed regarding intrusions but rather relate processing
and memory to the entire PTSD syndrome. However, some researchers argue that the most
parsimonious explanation for PTSD is that avoidance, numbing, and hyperarousal are a
consequence of the reexperiencing processes. Hence, any positive relationships between
cognitive processing or memory and PTSD would provide indirect support for the cognitive
theories of intrusions, therefore this research will be discussed briefly.

Cognitive processing and PTSD

Cognitive processing has been operationalized in various ways in these studies. A
number of studies examined peritraumatic dissociation and found that it was associated with
global measures of PTSD (e.g. Birmes et al., 2001; Brewin, Andrews, & Valentine, 2000;
Johnson, Pike, & Chard, 2001; O'Toole, Marshall, Schureck, & Dobson, 1999; Ozer, Best,
Lipsey, & Weiss, 2003), although a few studies did not find this relationship (e.g. Laposa &
Alden, 2003). Detachment, mental confusion, (Dunmore et al., 1999; 2001), mental defeat
(Dunmore et al., 1997; 1999; 2001; Ehlers et al., 2000), and lack of self-referent processing
(Halligan et al., 2003) have also been linked to PTSD. Several clinical studies found a
relationship between data driven processing and PTSD (Halligan et al., 2003; Murray et al.,
2002), while other clinical (Ehlers et al., 2003) and analogue studies (Halligan et al., 2002) show
mixed results. However, overall, most of these studies found that maladaptive cognitive
processing was associated with PTSD.

Memory disorganization/fragmentation and PTSD

A number of studies found an association between memory
disorganization/fragmentation and PTSD, both in clinical (e.g. Amir et al., 1998; Engelhard et
al., 2003; Halligan et al., 2003; Murray et al., 2002; van der Kolk & Fisler, 1995), and analogue
samples (Halligan et al., 2002, Study 2). Furthermore, Harvey and Bryant (1999) found that
trauma memories were more disorganized in individuals with acute stress disorder, a disorder
that is often a precursor to PTSD. In addition, several studies examined change in memory as a
result of treatment. Foa et al. (1995) reported that trauma memories became more coherent (less fragmented) with successful PTSD exposure treatment. In contrast, van Minnen et al. (2002) found only partial replication of Foa et al.'s study. Patients who improved showed a greater decrease in disorganized thoughts than those patients who did not improve. However, improved and non-improved patients showed no difference in changes in measures of fragmented or organized thoughts. While two clinical studies (Berntsen, Willert, & Rubin, 2003; Stallard, 2003) and one analogue study (Halligan et al., 2002 Study 1) did not find relationships between memory disorganization/fragmentation and PTSD, the majority of the extant literature supports this association. In addition, Engelhard et al. (2003) found that memory fragmentation, along with thought suppression, mediated the relationship between peritraumatic dissociation and acute PTSD symptoms.

As noted earlier, studies relating cognitive processing or memory to PTSD do not provide direct support for cognitive theories of intrusions. This is an important distinction, as some studies reveal that key cognitive variables can be related to one of the PTSD symptom clusters without similarly being related to overall PTSD severity (Laposa & Alden, 2003). Nonetheless, the fact that processing and memory have been associated with PTSD is largely consistent with such theories.

I turn now to studies that more directly evaluated the proposed relationships between cognitive processing, memory disorganization/fragmentation and intrusions. This review focuses on the types of cognitive processing highlighted by Ehlers and Clark (2000), namely peritraumatic dissociation, self-referent, data driven, and conceptual processing. I begin by examining studies that address the relationship between maladaptive cognitive processing and intrusive phenomena.
Cognitive processing and reexperiencing/intrusions

If cognitive writers are correct (e.g. Brewin et al., 1996; Conway & Pleydell-Pearce, 2000; Ehlers & Clark, 2000; Foa & Riggs, 1993; Siegel, 1995), one would expect to find an association between maladaptive cognitive processing and intrusions. As seen in Table 1, research on clinical samples showed positive relationships between peritraumatic dissociation and reexperiencing symptoms (Harvey & Bryant, 1999; Laposa & Alden, 2003; Marmar et al., 1994; O'Toole et al., 1999; Tampke & Irwin, 1999; Tichenor, Marmar, Weiss, Metzler, & Ronfeldt, 1996; Weiss et al., 1995), flashbacks (Bremner & Brett, 1997), and intrusive memory qualities (Halligan et al., 2003). Similar findings emerged between lack of self-referent processing and data driven processing, and intrusive memory qualities (Halligan et al., 2003). Note, however, that these findings were not always consistent. For example, Tichenor et al. (1996) found significant results on self-report, but not clinician-based, ratings of reexperiencing symptoms, and Zoellner et al. (2002) found a significant relationship at post-treatment, but not at pre-treatment. Furthermore, Tampke and Irwin (1997) reported that when trait anxiety, trait dissociation and combat exposure were entered into a regression analysis along with peritraumatic dissociation, the latter was no longer a significant predictor of reexperiencing symptoms. The importance of controlling for known predictors of PTSD will be addressed further when discussing the main study. More importantly, while many of the studies reviewed above show relationships between maladaptive cognitive processing and intrusive phenomena, they relied on retrospective reports, often collected several years to decades post-trauma. Research indicates that retrospective reports are prone to error (see Gorin & Stone, 2001 for a review).
Recently, researchers have used laboratory studies to examine causal relationships through the systematic manipulation of cognitive processing. The paradigm typically used to create an analogue trauma is viewing stressful films (e.g. Lazarus, Opton, Nomiko, & Ramkin, 1965). Laboratory studies have focused primarily on peritraumatic dissociation. Three studies tried to experimentally manipulate peritraumatic dissociation to determine its impact on intrusion frequency in student samples.

In the first study, Murray (1997) tried to manipulate dissociation through instructions designed to generate emotional numbness. Before viewing a stressful film, participants were given suggestions such as visualizing seeing themselves from outside of their body, or staring at a dot on the wall. In comparison to the control group, Murray found no increase in intrusion frequency over the week. However, there was no manipulation check in this study, and therefore it was unclear whether there was truly no effect, or whether the dissociation manipulation had failed.

Building from this study, Brewin and Saunders (2001) suggested that Murray’s (1997) null results may have arisen from the inherent difficulties of simply instructing participants to dissociate. Brewin and Saunders hypothesized that a concurrent divided attention task might overcome this limitation, and be more effective in producing the reduction in conscious processing that typifies dissociative states. The two conditions in their experiment were a control and a dual task group, where participants simultaneously performed a tapping task that was hypothesized to mimic peritraumatic dissociation. Contrary to their hypothesis, the “dissociation” condition produced fewer intrusions over two weeks. The researchers concluded that the dual task was not a good analogue to naturally occurring dissociation. In a divided
attention task one can easily switch attention between the tasks, something that would not be the
case for peritraumatic dissociation (Holmes et al., 2004).

Holmes et al. (2004, Study 1) tried to improve on the previous study by adopting
Leonard, Telch and Harrington’s (1999) suggestion that prolonged staring at a small dot is
effective at inducing dissociation. Holmes et al. (2004, Study 1) used a pre-screening procedure
to eliminate undergraduate participants who could not “dissociate” by using the dot staring
technique. Specifically, participants were asked to describe a time when they had dissociated (all
participants were able to do this). The experimenters then defined dissociation, and told
participants that they would be required to dissociate, and that participants should aim to
replicate the psychological state they described in their example. The screening procedure
involved selecting participants whose self-reported state dissociation after staring at a dot on a
film screen for 10 minutes was above a set cutoff. The undergraduates were then assigned to one
of three conditions: control, visuospatial tapping task (without practice interruption, a limitation
of Brewin and Saunders, (2001)), or dissociation task (staring at a dot on film screen). Although
a manipulation check revealed that the dissociation task was effective in increasing dissociation,
the task did not lead to an increase in intrusions over the week in comparison to the control
condition.

As a whole, the three studies indicate that laboratory methods to induce dissociation were
largely unsuccessful in inducing intrusions. In contrast, the amount of spontaneous peritraumatic
dissociation that occurred while watching a film (in Holmes et al., measured across all
experimental conditions) was linked to intrusion frequency in four analogue studies (Holmes et
al., 2004 Study 1; Study 2; Kindt et al., 2004 Study 1; Study 2), although not in three others
(Holmes et al., 2004, Study 3; Holmes & Steel, 2004; Kindt & van den Hout, 2003). All in all,
although peritraumatic dissociation has been difficult to purposely induce, and evidence on the importance of spontaneous levels has been mixed, the research literature does suggest that peritraumatic dissociation may play a role in intrusion development.

Two analogue studies investigated data driven processing. In Study 1 Halligan et al. (2002) manipulated conceptual and data driven processing. Participants in the conceptual processing condition were instructed to “Concentrate on the story. Ask yourself what is happening to the people in the scene and why. Figure out what is going on and what might happen next. Stay with the storyline as it unfolds in front of you”. Participants in the data driven processing condition were instructed to “Become absorbed in the images and sounds. Instead of trying to work out what is going on, try to let yourself be carried away by the things you can see, the sounds you can hear, and the physical sensations the people might be experiencing. See each scene as a series of unconnected snapshots and let the images and sounds impress themselves upon you”. The manipulation did not lead to group differences on intrusion symptoms over the week, although a manipulation check showed that participants adhered to group assignment instructions.

In Study 2 Halligan and colleagues capitalized on “traits” (i.e. global self-reported tendencies) of data driven and conceptual processing during unpleasant events, and pre-selected groups of extreme scorers on these traits. The data driven processing group reported more intrusions and intrusive memory qualities over the week than the conceptual processing group. On the basis of this finding, Halligan, Clark et al. argued the importance of data driven processing. Note, however, that this study did not involve an experimental manipulation of cognitive processing, therefore it is difficult to attribute causality to cognitive processing per se, and not to associated characteristics of being an extreme scorer on a trait measure. Moreover,
even if one assumes that the intrusion effect is a direct result of cognitive processing, the absence of a control group in this study renders it difficult to determine which type of cognitive processing was driving the effect.

In summary, in line with cognitive theorists’ proposed association, clinical studies showed positive relationships between self-reported indices of maladaptive cognitive processing and various forms of intrusive phenomena (Bremner & Brett, 1997; Halligan et al., 2003; Harvey & Bryant, 1999; Laposa & Alden, 2003; Marmar et al., 1994; O’Toole et al., 1999; Tampke & Irwin, 1999; Tichenor et al., 1996; Weiss et al., 1995; Zoellner et al., 2002), although not always consistently (Tampke & Irwin, 1999; Tichenor et al., 1996; Zoellner et al., 2002). Empirical support from analogue studies is more mixed. Three studies manipulating peritraumatic dissociation did not show that it led to an increase in intrusions in comparison to a control group (Brewin & Saunders, 2001; Holmes et al., 2004, Study 1; Murray, 1997). Four studies reported a correlation between spontaneous levels of peritraumatic dissociation regardless of group assignment, (Holmes et al., 2004, Study 1, Study 2; Kindt et al., 2004 Study 1; Study 2), and three did not (Holmes et al., 2004, Study 3; Holmes & Steel, 2004; Kindt & van den Hout, 2003). One study manipulating conceptual and data driven processing did not show any effect on intrusive symptoms (Halligan et al., 2002 Study 1), although participants high in “trait” data driven processing reported more intrusions and intrusive memory qualities (Halligan et al., 2002, Study 2). This mixed pattern is particularly interesting given that all of the analogue studies except those by Kindt and colleagues used the same traumatic film.

Cognitive processing and memory disorganization/fragmentation

If cognitive theorists (e.g. Conway & Pleydell-Pearce, 2000; Ehlers & Clark, 2000; Foa & Riggs, 1993; Siegel, 1995) are correct, we should find a positive association between
maladaptive cognitive processing and memory disorganization/fragmentation. Three types of maladaptive cognitive processing have been related to memory disorganization/fragmentation: peritraumatic dissociation, self-referent and data driven processing. Studies that addressed these variables can be seen in Table 1.

Peritraumatic dissociation was found to be related to indices of memory disorganization/fragmentation in four clinical studies (Engelhard et al., 2003; Halligan et al., 2003 Study 1; Study 2; Harvey & Bryant, 1999), with one exception (Zoellner et al., 2002). In analogue research three studies found the relationship on some, but not all, memory indices (Kindt & van den Hout, 2003; Kindt et al., 2004 Study 1; Study 2). Thus, while clinical studies often support the association between peritraumatic dissociation and memory disorganization/fragmentation, analogue findings are less supportive.

Less work has addressed self-referent and data driven processing. Lack of self-referent processing was correlated with memory disorganization in two studies (Halligan et al., 2003 Study 1; Study 2). Data driven processing was linked to memory disorganization in two clinical studies (Halligan et al., 2003 Study 1; Murray et al., 2002) and one analogue study (Halligan et al., 2002 Study 1). However, other work on data driven processing found conflicting results, both in clinical (Halligan et al., 2003, Study 2) and analogue (Halligan et al., 2002, Study 2) samples.

Differences in findings appeared to be influenced by the method used to assess memory. Positive relationships were most frequently found when disorganization/fragmentation was operationalized by self-report ratings, global experimenter ratings, or narrative coding. Positive relationships were found only half of the time or less using indices of content and coherence. In summary, other than studies that examined self-referent processing, inconsistent results emerge regarding whether maladaptive cognitive processing is associated with memory.
disorganization/fragmentation. In addition, positive relationships were found most frequently with subjective disorganization measures. Such measures have limitations, such as being confounded with subjective distress, and I will return to this point later.

**Memory disorganization/fragmentation and reexperiencing/intrusions**

Fewer studies have examined the proposition made by some cognitive theorists that memory disorganization/fragmentation is related to intrusive imagery (e.g. Conway & Pleydell-Pearce, 2000; Ehlers & Clark, 2000; Foa & Riggs, 1993). Studies that addressed this issue can be seen in Table 2. Harvey and Bryant (1999) and Zoellner et al. (2002) used clinical samples, while the other researchers used analogue samples. Halligan et al. (2002, Study 2) found positive relationships between self-report scales of memory disorganization and reexperiencing symptoms, and intrusive memory qualities. However, they failed to find a significant relationship between self-reported memory disorganization and frequency of intrusions, and between narrative coherence and reexperiencing symptoms. All other studies found no relationship (Halligan et al., 2002, Study 1; Harvey & Bryant, 1999; Zoellner et al., 2002), or a relationship in the opposite direction (Zoellner et al., 2002). In short, only one of four studies found evidence for any positive relationship between memory disorganization and intrusive phenomena.

**Overall summary**

To review, cognitive theorists proposed models suggesting that dysfunctional cognitive processing, intrusions, and memory disorganization/fragmentation are related. Twelve studies consistently showed positive relationships between maladaptive cognitive processing and intrusive phenomena (Bremner & Brett, 1997; Halligan et al., 2002 Study 2; Halligan et al., 2003 Study 1; Study 2; Harvey & Bryant, 1999; Holmes et al. 2004, Study 2; Kindt et al., 2004 Study 1; Study 2; Laposa & Alden, 2003; Marmar et al., 1994; O'Toole et al., 1999; Weiss et al.,
1995), and ten studies did not (Brewin & Saunders, 2001; Halligan et al., 2002 Study 1; Holmes et al., 2004, Study 1; Study 3; Holmes & Steel, 2004; Kindt & van den Hout, 2003; Murray, 1997; Tampke & Irwin, 1999; Tichenor et al., 1996; Zoellner et al., 2002). Five studies consistently supported the link between maladaptive cognitive processing and memory disorganization/fragmentation (Engelhard et al., 2003; Halligan et al., 2002, Study 1; Halligan et al., 2003, Study 1; Harvey & Bryant, 1999; Murray et al., 2002), and six studies did not (Halligan et al., 2002, Study 2; Halligan et al., 2003, Study 2; Kindt & van den Hout 2003; Kindt et al., 2004 Study 1; Study 2; Zoellner et al., 2002). No studies consistently supported the positive association between indices of memory disorganization/fragmentation and intrusive imagery (Halligan et al., 2002, Study 1; Study 2; Harvey & Bryant, 1999; Zoellner et al., 2002).

Overall, support for cognitive theories of intrusions is best described as inconsistent. The strongest support emerges for the role of cognitive processing in intrusion development, in that an association is often found between these two factors. Evidence for the role of memory is less convincing.

Limitations of the literature

A growing body of research has addressed the relationships between cognitive processing, intrusions and memory, but there are a number of limitations in these studies. As the review indicates, researchers have conceptualized cognitive processing in different ways. For the most part, these conceptualizations reflect poorly defined and overlapping constructs. Moreover, many of the questionnaires used to measure these variables are unvalidated. For example, the measures for “data driven processing” and “self-referent processing” developed by Ehlers and colleagues differ markedly from the constructs as originally described in the cognitive and perception literatures. Data driven processing, according to cognitive researchers, refers to
surface level perceptual processing, such that the individual processes perceptual and sensory characteristics as opposed to the broader meaning of the situation. Ehlers' data driven processing questionnaire contains items tapping other themes, such as confusion and feeling overwhelmed. This is also seen in the data driven processing measures that consist of either single items, "to what extent were you muddled/confused during the accident" (Ehlers et al., 2003), or difference scores between the items "were you overwhelmed by different sensations and impressions" and "did you realize you were in a dangerous situation" (Murray et al., 2002). Other problems arise in Ehlers' measure purportedly assessing state dissociation. The questionnaire is contaminated by emotional distress, in addition to reflecting many of the unusual cognitive phenomena measured by the Peritraumatic Dissociation Experiences Questionnaire (Marmar, Weiss, & Metzler, 1997), the widely used and validated measure of dissociation.

Moreover, the Ehlers' cognitive processing scales are highly correlated. Halligan et al. (2003) report correlations of .64 to .79 between the state dissociation, self-referent and data driven processing questionnaires. The degree of overlap raises questions about the specificity of the constructs. In short, work is needed to determine whether peritraumatic dissociation, lack of self-referent processing, and data driven processing are distinct constructs. While prior studies have provided valuable first steps, we need clear definitions and usage of terms. Finally, the majority of studies relied on retrospective reports, and it is unclear whether people can accurately describe their cognitive processing of an event that happened months to years earlier.

There are also problems with the measurement of memory disorganization/fragmentation. As noted earlier, multiple methods have been used to measure this construct, including single item questions, multi-item scales, global experimenter ratings, content and coherence, narrative coding, and reading indices. Amir et al. (1998) are to be commended for their attempts to find an
objective measure of the construct; computer-generated reading indices of trauma narratives.

However, recent evidence shows that reading levels are not a good operationalization of memory disorganization/fragmentation. Gray and Lombardo (2001) replicated Amir et al.’s (1998) findings that reading indices were related to PTSD. However, when they controlled for intelligence, the relationships were rendered non-significant. Gray and Lombardo argue that reading indices merely confirm that intelligence is related to PTSD, a finding that is well established in the literature (e.g. Macklin et al., 1998; Vasterling, Brailey, Constans, Borges, & Sutker, 1997).

The use of narrative coding to measure trauma memory also can be problematic. For example, Wolfe (1995) noted that verbalized rape narratives are contaminated by things like willingness to disclose and the effects of the social context. Gray and Lombardo (2001) suggested that written narratives could avoid many of the biases listed by Wolfe (1995).

In addition, there are recent suggestions that changes in rape narratives over exposure treatment are a function of repeatedly telling the trauma story, as opposed to a fundamental change in memory disorganization/fragmentation (e.g. van Minnen et al., 2002). Furthermore, correlations between narrative coded memory disorganization and self-report memory disorganization have been moderate at best (S. Halligan, personal communication, October, 2002). As current PTSD symptoms can inflate reports of emotional responses to, and severity of, the event (e.g. Harvey & Bryant, 2000; Roemer, Litz, Orsillo, Ehlich, & Friedman, 1998; Schwarz, Kowalski, & McNally, 1993; Zoellner, Sacks, & Foa, 2001), current levels of distress may likewise inflate self-reports of memory disorganization. All in all, there are a number of limitations in how prior studies have measured cognitive processing and memory disorganization/fragmentation.
Summary

To review, several cognitive theorists converged on predictions that maladaptive cognitive processing affects the development of intrusions, and how information for traumatic events is stored. Cognitive theorists do not converge in their views on the exact role of memory. While some cognitive theorists (e.g. Ehlers & Clark, 2000; Foa & Riggs, 1993) suggested a temporal sequence of intrusion development, where memory disorganization/fragmentation mediates the relationship between cognitive processing and intrusions, others (e.g. Brewin et al., 1996) did not advocate this view. The literature review revealed that support is strongest for the proposed link between maladaptive cognitive processing and intrusions. Evidence is more mixed for the association between maladaptive cognitive processing and memory disorganization/fragmentation, and is sparse for the relationship between the latter and intrusions.

In light of the patterns of findings revealed in the literature review, the primary focus of this dissertation is how cognitive processing relates to intrusions. As there is some, albeit weaker, evidence for the relationship between cognitive processing and memory, this relationship will also be explored. Given the inherent methodological confounds in causally determining that one form of memory (disorganization/fragmentation) leads to another form of memory (intrusions), and the lack of empirical support for the association between memory and intrusions, and this dissertation will not address a mediation pathway.

The literature review suggested that maladaptive cognitive processing during traumatic events might affect intrusions and memory. However, the use of complex, multi-thematic scales and other less than optimal methodology renders it unclear as to which of the factors being tapped by the measures are responsible for the relationships that have emerged. These limitations
highlight the need for more work on intrusion development. Specifically, more controlled laboratory studies are required. Furthermore, research has not addressed the possibility of functional cognitive processing.

**Functional cognitive strategies**

The extant research has focused on the study of pathological cognitive processes that lead to negative sequelae. However, it is noteworthy that most individuals who are exposed to traumatic events do not develop PTSD (e.g. Breslau, Davis, & Andreski, 1991). We can flip the focus to ask what are the functional cognitive processes that do not result in the development of negative sequelae? In particular, what types of cognitive strategies during traumatic events protect against the development of intrusions? This is the thrust of the current research.

Very few studies have examined functional strategies during traumatic events. One possibly functional strategy that has been investigated is mental planning during the event. Mental planning has been variously defined as thinking about how to escape/influence the assailant, protect the self physically or emotionally, and cope better (Dunmore et al., 1997; 1999; Ehlers, Clark et al., 1998, Ehlers et al., 2000). Some writers viewed mental planning as the opposite of mental defeat (Ehlers, Clark et al., 1998). As noted previously, mental defeat is operationalized as a giving up of psychological autonomy during the traumatic event, and it is thought to negatively influence subsequent appraisals (Ehlers & Clark, 2000). Although Ehlers and Clark (2000) do not specifically outline the role of mental planning in their cognitive model, one could infer that mental planning wards off negative appraisals.

Although mental planning has not been examined in the context of memory or intrusion development, five studies examined the link between mental planning and PTSD. They yielded mixed results. Dunmore et al. (1997) found that patients who recovered from PTSD reported
more mental planning than those with persistent PTSD. Ehlers, Clark et al. (1998) found that less mental planning was associated with poorer treatment outcome. In contrast, Dunmore et al. (1999) found that a PTSD group reported more mental planning than a non-PTSD group, and that there was no difference between persistent and recovered PTSD groups on mental planning. Dunmore et al. (2001) reported no correlation between mental planning and PTSD severity, and Ehlers et al. (2000) found no significant differences in mental planning between chronic, remitted and non-PTSD groups. Importantly, Ehlers et al. (2000) pointed out that one limitation of their investigation was a failure to assess the intention of the action, i.e. whether planning was a desperate response, or done with the intention of trying to “beat the system”. Overall, although the findings are inconsistent, these studies raise the possibility that there may be ways of processing traumatic events that protect against PTSD. However, these studies did not relate mental planning to intrusion development or memory for the event, therefore, it is unclear whether mental planning prevents intrusions and memory disorganization/fragmentation.

A second concept related to functional processing is conceptual processing. Conceptual processing, defined as organized and contextualized processing of the situation’s meaning, is hypothesized to prevent the development of PTSD symptoms. Two analogue studies previously described in the literature review directly examined how conceptual processing affected intrusions and memory. In the first study, Halligan et al. (2002 study 1) tried to manipulate conceptual processing by asking participants to concentrate on the story, and try to figure out what was going on in the film and what might happen next. These researchers found that the conceptual processing group did not differ from the data driven group in reexperiencing symptoms, although the former group did display better memory for the film. In the second study, Halligan et al. (2002 Study 2) compared groups high on “trait” conceptual or data driven
processing. The results were the opposite of the first study, namely that the findings on memory indices used in Study 1 were not replicated, although the conceptual group did report fewer intrusions. The latter finding suggests that when participants are naturally inclined to engage in conceptual processing, they have fewer subsequent intrusions. Taken together, these two studies suggest that conceptual processing may affect intrusions and memory. However, the findings are not robust.

In summary, mental planning may be an important variable that helps buffer against PTSD, but the evidence from five studies investigating this concept is mixed. In addition, as discussed earlier, retrospective reports of traumatic events are prone to error. The two analogue studies on conceptual processing indicate that approaching a distressing event with the intent of understanding its meaning may promote more coherent memories, or fewer intrusions, although again, this literature is inconsistent and extremely sparse. The possibility of functional processing is important because of its implications for understanding and preventing processes related to PTSD.

As so little is known about functional strategies, a logical starting point for further investigation would be to collect descriptive accounts of what people do cognitively during traumatic events. Laboratory-based studies could then be conducted to examine the effect of such strategies. In addition, placing these cognitive strategies within a theoretical context of the proposed relationships between cognitive processing, intrusions, and memory, would inform cognitive theories of intrusions. A good sample for studying functional cognitive strategies during traumatic situations is health care professionals.
PTSD in health care professionals

Studies of cognitive processes in PTSD have focused primarily on individuals who are direct victims of traumatic events that are out of the ordinary for them, for example, the woman who was raped, or the man who survived a terrible motor vehicle accident. Less work has addressed cognitive processes in individuals who routinely deal with horrifying events as part of their jobs, for example, emergency service workers such as paramedics or firefighters. This emphasis on primary PTSD may reflect the earlier DSM-III requirement that the event be “outside the normal range of human experience” (American Psychological Association, 1980). In the DSM-III-R and DSM-IV, criteria A for PTSD, which defines what constitutes a traumatic event, was broadened to include witnessing or being confronted with an event that threatens one’s own or others’ lives and produces a response of “intense fear, helplessness or horror” (APA, 1987; 1994). This change increased the boundaries for diagnosing PTSD. It also pointed to a need to examine PTSD in populations where distressing events are routine rather than atypical, and more likely to be witnessed than directly experienced, such as emergency service workers.

Recent studies demonstrate that emergency service workers are at risk for developing PTSD. Whereas epidemiological studies investigating past week to six month prevalence rates (i.e. point prevalence) of PTSD in the general population found prevalences ranging from 0.4 to 4.6% (Bernat, Rondfelt, Calhoun, & Arias, 1998; Davidson, Hughes, Blazer, & George, 1991; Kessler et al., 1995; Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993), point prevalence rates in disaster workers, which are typically a combination of paramedics, police officers, and firefighters, range from 2-17% (Anderson, Christensen, & Petersen, 1991; Durham, McCammon, & Allison, 1985; Ersland, Weisaeth, & Sund, 1989; McCammon, Durham, Allison, &
Williamson, 1988; Ursano, Fullerton, Kao, & Bhartiya, 1995; Weiss et al., 1995). For ambulance attendants the point prevalence of PTSD has been reported at 15-22%, and for firefighters alone between 6-32% (Bennett, Williams, Page, Hood, & Wollard, 2004; Chang et al., 2003; Clohessy & Ehlers, 1999; Corneil, Beaton, Murphy, Johnson, & Pike, 1999; DeAngelis, 1995; Grevin, 1996; Haslam & Mallon, 2003; McFarlane, 1989; North et al., 2002; Rentoul & Ravenscroft, 1993; Wagner, Heinrichs, & Elbert, 1998). The impact of life-threatening situations, massive material destruction, exposure to severely mutilated bodies and physically demanding activities can all cause traumatic stress and other distress symptoms (Marmar et al., 1996; Wagner, et al., 1998).

In particular, many emergency service workers report intrusive memories of work-related traumatic events (Jonsson & Segesten, 2003; Thompson & Suzuki, 1991). For example, Durham, et al. (1985) reported that among rescue personnel, intrusive thoughts about the disaster were the most frequently endorsed PTSD symptom. Genest, Levine, Ramsden and Swanson (1990) found that fewer than 5% of volunteer ambulance attendants involved in unsuccessful cardiopulmonary resuscitation attempts reported never thinking about the experience again. Moreover, for most of the participants, their recollections were not voluntary.

Recently, research efforts moved from focusing on emergency workers who venture out to accident sites to administer care, to addressing emergency personnel who work within a hospital setting. Hospital emergency department workers also routinely witness life-threatening situations experienced by their patients, and work under time pressure to deal with life or death medical situations. However, they work in a more controlled environment than firefighters, disaster workers and ambulance attendants. They do not face the added external physical dangers of outside workers and are equipped to deal with a wider variety of medical difficulties, having
at their disposal a broader array of diagnostic tools as well as experts, specialists and advanced facilities on site.

Despite this, the few empirical studies that addressed PTSD in emergency department personnel indicate that they too suffer from PTSD. Up to one third of emergency department workers reported having PTSD symptoms, and 12% met full criteria for the disorder (Helps, 1997; Laposa & Alden, 2003). Over one third had impaired life functioning due to their PTSD symptoms, and some individuals reported that their symptoms persisted for years (Laposa & Alden, 2003). These studies suggest that witnessing medical emergencies, even in a more controlled environment, can create longstanding negative emotional sequelae.

While it is clear that various types of emergency service professionals are at risk for posttraumatic symptomology, it is also noteworthy that many do not suffer from longstanding emotional distress after being inundated with horrible incidents. For example, Laposa and Alden (2003) found that the majority of their sample did not exhibit clinically significant levels of PTSD symptoms. Moreover, in light of the central role of intrusions, it is notable that 48% of this sample had not experienced upsetting intrusions during the past month. A key question then is why do intrusive recollections of distressing events continue to haunt some health care workers, while others are seemingly unaffected?

In line with cognitive theories of intrusion development, the way in which health care professionals cognitively process information during a medical crisis may be important. Some work suggests this is true. Two studies that addressed cognitive processing in emergency workers found that peritraumatic dissociation, a form of maladaptive cognitive processing, was related to reexperiencing symptoms (Laposa & Alden, 2003; Weiss et al., 1995). These results mirror findings in individuals directly traumatized in isolated incidents, and therefore suggest
that the key role of maladaptive cognitive processing is robust to changes in context. However, this work focused on a maladaptive form of processing. No studies have investigated functional processing while dealing with medical crises. Therefore, it remains unclear whether such functional strategies exist, and if so, whether they are responsible for the finding that many health care workers do not experience long-term negative cognitive sequelae after traumatic events.

Health care workers offer several advantages for examining nonpathological cognitive strategies. It is difficult to study functional cognitive strategies in individuals involved in an isolated traumatic event, as their experience is necessarily limited to that one situation. As noted earlier, health care workers routinely deal with horrible situations on the job. By investigating cognitive strategies in individuals who have been exposed to similar traumatic situations multiple times, one is more likely to detect strategies that are functional, and could generalize to similar traumatic events in the future. Moreover, as many health care workers do not develop intrusions, they have likely developed strategies to manage exposure to traumatic situations. Consequently, health care workers are a good sample to study functional cognitive strategies during traumatic situations, and how such processing may affect intrusions and general memory for the event. In addition, investigating processing and intrusions in the context of individuals who witness traumatic events, as opposed to being personally victimized, lends itself well to laboratory investigation, which has several methodological advantages. Lastly, this line of research also has implications for health care delivery, as the presence of PTSD symptoms has been shown to interfere with medical work performance (Laposa & Alden, 2003).
Exploratory Study

One approach to understanding processing of traumatic information is to assess health care workers' descriptions of peritraumatic strategies they use to enable themselves to effectively deal with stressful patient situations. In order to ascertain whether health care workers have strategies for managing traumatic medical events, open-ended unstructured interviews with three experienced nurses were conducted. The nurses did report using cognitive strategies to deal with stressful situations. For example, one nurse noted that during medical crises "you learn to detach yourself to a degree cognitively and think at a higher level; what to do and how to monitor it". To further investigate frequently used cognitive strategies during traumatic events, an exploratory study with a larger sample of health care workers was conducted.

Method

Participants

Participants were 19 nurses and 1 respiratory therapist from a large urban center in British Columbia. The inclusion criterion was that participants had at least one year of work experience in an acute care hospital. A cross section of health care professionals was recruited as earlier research suggested that nearly all who worked in acute care facilities would have encountered distressing medical crises at some point in their work experience, and sources of stress and PTSD severity are evident at comparable levels across various hospital departments (Burns, Kirilloff & Close, 1983; Kerasiotis, 2001). Participants were recruited from advertisements posted throughout the city.¹ The sample was primarily women, single, and of European Canadian background. The average age was 36.75 (SD = 12.36), with a range of 23-57 years. Participants had been working as a health care professional for an average of 12.60 years (SD = 12.53), with a range of 1.5-40 years.
Semi-structured interview

The semi-structured interview consisted of a series of open-ended and structured Likert-like ratings that addressed what participants did cognitively during medical crises, and the perceived efficacy of such strategies. The interview was divided into four parts. First, participants were asked to nominate and describe an upsetting medical event on the job that stood out as particularly distressing at the time. Second, they described what they did during such events to protect themselves from being emotionally overwhelmed. Third, they answered a series of 15 structured items regarding a variety of specific cognitive strategies that were drawn from the literature and prior work. Examples of these items include: do you “distract yourself with things not directly related to the medical crisis”, “focus on the mechanical steps of what you need to do medically”, and “think back to what you learned in your training and work experiences, and try to apply it”. (See Appendix A). For each strategy that the interviewer queried, participants were asked whether they used it, and if so, how frequently they used it, and how effective the strategy was for a) delivering treatment, and b) for controlling their own emotions. Frequency of use was rated on a five point scale where zero = never, and four = nearly always. Efficacy was rated on a five point scale were zero = not at all, and four = extremely. Fourth, participants were asked about their recommendations regarding what to do, and not do, when dealing with upsetting medical events.

Data Analyses

Structured items. As the purpose of the study was to gather information on frequently used functional cognitive strategies, any items that were not widely used (i.e. endorsed by fewer than 65% of participants), or were rated less than two out of four for efficacy, were removed
from further analyses. Following this, the remaining items were analyzed for common thematic content.

*Open-ended items.* Participants' open-ended responses regarding the strategies they used, and their recommendations for dealing with upsetting patient events, were each content coded. Two main cognitive themes emerged; medical orientation and emotional containment. Other cognitive themes were occasionally mentioned, for example focusing on how the patient was feeling; however, these were restricted to isolated comments made by a couple of participants. Consequently, the open-ended responses were then coded for the presence or absence of each of the two main themes. This coding was done for each of the themes because many participants described more than one theme in their answers, and a forced-choice coding of one theme only could mask relevant information. A second independent rater analyzed participants' answers, and inter-rater agreement was good, with kappas ranging from .69-1.0.

*Procedure*

Participants were telephone screened before the interview to ensure they met the inclusion criterion. All participants gave informed written consent prior to starting the interview. The interview lasted approximately 45 minutes. All interviews were conducted by J. Laposa, a clinically trained doctoral student with experience working with distressed individuals. Participants' comments during the open-ended and structured questions were recorded verbatim by the interviewer. Following the interview, nurses were debriefed as to the purpose of the study, and were offered contact numbers of relevant mental health professionals that they were encouraged to use if they felt distressed. Participants received financial compensation for their participation ($20).
Results

All participants endorsed experiencing an upsetting medical event while on the job. Many participants talked about medical crises, for example,

A patient hemorrhaged from the neck while I was the only person in the room. In a second everything was red.

Several nurses also recounted incidents that involved patients dying. Examples include:

The first one disturbed me the most; it made me want to leave nursing. Patient came in status asthmaticus, she had an asthma attack in the bed, there were no docs around. I held her while the assistant gave her adrenaline. I phoned for a doc, held her again and she died. It was the first time and I was least prepared. Her name was XXX, isn’t that funny, I still remember her name, and this was over 30 years ago. I’m getting a bit upset now even talking about it.

and

There was a man in his late 40s, he had a family, two grown daughters, a wife. He was in for vascular surgery, was doing quite well, he had been with us for a long time. One night, he was obviously in big trouble. He was diabetic; I did his blood sugars, tried to shove something down his throat. He looked at me with tears in his eyes and then just died. We worked on him for an hour to bring him back (unsuccessfully). I went home that day and screamed.

Cognitive Strategies

Structured items

Ratings on the structured items regarding what participants did cognitively during medical crises were examined for frequently used and effective strategies. Seven items that were
not widely endorsed, or were rated as largely ineffective, were removed from further analyses. These items reflected strategies such as distraction, self-reassurance, and focusing on one’s own feelings. Among the remaining eight items that were both frequently used and rated as effective, three themes emerged: 1. medical orientation, 2. emotional containment, and 3. focus on patient feelings. Items reflecting these themes can be seen in Table 3. Using a medical orientation was the most frequently used, and was rated as highly effective for both delivering treatment, and controlling one’s own emotions. Emotional containment and focusing on patient feelings were used less frequently, and although the former was rated as effective for delivering treatment and controlling emotions, the latter was not.

Open-ended item

When asked at the start of the interview what they do during distressing medical events to prevent themselves from being overwhelmed, 70% spontaneously referred to using a medical orientation. Examples include:

I tune out everything else, like others freaking out, and I specifically focus on what I have to do. I’m really good at focusing on one thing. I know my role and my purpose and I focus on that. Things go well if I can do that. I also plan ahead and that helps. I think about what I’m going to do; that gives me a real sense of control so I can just be there when it happens.

and

In emergencies there is a routine. ABC’s; airway, breathing, circulation. You deal with these priorities in order. You organize the routine until it becomes second nature, then you begin to enjoy it, it becomes a challenge, it’s a puzzle. Find out what the major problem is and deal with that. It’s a very organized procedure. If you follow it, the
situation should turn out as positively as possible, and you know you did what you could; there’s comfort in that.

Emotional containment was referred to by 50% of the participants:

Any feelings you have to put back until later when you have time to deal with it.

Notably, several participants noted that containing their emotions and focusing on the technical aspects went hand in hand. Examples include:

You close off...you shut down the emotions. You’re so focused on what you’re doing that there isn’t really any time to worry about that.

and

Emotionally detach yourself and focus on the job, saving the patient’s life before your feelings coming first. Rather than let your emotions come into play, focus on the patient, the airway, breathing. Assess the oxygen, do they need an airway, intubation, is there a heartbeat going? You have to act, and don’t feel.

*Recommendations for dealing with upsetting patient events*

When participants were asked what advice they would give about how to deal with upsetting patient events, 75% alluded to using a medical orientation;

Focus on what you need to do, the steps that need to be taken. Give 110% focus to the steps.

Containing their emotions was referred to by 15% participants.

In terms of what *not to do* during these types of events, 50% alluded to not getting too emotional;

Don’t panic. It’s awful. It sends your knowledge right out the window. You may know everything, but it clamps down your brain somehow. It’s a difficult emotion to overcome.
Using a medical orientation was not referred to by any participant.

Discussion

Consistent with prior research on various types of emergency service personnel, all of these health care workers experienced extremely upsetting patient incidents while on the job. The major finding from this study was that participants had several peritraumatic cognitive strategies that they used to enable themselves to effectively deal with those situations. Moreover, one strategy in particular was both frequently used, and perceived to be effective.

Results revealed that a medical orientation strategy was used most frequently during medical crises. Nearly three-quarters of participants spontaneously alluded to focusing on the technical aspects of their work during a medical crisis to prevent themselves from being emotionally overwhelmed. In addition, the medical orientation was also rated the most effective for both delivering treatment and for controlling their emotions. The fact that the participants valued such a strategy was evident in the finding that three-quarters of participants recommended emphasizing the medical aspects of their work in order to deal with upsetting patient events. In short, this strategy was used frequently, recommended, and enabled health care professionals to both work effectively and manage their emotions.

A second type of cognitive strategy was emotional containment. While this strategy was not endorsed as frequently, many participants did describe the importance of keeping their emotions in check. Particularly noteworthy was the finding that emotional containment was often a by-product of adopting a medical orientation. A third, albeit even less preferred, type of cognitive strategy was focusing on patient feelings. Again, this strategy was not as frequently endorsed, and was rarely spontaneously described. In addition, of the three strategies, focusing on patient feelings was perceived as least effective, particularly with respect to controlling
emotions. While such a strategy may help while monitoring the impact of treatment, it may also serve to increase the emotionality of the person delivering treatment, which may be detrimental.

Overall, results from the structured and open-ended items converged to highlight the use of a medical orientation cognitive strategy. Deliberately using a medical orientation, where participants pull up a medical plan based on prior experience, and analyze and deal with the current event in light of this information, seems to be a very frequently used functional cognitive strategy. It appears to allow health care workers to process the situation rationally, and downplay emotionality during the event. I have named the type of processing that this strategy would likely evoke medical processing. Medical processing is operationalized as a combination of conceptual medically-related thinking, and focus of attention. Conceptual medical thinking means that they assess the medical crisis, look for clues as to what is causing the injuries, and relate this information to their autobiographical memories of prior training and work experiences to bring up a prioritized step by step plan of how to medically treat the problems. Medical focus of attention means that they selectively focus on the medical aspects while assessing the situation, and while implementing the step by step medical techniques.

Medical processing has parallels with the types of cognitive processing described by Brewin et al. (1996) and Ehlers and Clark (2000). As previously outlined, Brewin et al. (1996) suggested that there are two memory systems, one based on verbal and one based on sensory processing. These two systems create two types of memory representations: verbally accessible memories (VAMs) and situationally accessible memories (SAMs). VAM memories are created by giving the information a high degree of conscious processing, such that this information is linked to other contextual information in the autobiographical memory base. VAM encoding serves to inhibit SAM encoding, which is thought to lead to intrusive recollections. Similarly,
Ehlers and Clark (2000) noted the importance of conceptual processing, which is organized and contextualized processing of the situation’s meaning. Conceptual processing is hypothesized to create organized memories that are properly elaborated within the autobiographical memory store, such that the trauma memory is not vulnerable to being triggered by matching sensory cues. Medical processing, which involves conscious and strategic medical meaning based processing of information, and relating this information to prior autobiographical memories, may be related to what these theorists call VAM or conceptual processing.

Medical processing may result from a functional cognitive strategy that health care workers use during distressing events; however, it has never been empirically evaluated. It remains to be determined what effect, if any, this strategy has on subsequent cognitive sequelae. This is the focus of the main study.

Main Study

The main study examined the effect of manipulating a medical cognitive strategy on intrusions, memory and anxiety in the context of the distressing film paradigm. The study was conducted within the framework of existing research on cognitive theories of intrusions. In light of the patterns of findings revealed in the literature review, the primary focus of the main study was how adopting the medical strategy affected intrusions. As there was some, albeit weaker, evidence for the relationship between cognitive processing and memory in prior works, the effect of the manipulation on memory disorganization was also explored.

In addition, the main study addressed one variable that may be responsible for the effect of the manipulation, namely change in anxiety. Theories of intrusion development often start with the premise that it is the overwhelming nature of the traumatic event that leads to maladaptive cognitive processing, such that encoding of information is impaired. Anxiety can
influence encoding of traumatic material (e.g. Krystal, Southwick & Charney, 1995). Drawing from the exploratory study, participants almost unanimously reported that the medical orientation strategy was highly effective for controlling their own emotions. If the manipulation does decrease anxiety, this may suggest why the medical cognitive strategy is effective. However, it is notable that some analogue studies found a decrease on intrusion frequency without a corresponding decrease on distress (e.g. Brewin & Saunders, 2001), and therefore the role of anxiety is unclear.

The distressing film paradigm was chosen for this experiment because it has several methodological advantages. First, the paradigm allows for the possibility of experimentally manipulating the medical cognitive strategy, which allows for inferences about causality. As discussed previously, other cognitive manipulations were largely unsuccessful. However, Brewin and colleagues demonstrated that performing a concurrent motor tapping task while watching a distressing film did have an effect on intrusion development (Brewin & Saunders, 2001; Holmes et al., 2004 Study 1; Study 2). This suggests that it may be possible to affect intrusions with a laboratory manipulation. Second, this paradigm allows for control over event characteristics so that all participants experience a standardized stimulus, which removes variance due to features of the distressing event. Third, ethical guidelines prohibit deliberately exposing people to actual traumatic events, such as those that would be experienced in the emergency department. The film paradigm can be used to create an analogue situation to directly witnessing and dealing with medical crises. Furthermore, prior research demonstrated that this paradigm does not create ongoing distress. For example, Brewin and Saunders (2001) found that two weeks after viewing their trauma film, no participants continued to experience intrusive recollections of the film. In summary, using the distressing film paradigm offers the advantages of modeling peritraumatic
processes in a tightly controlled laboratory-based study to answer key theoretical questions about trauma-related processes, without simultaneously creating long-term negative sequelae.

Prior studies were limited by failing to control for multiple types of preexisting psychological vulnerabilities for developing PTSD. When investigating cognitive processes in the context of distressing events, it is important to rule out alternative explanations offered by other risk factors known to be associated with adverse trauma reactions. For example, trait anxiety predicts PTSD (Tampke & Irwin, 1999), and is higher in individuals with PTSD than those without PTSD, even when the individuals are exposed to comparable traumatic events (Halligan et al., 2003). Lower intelligence is related to PTSD (Kaplan et al., 2002; Macklin et al., 1998; McNally & Shin, 1995; Silva et al., 2000; Vasterling et al., 1997). The same is true of depression (e.g. Halligan et al., 2003; Koenen, Stellman, Stellman, & Sommer, 2003; Ozer et al., 2003). Indeed, comorbidity rates of PTSD and depression are upwards of 50% (e.g. Blanchard et al., 2003; McFarlane & Papay, 1992). Lastly, trait dissociation is related to PTSD (e.g. Hyer, Albrecht, Boudewyns, Woods, & Brandsma, 1993; Murray et al., 2002). Particularly noteworthy are findings suggesting that these variables may be specifically related to intrusive phenomena. Although studies have not directly investigated relationships between intelligence, depression and intrusions, other work demonstrated that trait anxiety and trait dissociation were correlated with reexperiencing symptoms in a clinical sample (Tampke & Irwin, 1999). In addition, trait dissociation predicted intrusion development after watching a distressing film (Holmes et al., 2004, Study 2; Holmes & Steel, 2004). Overall, this research indicates that trait anxiety, depression, intelligence and trait dissociation may influence intrusion development.

Although less work has addressed this possibility, these vulnerability factors could also create differences in cognitive processing. Ehlers and Clark (2000) postulated that lower
intelligence levels could hinder individuals' ability to perform conceptual processing. Moreover, upon selecting groups of extreme scorers on "trait" data driven and conceptual processing, Halligan et al. (2002 Study 2) found that the data driven group was higher on measures of trait anxiety and dissociation, whereas the conceptual group was higher on intelligence. Known PTSD vulnerabilities could also impact memory performance. Trait anxiety and depression are associated with memory difficulties (e.g. Barker, Prior, & Jones, 1995; Burt, Zembar, & Niederehe, 1995), and higher intelligence is associated with better memory (e.g. Ryan, Rosenberg, & Heilbronner, 1984). In addition, Gray and Lombardo (2001) found that when they controlled for intelligence, reading indices (thought to reflect memory disorganization/fragmentation) were no longer related to PTSD. Furthermore, trait dissociation has also been associated with memory biases (Merckelbach, Muris, Horselenberg, & Stougie, 2000). Together, this research suggests that these variables may also create differences in cognitive processing or memory performance. To date, only one study controlled for all four variables when investigating these cognitive processes.

In addition, few studies assessed for the presence of previous traumatic experiences. Several meta-analyses demonstrated that prior traumatic events can sensitize individuals to developing PTSD (e.g. Brewin et al., 2000; Ozer et al., 2003). Prior traumatic experiences could also create differences in cognitive processing, intrusion development, or memory.

Finally, another notable limitation in the literature is that the analogue studies previously reviewed all used the same population; psychology undergraduates. It is unknown whether experimental findings can be extended beyond this population. The ultimate applied goal of this program of research is to develop strategies that medical personnel can use to protect themselves from any adverse impact of assisting patients through medical crises. With this end goal in mind,
it was important to determine the effect of adopting a medical cognitive strategy in individuals who have chosen to pursue a medical career, such as nurses. However, given that the study employed an analogue task, it was also important to select participants who would be sensitive to the medical footage. For this reason, student nurses were chosen as an analogue to more experienced nurses. In addition, nursing students also offered the advantage of being comparable to past populations on variables such as age and years of education. In summary, by including both nursing and psychology students one can directly compare the results of the main study to prior studies, and also increase the generalizability of the results to a new externally valid population.

The study addressed four central questions. What is the effect of the medical cognitive strategy manipulation on a) intrusion development, b) memory organization, and c) anxiety during the film? In addition, does the manipulation create similar effects in nursing and psychology students?

My hypotheses were the following:
1. In both groups the medical cognitive strategy condition will lead to a decrease in intrusions relative to the control condition.
2. In both groups the medical cognitive strategy condition will lead to a decrease in anxiety relative to the control condition.
3. Given the mixed literature on maladaptive cognitive processing and memory, no specific hypotheses were made regarding the effect of the manipulation on memory, although I hypothesized that the effect of the manipulation would be similar in both groups.
Method

Overview of Experiment

The experiment occurred in two sessions, one week apart. Participants within each group were randomly assigned to the experimental or control conditions before they watched a film of graphic medical procedures. Measures were collected both pre and post film, and participants completed an intrusion diary between sessions.

Participants

Participants consisted of 136 female undergraduate students (68 nursing students, 68 psychology students). Participants were recruited by posters distributed throughout the Vancouver area, and from undergraduate classes. This study had three exclusion criteria: 1) current or previous mental health treatment, 2) recent experience with a car accident and 3) recent death of close friend or relative due to a car accident. These exclusion criteria were created for two reasons. First, to minimize the inclusion of psychologically vulnerable populations. Second, recent car accident-related involvement could still create ongoing distress, and as the patient’s injuries in the film are due to a car accident, this could affect participants’ responses to the film, thereby masking any effects of the manipulation. Consequently participants who had such experiences were not included in the study. Sixteen participants were excluded on the basis of prior mental health treatment, and 9 participants were excluded on the basis of recent car accident involvement. The latter group consisted of recent personal involvement in a car accident (n=1), recent death of close friend or relative in car accident (n=7), and recent witnessed death of a stranger while trying to assist the victim following a car accident outside the participant’s house (n=1).
Participants were primarily single, and of European Canadian cultural background. The average age was 20.79 (SD = 3.25) years, and participants had completed an average of 2.28 (SD = 1.59) years of post-secondary education. Seventeen percent of participants had been in a serious car accident in the past, and 7% reported having had a close friend or relative die in a car accident. Demographic information can be seen in Table 4.

Materials

Participants viewed a film that was approximately nine minutes in length. The film was shown on a 27-inch television. The film consisted of graphic real-life footage of a patient undergoing medical treatment for injuries resulting from a car accident. While the footage is graphic, it is not sensationalistic. Upon arrival to the emergency department the patient appears relatively uninjured. It is soon apparent that the patient has extensive internal injuries, and the patient’s chest is cut open during the medical staff’s attempts to repair the damage. The patient does not survive. This footage was shown on the television show *Trauma: Life in the ER*, and the Discovery Channel granted the experimenters permission to use this footage in the research study. Thus, the content of the film is akin to what individuals can choose to watch on television in surgical shows.

Experimental Conditions

Participants within the two student groups were randomly assigned to the medical cognitive strategy condition or the control condition. Viewing instructions were based on the results of the exploratory study, and were tailored to the analogue nature of the film. Participants in the medical cognitive strategy condition were given the following instructions before viewing the film:
In a few moments you will watch real-life footage of an emergency case. While you watch the film, focus on the medical procedures that the medical staff are doing. Based on what you have learned in your classes and work experience, think about what the staff are trying to accomplish with each procedure. Are there other steps they could have taken?

Participants in the control condition were given the following instructions:

In a few moments you will watch real-life footage of an emergency case.

**Measures (See Appendix B)**

**Vulnerability measures.**

*Trait anxiety.* Trait anxiety was assessed with the State Trait Anxiety Inventory Trait subscale (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The STAI-T is a commonly used measure of trait anxiety. It consists of 20 items that are summed to create a total score reflecting severity of general anxiety. Items are answered on a scale from one to four, where one = not at all and four = very much so. The STAI has been shown to have good reliability and validity (Spielberger et al., 1983). In the current sample internal consistency was good, α = .93.

*Intelligence.* Intelligence was assessed with the Wonderlic Personnel Test (WPT: Wonderlic, 1999). This is a 50-item written test of general cognitive ability, where the items successively increase in difficulty. A variety of domains are assessed, including similarities and differences, abstraction, general knowledge, vocabulary, arithmetic and visuospatial tasks. Participants have 12 minutes to complete the test. A set formula is used to compute the test score, and scores can range from 0 to 50. The Wonderlic has demonstrated good reliability and
validity, and correlates .92 with the WAIS-R. In addition, the Wonderlic has been extensively normed (Wonderlic, 1999).

Depression. Depression was assessed with the Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a commonly used measure of depressive symptoms. It consists of 21 items that are summed to create a total score reflecting severity of depression over the past two weeks. Items are answered on a scale from zero to three. The BDI-II has been shown to have good reliability and validity (Beck et al., 1996; Dozois, Dobson, & Ahnberg, 1998; Steer, Ball, Ranieri, & Beck, 1997; Steer & Clark, 1997). In the current sample, $\alpha = .87$, which indicates adequate internal consistency.

Trait dissociation. Trait dissociation was assessed with the Dissociative Experiences Scale (DES; Berstein & Putnam, 1986). The DES is a widely used index of trait dissociation. Twenty-eight items are rated on the percentage of time they occur (0-100%), and an average score for all items is calculated. The DES has demonstrated good validity and reliability (e.g. Carlson & Putnam, 1993). In the current sample, $\alpha = .95$, which indicates adequate internal consistency.

Prior traumatic experiences. Prior traumatic experiences were assessed with the criterion A list of the Posttraumatic Diagnostic Scale (PDS; Foa, 1995). This list includes 12 traumatic events (including a category for “other”) that prior research has shown can lead to PTSD, such as assault and natural disasters. The PDS has good diagnostic agreement with the Structured Clinical Interview for DSM-IV and has been shown to have good internal consistency and test–retest reliability (Foa, Cashman, Jaycox, & Perry, 1997). Participants indicated whether they had experienced each of the traumatic events. The number of events endorsed was summed to create a total score of number of prior traumatic experiences (cf. Holmes & Steel, 2004).
Experimental checks

*Medical cognitive strategy.* The degree to which the medical cognitive strategy was used during the film was assessed with the Medical Cognitive Strategies Scale (MCSS). The MCSS was created for the purpose of this study based on the viewing instructions and anecdotal reports in the exploratory study. Nine items are rated on a scale of one (not at all) to five (extremely).

The items written to reflect the cognitive strategy were subjected to a principal components analysis with a Promax rotation, extracting components with Eigenvalues greater than 1.0. Both the scree plot and Eigenvalues revealed two components that accounted for 55% of the shared variance. Item loadings for the two components can be seen in Appendix C. The first component, medical thinking, reflected relating the film content to prior medical knowledge and thinking about how to treat the injuries, and accounted for 42% of the variance. It consisted of five items, e.g. “Based on the patient’s injuries, I thought about what medical procedures had first priority”, and “I thought about how I would be able to apply my training in this situation”.

The second component, medical focus of attention, reflected focusing attention on the medical procedures, and accounted for 13% of the variance. It consisted of four items, e.g. “I focused on how the medical staff were treating the patient’s injuries”, and “I focused on the instruments the medical staff were using”. For both subscales, items are summed to create a total subscale score. The internal consistencies for the two of the components were good, $a = .76$ and $.74$ for medical thinking and medical focus of attention, respectively. The two subscales correlated with each other at $r = .54$, indicating that the two subscales measure overlapping but distinct constructs. The two subscales correlated $r = .40$ and $r = .61$, respectively, with the Conceptual Processing Scale (Halligan et al., 2002).
Attention. Participants were asked how much attention they paid to the film, on a scale of zero (no attention at all) to ten (complete attention) (cf. Holmes et al., 2004).

Demand characteristics. Participants were asked to rate what effect they predicted their viewing instructions had on intrusions of the kind they reported in the diaries, in comparison to watching the film with no instructions. A 21 point scale was used, anchored with \(-10 = \) would extremely reduce intrusions and \(+10 = \) would extremely increase intrusions (cf. Holmes et al., 2004).

Prior frequency of medical footage exposure. Prior familiarity with televised surgical footage could affect individuals’ responses to the current film. In order to assess participants’ prior tendency to watch medical footage, participants were asked “To what extent is this statement true of you: I watch surgical TV programs, for example like those on The Learning Channel”, on a scale of zero (never) to seven (almost everyday).

Dependant variables

Intrusions

Intrusion diary. Intrusions were assessed in two ways. First, participants completed an intrusion diary between the two sessions. Before leaving the first session, intrusions were defined for participants, and any questions regarding the definition of intrusions were answered. Participants were asked to record the date and time for every spontaneous intrusive thought/image of the film they had, to rate how distressing the intrusion was, to give a description of its content, and to indicate whether the intrusion was a thought, image, or combination of the two. This method has been used successfully in the past (e.g. Holmes et al., 2004; Holmes & Steel, 2004). For this study we were only interested in the intrusions that participants rated as being distressing (i.e. rated over zero out of ten on the distress scale).
number of distressing intrusions that were recorded in the diary was summed to create an intrusion frequency total score.

At session two, participants described in detail the most significant intrusive recollection they had over the week, and answered questions about various qualities of that intrusion. Participants were also asked to rate their degree of compliance in intrusion monitoring. They were asked “to what extent is this statement true of you: I was often unable (or forgot) to record my spontaneous memories/images/thoughts in the diary chart”, given a rating scale of zero (not at all true of me) to ten (extremely true of me) (cf. Holmes et al., 2004).

*Self-report intrusion scale.* Intrusions were also assessed with the intrusion subscale of the Impact of Event Scale (IES; Horowitz, Wilner, & Alvarez, 1979). The IES intrusion subscale consists of seven items measuring intrusive symptoms over the week. “Trauma” wording was changed to references to the film. Items are answered on a scale from “not at all” to “often”. The IES has been shown to have good reliability and validity (e.g. Horowitz et al., 1979), and has been associated with both self-report and structured clinical interview measures of PTSD (Neal et al., 1994). In the current sample, $\alpha = .74$, which indicated adequate internal consistency. The diary intrusion frequency and IES intrusion scores correlated at $r = .69$.

**Memory**

*Objective memory measures*

*Trauma recall.* Participants were asked to describe (in writing) everything they could recall about the film, paying attention to the correct sequence of events. They were given up to 10 minutes to complete this task. Pilot work suggested that 10 minutes was adequate for participants to complete this task, and this time limit was comparable to prior analogue studies (Kindt et al., 2004 Study 2; Halligan et al., 2002). This memory task was completed first in
session two to prevent contamination from the other memory measures. This narrative was compared to a list of 90 events that occurred in the film (see Appendix D), and was coded for number of events remembered (content) (cf. Halligan et al., 2002) and number of events remembered in the correct order (coherence) (cf. Halligan et al., 2002; Wegner, Quillian, & Houston, 1996).

For each event they reported, participants received one point for content if they captured the gist of the event. For coherence, a pairwise sequential comparison was conducted on all the events reported in the narrative recall. For each pairwise comparison, participants received one point for correct sequencing if the event they described followed in the film the event that they just previously described, i.e. if their description of event B followed their description of event A. If this was not the case, and the event occurred in the film before the event they just described, i.e. their description of event A followed their description of event B, this was given one point for sequencing error. In other words, the rater used a vertical sequential list of the film’s events, and whenever the rater continued down the list it was scored as correct sequencing, whereas whenever the rater had to go back up the list, this was scored as incorrect sequencing. Any events the participant did not report were not scored, therefore this analysis reflects coherence only for what the participant recalled (Wegner et al., 1996).

A sequence-recall ratio was then created, which was the number of correctly sequenced events to the sum of the number of correctly sequenced events and the number of incorrectly sequenced events (Wegner et al., 1996). The narrative rater was blind to group and condition status. A second blind rater rated 25% of the narratives to establish inter-rater reliability. The intra-class coefficient was .96 for content, and .80 for coherence, which indicates that adequate inter-rater reliability was achieved.
Temporal sequence task. Participants were given 20 slips of paper, each of which listed one event that occurred in the film. Each participant was given the slips in the same fixed random order. Participants were asked to arrange the slips of paper vertically in the order that they occurred in the film, with the first event at the top. The order that participants arranged the events in was recorded, and scored for the number of events arranged in the correct order (cf. Wegner et al., 1996). Each event was compared to the event participants thought preceded it. For each pairwise comparison, participants received one point for correct sequencing if what they said was the second event directly followed what they said was the first event in the film, if the third event directly followed what they said was the second event, and so on. This memory task was completed last in the sequence of memory measures to prevent contaminating the other memory measures.

Subjective memory measure

Self-reported memory disorganization. The subscale “disorganization” was used from the Trauma Memory Questionnaire (Halligan et al., 2003). This scale consists of five self-report items that assess the extent to which the participant’s memory for the trauma is incomplete or disorganized. “Trauma” wording was changed to references to the film. Sample items include “I feel that my memory for the film is incomplete” and “I have trouble remembering the order in which things happened during the film”. This scale has demonstrated adequate internal consistency, α = .88, and has been shown to discriminate between current and no PTSD groups (Halligan et al., 2003). In the current sample α = .89, which indicates adequate internal consistency.
Anxiety

Emotional state change due to film. Changes in emotional state due to watching the film was assessed with the State Trait Anxiety Inventory, State subscale (STAI-S; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The STAI-S is a commonly used measure of current anxiety. It consists of 20 items that are summed to create a total score reflecting severity of current anxiety. Items are answered on a scale from one to four, where one = not at all, and four = very much so. The STAI-S has been shown to have good reliability and validity (Spielberger et al., 1983). In the current sample internal consistency was good, α = .93.

Procedure

Participants were telephone screened before being invited to participate in the experiment. During the telephone screen, participants were informed that the study included watching a short film of an injured person being attended to in an emergency room, and that the film was graphic. The experiment was conducted by two female personnel; J. Laposa, a clinically trained doctoral student with experience working with distressed individuals, and an undergraduate research assistant, who was trained in what to do should a participant become very distressed after viewing the film. The second experimenter was blind to experimental hypotheses about the manipulation.

The experiment was conducted over the course of two sessions. At session one, participants were informed again of the graphic nature of the film and that they could withdraw from the study at any point, and participants then gave written consent. Pilot work revealed that based on what they were told during the telephone screen and in the consent form, participants felt adequately prepared for what they saw in the film. Participants were then randomly assigned to one of two experimental conditions. They completed the STAI-T, BDI-II, DES, and STAI-S
measures, and then were given the viewing instructions and watched the film. All participants completed the experiment individually, and were alone during the film. After the film, participants completed the STAI-S again, rated the attention item, and completed the MCSS. Participants were then given the intrusion diary to complete over the week. Before leaving the first session, the experimenter, using scripted questions and a neutral tone and body language, checked in with the participant as to how she was doing, to ensure that no one left the experiment in an extreme state of emotional distress.

Session two took place one week after session one. The intrusion diary was collected, and participants completed the memory free recall task, Trauma Memory Questionnaire, and temporal sequence task. They then completed the IES intrusion subscale, made their diary compliance ratings, described in detail their most significant intrusion over the week, and answered the effect they predicted their viewing instructions had on intrusion frequency. Participants then completed the Wonderlic, and answered questions about their prior tendency to watch medical footage, car accident involvement, and traumatic experiences. As a token of our appreciation for their participation, psychology participants received course bonus credits, and nursing students received financial compensation ($40). Participants were fully debriefed, and given contact details that they were invited to use should they feel distressed from having been in the experiment. However, no participants contacted the experimenters after completing the study.

Results

An examination of the data for potential univariate and multivariate outliers revealed no multivariate outliers (Tabachnick & Fidell, 2001). However, ten univariate outliers were detected. One univariate outlier was found on each of the following variables: medical cognitive strategy thinking subscale, IES intrusion total score, intrusion diary frequency score, depression,
and trait dissociation. Three univariate outliers were found on the attention score, and two on the diary compliance score. These scores were subjected to the Winsorizing procedure, whereby each outlier was replaced with its closest non-outlier score, and one degree of freedom was dropped (Tukey, 1977). All reported analyses use the Winsorized scores.\textsuperscript{4} An alpha level of .05 was used for all analyses.

\textit{Preliminary Analyses}

\textit{Demographics.} A 2 (group) by 2 (condition) multivariate analysis of variance (MANOVA) conducted on age and years of education revealed no significant difference for group, $F(1,131) = 1.03, p > .05$, or condition, $F(1,131) = 0.35, p > .05$. The group by condition interaction was also not significant, $F(1,131) = 0.23, p > .05$. Chi square analyses on cultural background and marital status revealed no differences between the groups, $\chi^2(3) = 2.58, p > .05$, and $\chi^2(1) = 0.00, p > .05$, respectively, or conditions, $\chi^2(3) = 0.22, p > .05$, and $\chi^2(1) = 0.70, p > .05$, respectively. Chi square analyses on whether participants had been in a serious car accident, and whether they had had a close friend or relative die in a car accident also revealed no differences between the groups, $\chi^2(1) = 0.05, p > .05$, $\chi^2(1) = 0.93, p > .05$, respectively, or conditions, $\chi^2(1) = 0.47, p > .05$, $\chi^2(1) = 0.22, p > .05$, respectively. Together, these results suggest that the groups and conditions were comparable on demographic characteristics. A 2 (group) by 2 (condition) ANOVA was conducted on number of months worked as a nurse. Results revealed, as expected, a significant group effect, $F(1,132) = 42.32, p < .000$, where nursing students had worked more months as a nurse. The condition, $F(1,132) = 0.07, p > .05$, and group by condition interaction effects, $F(1,132) = 0.07, p > .05$ were not significant.

\textit{Vulnerability measures.} A 2 (group) by 2 (condition) MANOVA was conducted on the STAI-T, Wonderlic, BDI-II, DES, and prior traumatic experiences scores. Results revealed no
significant multivariate effects for group, $F(5,126) = 1.83, p > .05$, condition, $F(5,126) = 0.76, p > .05$, or group by condition interaction effects $F(5,126) = 0.41, p > .05$. This suggested that the groups and conditions were comparable on measures that are established predictors of PTSD (See Table 5).

Film Manipulation and Experimental Checks

Medical cognitive strategy. A 2 (group) by 2 (condition) MANOVA was conducted on the two MCSS components. Results revealed a significant multivariate main effect for group, $F(2, 130) = 15.96, p < .000$ and condition, $F(2, 130) = 14.87, p < .000$. The group by condition interaction was not significant, $F(2, 130) = 0.32, p > .05$. Follow-up univariate analyses demonstrated that for each of the two components, medical thinking and focus of attention, a significant main effect for group, $F(1, 131) = 32.13, p < .000$, and $F(1, 132) = 6.11, p < .05$, respectively, and condition $F(1, 131) = 29.58, p < .000$, and $F(1, 132) = 9.31, p < .01$, respectively, emerged. Nursing students reported using the medical strategy more during the film in comparison to psychology students, and participants in the medical condition reported using the strategy more than participants in the control condition (See Table 6).

Attention during the film. A 2 (group) by 2 (condition) ANOVA was conducted on the amount of attention participants reported paying to the film. Results revealed no group, $F(1, 129) = 0.13, p > .05$, condition, $F(1, 129) = 0.68, p > .05$, or group by condition interaction effects, $F(1, 129) = 0.35, p > .05$. This indicates that all participants paid comparable levels of attention to the film.

Experimenter check and demand characteristics. To examine whether the results were influenced by the experimenter, a one way (experimenter) MANOVA was conducted on all dependant variables and the Medical Cognitive Strategies Scale. Results revealed no significant
experimenter effect, $F(1, 132) = 0.99, p > .05$. A 2 (group) by 2 (condition) ANOVA was conducted on participants' predicted effect of the viewing instructions. Results revealed no group, $F(1, 132) = 0.03, p > .05$, condition, $F(1, 132) = 0.01, p > .05$, or group by condition interaction, $F(1, 132) = 0.05, p > .05$. Together, these two sets of results indicate that the pattern of results is not due to experimenter effects or to demand.

*Frequency of medical footage exposure.* A 2 (group) by 2 (condition) ANOVA was conducted on participants' responses to, in general, how frequently they watch surgical TV programs. Results revealed a significant effect for group, $F(1, 132) = 13.62, p < .001$. As might be expected, nursing students tended to watch surgical television programs more frequently than psychology students. The condition $F(1, 132) = 0.01, p > .05$, and group by condition interaction effects, $F(1, 132) = 0.64, p > .05$, were not significant. To control for the potential effects of prior tendency to watch surgical TV programs on the results, all analyses were repeated using these scores as a covariate. The results revealed that controlling for prior tendency to watch surgical programs affected one of the results; the univariate group effect on the medical focus of attention component of the manipulation check was no longer significant, $F(1, 131) = 3.33, p > .05$.

**Main Analyses**

*Intrusions.* Overall, the mean number of distressing intrusions over the week was 2.15 (SD = 2.60), with a range of 0-13 intrusions. Sixty-eight percent of participants reported having at least one distressing intrusion during the week. The overall mean rating for intrusion diary compliance was 0.65 (SD = 1.06), which indicates that most intrusions that occurred over the week were recorded. A 2 (group) by 2 (condition) ANOVA was conducted on diary compliance. Results revealed no significant group, $F(1, 130) = 2.09, p > .05$, condition, $F(1, 130) = 0.23, p >$
.05, or group by condition interaction effects, $F(1,130) = 0.10, p > .05$. This indicates that all participants were comparable in adhering to recording their intrusions in the intrusion diary.

Forty-seven percent of participants who had distressing intrusions reported that their most significant intrusion took the form of an image, 44% reported that it was a combination of an image and a thought, and 9% reported it was a thought only. Of those with visual intrusions, 59% described it as a static snapshot, and 41% described a moving film sequence. Sixty-six percent reported it was a detail as opposed to an entire scene. Examples of intrusions include:

The man was lying on the stretcher and blood was dripping out of his chest onto the floor. He had the metal clamp in his side and towels were thrown onto the ground to mop up the blood.

and

I saw a package of cigarettes that had a picture of lungs on it. I instantly had a mental image of the patient's exposed heart. There were no other people or objects in the image. The rest of the patient's body, including his face, was absent. Only the wound and contents inside the chest.

A 2 (group) by 2 (condition) ANOVA conducted on the amount of distress associated with the most significant intrusion ($M = 3.24, SD = 2.30$) revealed no significant group, $F(1,88) = 1.41, p > .05$, condition, $F(1,88) = 0.26, p > .05$, or group by condition interaction effects, $F(1,88) = 0.82, p > .05$. This indicates that participants experienced their intrusions as equally distressing.

We hypothesized that the experimental condition would decrease intrusion frequency. A 2 (group) by 2 (condition) MANOVA was conducted on intrusion diary frequency and IES intrusion total scores. Results revealed a significant main multivariate effect for condition, $F(2,129) = 3.30, p < .05$. The group, and group by condition interaction multivariate effects, were
not significant, $F(2,129) = 0.37, p > 0.05$, and $F(2,129) = 0.80, p > 0.05$, respectively. Follow-up univariate analyses revealed a significant main effect for both intrusion diary frequency, $F(1,131) = 5.61, p < 0.05$, and IES intrusion scores, $F(1,131) = 5.55, p < 0.05$. For both intrusion measures, participants in the medical condition experienced fewer intrusions than participants in the control condition (see Figure 1). The experimental manipulation was successful in decreasing intrusions in both nursing and psychology students, thus our prediction was confirmed (See Table 6). To determine the magnitude of these effects, experimental effect sizes were calculated. The condition effect was .41 for the intrusion diary frequency, and .40 for the IES intrusion score. This demonstrates that the effect of the manipulation on decreasing intrusions was comparable in both measures, and was small to medium in magnitude.

**Memory.** To examine our second question, the effect of the medical cognitive strategy on memory organization, a 2 (group) by 2 (condition) MANOVA was conducted on the free recall content and coherence ratings, temporal sequence task, and self-report memory disorganization scale scores. Results did not reveal a significant multivariate effect for group $F(4,129) = 2.18, p > 0.05$, condition, $F(4,129) = 0.71, p > 0.05$, or group by condition interaction, $F(4,129) = 0.71, p > 0.05$. (See Table 6). Therefore, the experimental manipulation did not have an effect on memory for the film.

**Emotional state change due to film.** Watching the film resulted in a significant increase in anxiety. A 2 (group) by 2 (condition) by 2 (pre-film vs. post-film) repeated measures ANOVA conducted on the STAI-S revealed a significant main effect of time, $F(1,132) = 159.32, p < 0.000$. There were no significant interactions by group, $F(1,132) = 0.18$, condition, $F(1,132) = 1.88$, or group and condition, $F(1,132) = 0.04$, all $ps > 0.05$. Therefore, the groups and conditions experienced comparable increases in anxiety when watching the film. (See Table 6). Thus, our
prediction that the experimental manipulation would lead to a reduced change in anxiety was not confirmed, although the means were in the predicted direction.

The between group results revealed a significant effect of group, $F(1,132) = 7.24, p < .01$. The condition, $F(1,132) = 0.03, p > .05$, and group by condition interaction effects, $F(1,132) = 0.37, p > .05$, were not significant. Psychology students had higher baseline state anxiety and post-anxiety scores than nursing students. To control for the potential effects of pre-state anxiety on the results, all analyses were repeated using pre-state anxiety scores as a covariate. The results revealed that controlling pre-state anxiety affected one of the results; the univariate group effect on the medical focus of attention component of the manipulation check was no longer significant, $F(1,131) = 3.62, p > .05$.

Discussion

The current study investigated the effect of adopting a medical cognitive strategy while watching a distressing film. The results provided partial support for cognitive theories of intrusions. In particular, participants in the experimental condition reported having fewer intrusive recollections over the week. In contrast, no support was found for the putative role of memory disorganization. These findings are discussed below.

According to cognitive theorists, intrusive memories of traumatic events have their origin in how information during the event is processed. Cognitive writers believe that cognitive processing, memory for the event, and intrusions are interrelated, although they differ in their hypotheses about how these variables are involved (e.g. Brewin et al., 1996; Ehlers & Clark, 2000). The vast majority of research on cognitive processing focused on maladaptive forms of processing, such as peritraumatic dissociation, data driven processing, and lack of self-referent processing. The absence of research on functional cognitive strategies was particularly striking
because the least common outcome of experiencing a traumatic event is the development of PTSD. In order to investigate functional strategies two studies were conducted.

The first study involved exploratory interviews with health care workers regarding cognitive strategies they use during medical crises. Results from the interviews highlighted the use of strategies designed to maintain a medical orientation toward the event, i.e., to selectively focus on medical aspects of the situation, assess the medical crisis, look for clues as to what is causing the injuries, and relate this information to their prior training and work experiences to bring up a prioritized step by step plan of how to medically treat the problems. In the context of cognitive theories of peritraumatic processing, such strategies appeared to enhance the likelihood that information about the event would be linked to and interpreted in terms of existing knowledge structures developed from professional training. Brewin, in his dual representation model, proposed that intentionally retrievable memories, as opposed to spontaneous intrusive memories, are created by high degree of conscious processing of information, such that this information is contextually linked to other autobiographical memories. Ehlers and Clark (2000) hypothesized that conceptual processing, which they define as organized processing of the meaning of the situation and placing it into context, would create memories that were properly elaborated within the autobiographical memory store, thereby reducing the likelihood of subsequent intrusions. The strategies outlined in the first study would seem to result in the type of cognitive processing described in those models.

The second study examined the effect of adopting these strategies on the cognitive sequelae of distressing events. Before watching real-life footage of an emergency case, instructions were given to participants in the experimental condition. They were asked to a) focus on the medical procedures that the medical staff were doing, and b) think about what the
staff were trying to accomplish with each procedure, and other steps they could have taken, based on what they had learned in their classes and work experience.

The major finding of this study was that participants in the medical cognitive strategy condition reported fewer intrusions over the week than participants who did not receive viewing instructions. To our knowledge, this is the first study to demonstrate that a cognitive manipulation reduced intrusive recollections of an emotionally distressing event. This will be discussed further below.

Some cognitive theorists proposed that cognitive processing affects the degree of organization or fragmentation of the individual's memory for the traumatic event, and that intrusions arise as a result of disorganized or fragmented memory. In this case, one would expect to find a difference in memory organization between the experimental and control conditions. Our results did not support this relationship. This result adds to a growing body of clinical and analogue studies that either failed to support any association between processing and memory disorganization/fragmentation, or could not replicate the relationship across their memory measures (Halligan et al., 2002; Halligan et al., 2003 Study 2; Kindt & van den Hout, 2003; Kindt et al., 2004 Study 1; Study 2; Zoellner et al., 2002). It is possible that our null finding is due to inadequately sensitive memory measures. However, this explanation is less plausible given that failure to support the relationship is not unique, other analogue studies found no association between recognition memory and cognitive processing or intrusion frequency (Holmes et al., 2004 Study 2; Study 3), and memory biases in individuals with PTSD have been shown across explicit and implicit measures (e.g. Zeitlin & McNally, 1991).

What is the underlying mechanism responsible for the decreased intrusion frequency? One possibility was anxiety. Theories of intrusion development often start with the premise that
it is the overwhelming nature of the traumatic event that leads to maladaptive cognitive processing. In addition, participants in the exploratory study overwhelmingly reported that using a medical orientation was highly effective in controlling their own emotions. The results of the current study did not support anxiety as the mechanism. This may be an artifact of measuring anxiety only before and after viewing the film. In particular, the final event in the film involves the patient dying. This clearly distressing last incident may have affected participants in both conditions equally, and assessing state anxiety immediately after this event may have obscured anxiety differences that occurred during the film. A better anxiety measure would have included online assessment, which may have revealed that when participants were adopting the experimental instructions, anxiety did decrease. By adopting the experimental strategy, it is likely that participants perceived the film in a less emotional way, and perception of the affective quality of a stimulus can impact one’s felt emotion (Russell, 2003). However, there may have been some exceptions while viewing the film such that some frames slipped by into being encoded in an emotional way. This could explain why overall the experimental group reported fewer intrusions, yet when they did have intrusions, rated them as equally distressing as those reported by the control group. It would be valuable for future research to use online, real-time measures of emotion, and to investigate how perception of affective quality is related to intrusions.

Another explanation for the experimental effect on intrusions rests on the premise that what ends up being represented in memory depends on what information you take in. In the experimental condition, participants were instructed to specifically use a medical orientation, thereby placing the film in the context of medical procedures. This may have decreased the number of types of stimuli participants associated with the film. For example, the instructions
may have decreased participants' tendency to relate information presented in the film to other things such as tragic injuries, cars, loss of a loved one, etc. Therefore the manipulation may have created fewer types of memory representations that could then be triggered as intrusions over the week.

Competing explanations of intrusion monitoring compliance, experimental demand, prior tendency to watch medical television shows, attention during the film, and known predictors of PTSD, such as trait anxiety, depression, intelligence, trait dissociation, and prior traumatic experiences, were all ruled out as both conditions were comparable on these measures. This increased our confidence that the effect on intrusions was due to the experimental manipulation. However, the results of this study cannot completely resolve the question of why the manipulation decreased intrusion frequency.

It is noteworthy that the current study is one of very few studies to demonstrate that an experimental manipulation can decrease intrusion frequency. Brewin and colleagues reported a series of studies where instructing participants to concurrently perform a motor visuospatial tapping task while watching a distressing video led to fewer intrusions over the week (Brewin & Saunders, 2001; Holmes et al., 2004 Study 1; Study 2). These researchers interpreted this finding in the context of Brewin et al.'s (1996) dual representation model, suggesting that performing the motor task competed for visuospatial resources in the SAM memory system. They believed that this selective interference with the SAM system disrupted image-based encoding, and therefore these representations of the film were less likely to be triggered as intrusions during the week.

The cognitive strategy manipulation used in the current study differed from Brewin's tapping manipulation in several ways. It was not based on motor movements, nor was it a task that divides attention. Instead, the medical cognitive strategy manipulation specifically instructed
participants to engage with the film, attending to and thinking about specific aspects of it. It is
unclear how our findings relate to those of Brewin and colleagues, although it is unlikely that the
results of the current study can be explained in terms of a resource competition, selective
interference model.

One of the main theoretical implications of this study is that it calls into question the
importance of memory disorganization/fragmentation. In prior research, positive relationships
between cognitive processing and memory disorganization/fragmentation were most frequently
found with subjective memory measures. Indeed, several studies that reported a positive
relationship between processing and memory were unable to demonstrate this effect consistently
across objective and subjective memory measures, either in clinical (Halligan et al., 2003 Study
2) or analogue studies (e.g. Halligan et al., 2002 Study 2; Kindt & van den Hout, 2003; Kindt et
al., 2004 Study 1, Study 2). The difference in findings between indices of objective and
subjective memory has also been found in non-traumatized populations, and underscores the
notion that objective memory performance may not always coincide with subjective memory
evaluations (e.g. Ponds, van Boxtel, & Jolles, 2000; Shimamura & Squire, 1986). As previously
noted, subjective memory measures may be contaminated with distress, therefore subjective
memory disorganization may reflect distress (see also Kindt et al., 2004), as opposed to being a
result of impaired cognitive processing and a basis for intrusions.

Although the current study did not test for mediation, together with prior studies, the
current results call into question theories asserting that memory disorganization/fragmentation
mediates the relationship between cognitive processing and intrusions. Despite the longevity of
this theory of intrusion development, and the conviction with which it is stated, only one study
formally examined mediation. Halligan et al. (2002, Study 2) tested the pathway from data-
driven processing to disorganized memory to reexperiencing symptoms. They found that self-reported memory disorganization, but not objective memory measures, was a mediator of the processing-reexperiencing relationship. Note, however, that only one of four studies found evidence for any relationship in the predicted direction between memory disorganization and intrusive imagery (Halligan et al., 2002, Study 1; Study 2; Harvey & Bryant, 1999; Zoellner et al., 2002). Furthermore, the researchers that did find a significant relationship were unable to consistently replicate this across their memory measures (Halligan et al., 2002 Study 2).

Moreover, several analogue studies, including this one, show that various types of cognitive processing can affect intrusion development without affecting memory disorganization/fragmentation. Peritraumatic dissociation and data driven processing were associated with more frequent intrusions without also being associated with objective memory disorganization or fragmentation (Halligan et al., 2002 Study 2; Kindt et al., 2004 Study 1; Study 2). These studies indicate that intrusion frequency is not related to the organizational/fragmentary quality of the memory accessible to triggering by matching sensory cues of stimuli that were present during the distressing event. These studies also rule out the explanation that more frequent intrusions increase memory disorganization/fragmentation at follow-up. In addition, another series of experimental studies found an effect on intrusions without similarly finding an effect on measures of recall or recognition (Brewin & Saunders, 2001; Holmes et al., 2004, Study 1; Study 3). These studies indicate that the manipulations did not have their effect on intrusion development via interference with the amount of information encoded and/or retrieved (e.g. Holmes et al., 2004). Taken together, these findings call into question the pathway of intrusion development suggested by several cognitive theorists, and
suggest that memory disorganization/fragmentation or general memory performance does not mediate the relationship between cognitive processing and intrusions.

Nevertheless, research has yet to determine the active mechanism of cognitive processing during a traumatic event. Cognitive theorists presume that cognitive processing affects intrusion development because it influences the individual’s mental representation of the event (e.g. Holmes et al., 2004). Since the early 1900s, clinicians such as Janet have argued the existence of a relationship between dissociation and memory fragmentation (van der Kolk & Fisler, 1995). More recent theories introduced different forms of cognitive processing, and suggested a relationship with memory disorganization. Both leading PTSD theories suggested that contextual linkage to other autobiographical memories is the mechanism by which functional cognitive processing impedes intrusion development (Brewin et al., 1996; Ehlers & Clark, 2000). However, if our intrusion finding was due to increased contextualization, we should have also found corresponding superior performance in the experimental condition on memory measures requiring temporal ordering. Kindt et al. (2004) drew from Mandler’s (1979) identification of two dimensions of organization, integration and elaboration, to suggest that perhaps the key variable of interest is not coherence of memory, but rather the degree of elaboration with other units in memory. However, work by Graf and Mandler (1984) suggests that elaboration increases, not decreases, retrievability, which indicates that the experimental effect was not due to increased elaboration. In short, we have yet to determine what aspect of the representation in memory is important. Although the data available in the current study does not shed light on the answer to this question, this study does provide further impetus for the generation of alternative explanations regarding how cognitive processing influences intrusion development.
The results of this study must be tempered with a reminder that the study had some limitations. First, it is unclear how accurately individuals can report on their internal cognitive processes. Our experimental manipulation check relied on individuals retrospectively recalling what they did cognitively immediately after they viewed the film. Ideally, a measure of adherence to a cognitive strategy should occur online. In future studies, online measurement of cognitive processing using brain imaging techniques would likely be informative in confirming adherence to the manipulation, and in discerning the areas of the brain involved in different types of cognitive processing.

Second, both studies consisted only of female participants who had never received mental health treatment, and had not recently been involved with car accidents. Further studies are needed to determine whether these findings generalize past this group of individuals. Lastly, although the film is a distressing depiction of a real-life traumatic event, there is necessarily less impact of watching a film in a laboratory environment as opposed to being a participant in a medical crisis. Medical crises are complex events, and dealing with them involves a complex integration of cognitive processes, motor activities, and co-worker cooperation. Consequently, there may be variables that impact cognitive processing, such as feelings of personal responsibility, that cannot be recreated through watching others deal with a medical crisis. However, the film itself, graphic real-life footage of a medical emergency, was perceived as distressing and created a significant increase in anxiety. The resulting intrusions of the film that arose over the week were described as distressing, largely visual in nature, consisting of whole scenes, details, static snapshots and moving sequences (cf. Holmes et al., 2004). These intrusion qualities are similar to those reported by individuals with PTSD (e.g. Ehlers et al., 2002; Ehlers & Steil, 1995). In addition, factor analyses demonstrate that PTSD symptoms are dimensional
(Maes et al., 1998). Together, these point to the validity of using this paradigm to investigate the effect of using a medical cognitive strategy. Nevertheless, further research using employed medical personnel is needed before generalizations about the utility of this strategy can be made to naturalistic settings.

These limitations notwithstanding, there are several major methodological strengths of the current study. By using a distressing film paradigm, we were able to control event characteristics, and to manipulate a cognitive strategy, both of which have been lacking in clinical studies. Similarly, in comparison to clinical studies, the analogue study confers the advantage of more timely assessment of cognitive processes, as opposed to asking participants to retrospectively report on their cognitive processing during a traumatic event that occurred days to years ago. This study also employed more than double the sample size per experimental condition of prior analogue studies, which increased our confidence in our conclusions. The film we used had not only external validity, but also had a single storyline, as opposed to several unrelated clips, which allowed for greater understanding of the effects of the manipulation on memory. In prior studies, confusion as to the sequencing of unrelated scenes may not have reflected problems in cognitive processing (Halligan et al., 2002). We used several measures employed in prior research, which promoted direct comparison of our findings. In addition, the use of multiple measures of dependant variables increased the robustness of our findings. Of particular importance is the demonstration of an intrusion effect across two measures of intrusions, one of which was a widely used and psychometrically sound measure. Other research employing intrusion diaries has been limited by solely relying on an intrusion diary measure because it does not offer standard psychometric information on reliability and validity (Holmes et al., 2004).
The current study extends the existing literature in several ways. It demonstrated that it is possible to manipulate a functional cognitive strategy and decrease intrusions. As noted in the introduction, studies using manipulations to attempt to create peritraumatic dissociation, data driven or conceptual processing were unsuccessful in affecting intrusions. In addition, this is the first study to examine the effect of a cognitive manipulation in participants that are comparable on other measures of psychopathology and prior traumatic experiences, and to demonstrate the effect of a functional cognitive manipulation in relation to a control group. The current study also shows it is possible to decrease intrusions in ways other than performing a concurrent motor task.

Of particular importance is the ecological validity of the medical cognitive strategy manipulation in terms of potentially offering a strategy for health care workers to use to decrease the negative intrusive sequelae that can result from routinely dealing with horrifying events on the job. Moreover, this is the first study to extend analogue research on cognitive processing beyond psychology students to not only an additional population, but to a more externally valid population for whom the manipulation was directly relevant to their career path, thereby increasing the generalizability of the results. One of the next steps in this line of research would be to elucidate the individual and situational factors that determine the occurrence and efficacy of functional processing.

In summary, the results of this study have three main implications. First, it is possible to have functional cognitive strategies that can decrease intrusion frequency following exposure to distressing stimuli. Second, it is possible to teach individuals to use these strategies. This is particularly important given that the overwhelming majority of medical professionals in our exploratory study reported that their training did not provide them with information on helpful and unhelpful cognitive strategies to use during medical crises. The ultimate clinically applied
goal of this line of research is to develop strategies that medical personnel can use to protect themselves from any adverse impact of assisting patients through medical crises. If the findings of the current study are replicated and shown to be effective in employed medical personnel, then the medical cognitive strategy may be taught in training programs as a possible way to prevent intrusive sequelae following critical medical incidents. Third, cognitive theories of PTSD need to be expanded to include alternative explanations regarding the mechanism through which cognitive processing leads to intrusion development.
Footnotes

1The University of British Columbia Behavioural Research Ethics Board granted ethics approval for this study.

2Information on additional aspects of workplace trauma not intended for use in the current study was also collected during the course of the interview.

3The University of British Columbia Behavioural Research Ethics Board granted ethics approval for this study.

4Winsorized and unadjusted scores resulted in the same patterns of significance.

5A recent factor analysis of the Impact of Event Scale revealed multidimensionality in the IES intrusion subscale, where the two sleep disturbance items split off from the other intrusion items to form a separate factor (Andrews, Shevlin, Troop, & Joseph, 2004). Analyses using the original 7-item intrusion subscale, or using the 5-item intrusion subscale described by Andrews et al. demonstrated the same pattern of significance.
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Table 1

Summary of Research Findings Relating Cognitive Processing to Memory Disorganization/Fragmentation and Intrusions/Reexperiencing

<table>
<thead>
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<th>Variable</th>
<th>Memory disorganization/fragmentation</th>
<th>Intrusions/reexperiencing</th>
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<tr>
<td></td>
<td>self-report single item</td>
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<td>self-report scale</td>
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<td>experimenter rating of narrative</td>
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<td>content (# of events recalled)</td>
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<td>coherence (recalled in correct order)</td>
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<td>narrative coding</td>
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<td>reading indices</td>
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<td>reexperiencing symptoms</td>
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<td>self-report intrusive qualities</td>
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<td>intrusion frequency</td>
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<td>flashback frequency</td>
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<td>Bremner &amp; Brett, 1997</td>
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<td>Englehard et al., 2003</td>
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<td>Halligan et al., 2003 Study 1</td>
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<td>Halligan et al., 2003 Study 2</td>
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<td>Harvey &amp; Bryant 1999</td>
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<td>Weiss et al., 1995</td>
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<td>Zoellner et al., 2002</td>
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<td>Study</td>
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<td>Holmes et al., 2004 Study 1</td>
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<td>Study</td>
<td>Frequency thresholds (&lt; O)</td>
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<td>Intrusion</td>
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<td>Halligan et al., 2003 Study 2</td>
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<td>data driven processing (clinical)</td>
<td>Halligan et al., 2003 Study 1</td>
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</tr>
<tr>
<td></td>
<td>Murray et al., 2002</td>
<td>*</td>
</tr>
<tr>
<td>(analogue)</td>
<td>Halligan et al., 2002 Study 1</td>
<td>^</td>
</tr>
<tr>
<td></td>
<td>Halligan et al., 2002 Study 2</td>
<td>^</td>
</tr>
</tbody>
</table>

*Note. * = significant correlation, ^ = significant between group difference, ^O = significant between group difference in the opposite direction, OR = increased odds ratio, ns* = non-significant correlation, and ns^ = non-significant between group difference.

*Note. a = significant correlation with self-report only, not with clinician ratings; b = significant correlation at post-treatment only.
Table 2

Summary of Research Findings Relating Memory Disorganization/Fragmentation to Intrusions/Reexperiencing

<table>
<thead>
<tr>
<th>Variable</th>
<th>Study</th>
<th>Reexperiencing symptoms</th>
<th>Self-reported intrusive memory qualities</th>
<th>Intrusion frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>self-report scale</td>
<td>Halligan et al., 2002 Study 2</td>
<td>*</td>
<td>*</td>
<td>ns*</td>
</tr>
<tr>
<td>coherence (recalled in correct order)</td>
<td>Halligan et al., 2002 Study 1</td>
<td>ns*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Halligan et al., 2002 Study 2</td>
<td>ns*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>narrative coding</td>
<td>Harvey &amp; Bryant, 1999</td>
<td>ns*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>reading indices</td>
<td>Zoellner et al., 2002</td>
<td>ns* pre-treatment</td>
<td>ns* or *O post-treatment</td>
<td></td>
</tr>
</tbody>
</table>

* = significant correlation, *O = significant correlation in the opposite direction, and ns* = non-significant correlation
Table 3

*Main Strategies that Participants Endorsed Using During Critical Medical Incidents*

<table>
<thead>
<tr>
<th>Item</th>
<th>Frequency of usage</th>
<th>Efficacy for delivering treatment</th>
<th>Efficacy for controlling my own emotions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medical orientation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct my attention to the mechanical steps of what I need to do medically</td>
<td>3.90 (0.31)</td>
<td>3.85 (0.37)</td>
<td>3.70 (0.47)</td>
</tr>
<tr>
<td>Focus on the step by step process of what I need to do medically</td>
<td>3.75 (0.44)</td>
<td>3.85 (0.37)</td>
<td>3.75 (0.44)</td>
</tr>
<tr>
<td>Think back to my prior training and work experiences and try to apply it</td>
<td>3.30 (1.03)</td>
<td>3.53 (0.70)</td>
<td>3.47 (1.07)</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>3.65 (0.48)</td>
<td>3.74 (0.33)</td>
<td>3.62 (0.40)</td>
</tr>
<tr>
<td><strong>Emotional containment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Try to pull back and look at the situation more objectively</td>
<td>2.33 (1.69)</td>
<td>3.79 (0.43)</td>
<td>3.43 (0.65)</td>
</tr>
<tr>
<td>Compartmentalize my emotions (when an emotion comes up, I set it aside)</td>
<td>2.60 (1.43)</td>
<td>3.71 (0.47)</td>
<td>3.59 (0.51)</td>
</tr>
<tr>
<td>Detach or distance myself from the situation</td>
<td>2.10 (1.65)</td>
<td>3.43 (1.16)</td>
<td>3.50 (1.16)</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>2.34 (1.10)</td>
<td>3.61 (0.59)</td>
<td>3.48 (0.64)</td>
</tr>
<tr>
<td><strong>Focus on patient feelings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Focus on how the patient is feeling</td>
<td>2.80 (1.32)</td>
<td>2.89 (1.13)</td>
<td>2.33 (1.24)</td>
</tr>
<tr>
<td>Try to ensure that I am empathizing with the patient</td>
<td>2.63 (1.40)</td>
<td>3.12 (1.11)</td>
<td>2.59 (0.94)</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>2.71 (1.04)</td>
<td>2.98 (1.02)</td>
<td>2.38 (1.05)</td>
</tr>
</tbody>
</table>

*Note.* M = mean, SD = standard deviation. Frequency items rated on a scale of 0 (never) to 4 (nearly always). Efficacy items rated on a scale of 0 (not at all effective) to 4 (extremely effective).
Table 4

*Demographics for the Nursing and Psychology Students in the Medical and Control Conditions*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>Nursing Students</th>
<th>Psychology Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Medical</td>
<td>Control</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>21.24 (3.24)</td>
<td>21.15 (3.85)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td>2.40 (1.82)</td>
<td>2.39 (1.55)</td>
</tr>
<tr>
<td>Cultural Background (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>European Canadian</td>
<td></td>
<td>50</td>
<td>53</td>
</tr>
<tr>
<td>Asian Canadian</td>
<td></td>
<td>44</td>
<td>41</td>
</tr>
<tr>
<td>Indo Canadian</td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Marital Status (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td></td>
<td>100</td>
<td>91</td>
</tr>
<tr>
<td>Common-law/Married</td>
<td></td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Been in serious car accident (%)</td>
<td></td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>Close friend or relative died in car accident (%)</td>
<td></td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Months working as a nurse</td>
<td></td>
<td>4.04 (4.58)</td>
<td>3.72 (5.24)</td>
</tr>
</tbody>
</table>

*Note. Standard deviations in parentheses.*
Table 5

**Means and Standard Deviations for Psychological Measures of PTSD Vulnerability**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>Nursing Students</th>
<th>Psychology Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Medical</td>
<td>Control</td>
<td>Medical</td>
</tr>
<tr>
<td>STAI-T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>37.00</td>
<td>35.35</td>
<td>36.59</td>
</tr>
<tr>
<td></td>
<td>(11.16)</td>
<td>(9.55)</td>
<td>(10.57)</td>
</tr>
<tr>
<td>Wonderlic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>28.29</td>
<td>27.09</td>
<td>29.44</td>
</tr>
<tr>
<td></td>
<td>(4.15)</td>
<td>(4.91)</td>
<td>(4.14)</td>
</tr>
<tr>
<td>BDI-II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.59</td>
<td>5.59</td>
<td>5.91</td>
</tr>
<tr>
<td></td>
<td>(4.50)</td>
<td>(5.11)</td>
<td>(5.46)</td>
</tr>
<tr>
<td>DES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13.26</td>
<td>12.51</td>
<td>12.80</td>
</tr>
<tr>
<td></td>
<td>(12.30)</td>
<td>(11.64)</td>
<td>(14.20)</td>
</tr>
<tr>
<td>Number of prior traumas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.76</td>
<td>1.71</td>
<td>1.26</td>
</tr>
<tr>
<td></td>
<td>(1.46)</td>
<td>(1.34)</td>
<td>(1.29)</td>
</tr>
</tbody>
</table>

*Note.* Standard deviation in parentheses. STAI-T = State-Trait Anxiety Inventory, Trait Version; BDI-II = Beck Depression Inventory II; DES = Dissociative Experiences Scale.
Table 6

*Means and Standard Deviations for the Medical Cognitive Strategy, Intrusion, Memory, and State Anxiety Measures*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>Nursing Students</th>
<th>Psychology Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Medical</td>
<td>Control</td>
</tr>
<tr>
<td>Medical cognitive strategy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thinking</td>
<td></td>
<td>14.32 (4.42)</td>
<td>10.85 (4.42)</td>
</tr>
<tr>
<td>Focus of attention</td>
<td></td>
<td>14.71 (2.55)</td>
<td>13.76 (3.09)</td>
</tr>
<tr>
<td>Intrusions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diary frequency</td>
<td></td>
<td>1.56 (1.88)</td>
<td>1.71 (1.96)</td>
</tr>
<tr>
<td>IES intrusion</td>
<td></td>
<td>3.18 (2.55)</td>
<td>4.11 (3.19)</td>
</tr>
<tr>
<td>Memory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Narrative free recall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content</td>
<td></td>
<td>14.97 (3.99)</td>
<td>13.85 (3.39)</td>
</tr>
<tr>
<td>Coherence</td>
<td></td>
<td>0.81 (0.09)</td>
<td>0.82 (0.09)</td>
</tr>
<tr>
<td>Temporal sequence</td>
<td></td>
<td>6.18 (2.78)</td>
<td>4.85 (2.03)</td>
</tr>
<tr>
<td>Self report memory disorganization</td>
<td></td>
<td>6.03 (4.30)</td>
<td>6.35 (4.34)</td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAI-S pre</td>
<td></td>
<td>27.38 (7.43)</td>
<td>32.09 (11.77)</td>
</tr>
<tr>
<td>STAI-S post</td>
<td></td>
<td>37.44 (11.71)</td>
<td>43.29 (12.13)</td>
</tr>
</tbody>
</table>
Note. Standard deviations parentheses. IES = Impact of Event Scale, STAI-S pre = State-Trait Anxiety Inventory, State Version before the film; STAI-S post = State-Trait Anxiety Inventory, State Version after the film.

Note. For self report memory disorganization, higher numbers indicate worse memory. For all other memory measures, higher numbers indicate better memory.
Figure Caption

*Figure 1.* Intrusion frequency in the experimental and control conditions.
Appendix A Exploratory Study Interview

Nurses’ Processing of Distressing Work-related Incidents Interview

We are interested in finding out more details about what nurses do during critical medical incidents. Our previous research has shown that while many nurses have dealt with horrific or extremely upsetting incidents when caring for patients, the majority of them do not suffer from ongoing distress after the event. I’m hoping to get your input about this so we can understand better what exactly nurses do during critical medical incidents to manage their emotional reactions.

Have you ever experienced an upsetting medical event while on the job? Y N Are there certain events that stand out in your mind as being very distressing at the time?

In these types of incidents, what do you do during the event to prevent yourself from being overwhelmed? What strategies do you use to cope during the event?
You’ve experienced some distressing events at work. Many people who experience similar events would just leave the situation. However, as a nurse, you can’t do that, as it is your job to help ailing the patient. What do you do cognitively, i.e. in your mind, to enable yourself to deal with the situation?

Do you:

1. Distract yourself with things not directly related to the medical crisis? Y N

   how frequently do you do this? 0 1 2 3 4
   never

   how effective is it for delivering Tx? 0 1 2 3 4
   not at all

   how effective is it for controlling your emotions? 0 1 2 3 4
   not at all

2. Think about something else? Y N

   how frequently do you do this? 0 1 2 3 4
   never

   how effective is it for delivering Tx? 0 1 2 3 4
   not at all

   how effective is it for controlling your emotions? 0 1 2 3 4
   not at all

3. Reassure yourself that you’ll get through the situation? Y N

   how frequently do you do this? 0 1 2 3 4
   never

   how effective is it for delivering Tx? 0 1 2 3 4
   not at all

   how effective is it for controlling your emotions? 0 1 2 3 4
   not at all

4. Do nothing other than push yourself to get through it? Y N

   how frequently do you do this? 0 1 2 3 4
   never

   how effective is it for delivering Tx? 0 1 2 3 4
   not at all

   how effective is it for controlling your emotions? 0 1 2 3 4
   not at all
5. Direct your attention to the mechanical steps of what you need to do medically?
   Y  N
   how frequently do you do this?  0  1  2  3  4
   never nearly always
   how effective is it for delivering Tx?
   0  1  2  3  4
   not at all extremely
   how effective is it for controlling your emotions?
   0  1  2  3  4
   not at all extremely

6. Think back to what I learned in my training and past work experiences, and try to apply it?
   Y  N
   how frequently do you do this?  0  1  2  3  4
   never nearly always
   how effective is it for delivering Tx?
   0  1  2  3  4
   not at all extremely
   how effective is it for controlling your emotions?
   0  1  2  3  4
   not at all extremely

7. Try to pull back and look at things more objectively?
   Y  N
   how frequently do you do this?  0  1  2  3  4
   never nearly always
   how effective is it for delivering Tx?
   0  1  2  3  4
   not at all extremely
   how effective is it for controlling your emotions?
   0  1  2  3  4
   not at all extremely

8. Some people have mentioned the idea of compartmentalizing their emotions (if an
   emotion comes up, they set it aside). Do you do this? Y  N
   how frequently do you do this?  0  1  2  3  4
   never nearly always
   how effective is it for delivering Tx?
   0  1  2  3  4
   not at all extremely
   how effective is it for controlling your emotions?
   0  1  2  3  4
   not at all extremely
9. Some people have mentioned blocking out their emotions during the event. Do you do this? Y N
how frequently do you do this? 0 1 2 3 4
never nearly always
how effective is it for delivering Tx? 0 1 2 3 4
not at all extremely
how effective is it for controlling your emotions? 0 1 2 3 4
not at all extremely

10. Some people have mentioned detaching or distancing themselves from the situation while it is occurring. Do you do this? Y N
how frequently do you do this? 0 1 2 3 4
never nearly always
how effective is it for delivering Tx? 0 1 2 3 4
not at all extremely
how effective is it for controlling your emotions? 0 1 2 3 4
not at all extremely

11. Some people mention focusing on how the patient is feeling. Have you done this? Y N
how frequently do you do this? 0 1 2 3 4
never nearly always
how effective is it for delivering Tx? 0 1 2 3 4
not at all extremely
how effective is it for controlling your emotions? 0 1 2 3 4
not at all extremely

12. Some people mention focusing on how they themselves are feeling during the event. Have you done this? Y N
how frequently do you do this? 0 1 2 3 4
never nearly always
how effective is it for delivering Tx? 0 1 2 3 4
not at all extremely
how effective is it for controlling your emotions? 0 1 2 3 4
not at all extremely
13. Some people mention trying to ensure they are empathizing with the patient. Do you do this? Y N

<table>
<thead>
<tr>
<th>how frequently do you do this?</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>never</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>how effective is it for delivering Tx?</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>how effective is it for controlling your emotions?</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

14. Some people mention paying attention to how much the patient resembles someone they know. Have you done this? Y N

<table>
<thead>
<tr>
<th>how frequently do you do this?</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>never</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>how effective is it for delivering Tx?</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>how effective is it for controlling your emotions?</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. During distressing patient incidents, do you focus on a step by step process of what you need to do to help the patient? Y N

<table>
<thead>
<tr>
<th>how frequently do you do this?</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>never</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>how effective is it for delivering Tx?</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>how effective is it for controlling your emotions?</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If you were advising a student nurse as to how to deal with upsetting patient events on the job, what would you tell him/her to do during the event? What would you tell him/her NOT to do?

**DO**

**DON'T DO**
Appendix B Main Study Questionnaires

State-Trait Anxiety Inventory – Trait subscale

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel. Please use the following scale:

1= almost never   2= sometimes   3= often   4= almost always

21. I feel pleasant ..................................................1  2  3  4
22. I feel nervous and restless ....................................1  2  3  4
23. I feel satisfied with myself .....................................1  2  3  4
24. I wish I could be as happy as others seem to be ...............1  2  3  4
25. I feel like a failure .............................................1  2  3  4
26. I feel rested .....................................................1  2  3  4
27. I am “calm, cool, and collected” ...............................1  2  3  4
28. I feel that difficulties are piling up so that I cannot overcome them ..............................................1  2  3  4
29. I worry too much over something that really doesn’t matter ..........................................................1  2  3  4
30. I am happy ........................................................1  2  3  4
31. I have disturbing thoughts ......................................1  2  3  4
32. I lack self-confidence ..........................................1  2  3  4
33. I feel secure ....................................................1  2  3  4
34. I make decisions easily ........................................1  2  3  4
35. I feel inadequate ...............................................1  2  3  4
36. I am content ....................................................1  2  3  4
37. Some unimportant thought runs through my mind and bothers me ....................................................1  2  3  4
38. I take disappointments so keenly that I can’t put them out of my mind ..............................................1  2  3  4
39. I am a steady person ............................................1  2  3  4
40. I get in a state of tension or turmoil as I think over my recent concerns and interests .........................................1  2  3  4
Beck Depression Inventory II

Instructions: This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the one statement in each group that best describes the way you have been feeling during the past two weeks, including today. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for any group, including Item 16 or Item 18.

1. 0 I do not feel sad.
   1 I feel sad much of the time.
   2 I am sad all the time.
   3 I am so sad or unhappy that I can’t stand it.

2. 0 I am not discouraged about my future.
   1 I feel more discouraged about my future than I used to be.
   2 I do not expect things to work out for me.
   3 I feel my future is hopeless and will only get worse.

3. 0 I do not feel like a failure.
   1 I have failed more than I should have.
   2 As I look back, I see a lot of failures.
   3 I feel I am a total failure as a person.

4. 0 I get as much pleasure as I ever did from the things I enjoy.
   1 I don’t enjoy things as much as I used to.
   2 I get very little pleasure from the things I used to enjoy.
   3 I can’t get any pleasure from the things I used to enjoy.

5. 0 I don’t feel particularly guilty.
   1 I feel guilty over many things I have done or should have done.
   2 I feel quite guilty most of the time.
   3 I feel guilty all of the time.

6. 0 I don’t feel I am being punished.
   1 I feel I may be punished.
   2 I expect to be punished.
   3 I feel I am being punished.

7. 0 I feel the same about myself as ever.
   1 I have lost confidence in myself.
   2 I am disappointed in myself.
   3 I dislike myself.

8. 0 I don’t criticize or blame myself more than usual.
   1 I am more critical of myself than I used to be.
   2 I criticize myself for all of my faults.
3  I blame myself for everything bad that happens.

9.  0  I don’t have any thoughts of killing myself.
  1  I have thoughts of killing myself, but I would not carry them out.
  2  I would like to kill myself.
  3  I would kill myself if I had the chance.

10. 0  I don’t cry anymore than I used to.
  1  I cry more than I used to.
  2  I cry over every little thing.
  3  I feel like crying, but I can’t.

11. 0  I am no more restless or wound up than usual.
  1  I feel more restless or wound up than usual.
  2  I am so restless or agitated that it’s hard to stay still.
  3  I am so restless or agitated that I have to keep moving or doing something.

12. 0  I have not lost interest in other people or activities.
  1  I am less interested in other people or things than before.
  2  I have lost most of my interest in other people or things.
  3  It’s hard to get interested in anything.

13. 0  I make decisions about as well as ever.
  1  I find it more difficult to make decisions than usual.
  2  I have much greater difficulty in making decisions than I used to.
  3  I have trouble making any decisions.

14. 0  I do not feel I am worthless.
  1  I don’t consider myself as worthwhile and useful as I used to.
  2  I feel more worthless as compared to other people.
  3  I feel utterly worthless.

15. 0  I have as much energy as ever.
  1  I have less energy than I used to have.
  2  I don’t have enough energy to do very much.
  3  I don’t have enough energy to do anything.

16. 0  I have not experienced any change in my sleeping pattern.
  1a  I sleep somewhat more than usual.
  1b  I sleep somewhat less than usual.
  2a  I sleep a lot more than usual.
  2b  I sleep a lot less than usual.
  3a  I sleep most of the day.
  3b  I wake up 1-2 hours early and can’t get back to sleep.
17. 0 I am no more irritable than usual.
   1 I am more irritable than usual.
   2 I am much more irritable than usual.
   3 I am irritable all the time.

18. 0 I have not experienced any change in my appetite.
   1a My appetite is somewhat less than usual.
   1b My appetite is somewhat greater than usual.
   2a My appetite is much less than before.
   2b My appetite is much greater than usual.
   3a I have no appetite at all.
   3b I crave food all the time.

19. 0 I can concentrate as well as ever.
   1 I can’t concentrate as well as usual.
   2 It’s hard to keep my mind on anything for very long.
   3 I find I can’t concentrate on anything.

20. 0 I am no more tired or fatigued than usual.
   1 I get more tired or fatigued more easily than usual.
   2 I am too tired or fatigued to do a lot of the things I used to do.
   3 I am too tired or fatigued to do most of the things I used to do.

21. 0 I have not noticed any recent change in my interest in sex.
   1 I am less interested in sex than I used to be.
   2 I am much less interested in sex now.
   3 I have lost interest in sex completely.
Dissociative Experiences Scale

Directions: This questionnaire consists of twenty-eight questions about experiences that you may have in your daily life. We are interested in how often you have these experiences. It is important, however, that your answers show how often these experiences happen to you when you are not under the influence of alcohol or drugs. To answer the questions, please determine to what degree the experience described in the question applies to you and circle the number to show what percentage of the time you have the experience.

Example:

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

(never) (always)

1. Some people have the experience of driving or riding in a car or bus or subway and suddenly realizing that they don’t remember what has happened during all or part of the trip.
   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

2. Some people find that sometimes they are listening to someone talk and they suddenly realize that they did not hear part or all of what was said.
   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

3. Some people have the experience of finding themselves in a place and having no idea how they got there.
   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

4. Some people have the experience of finding themselves dressed in clothes that they don’t remember putting on.
   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

5. Some people have the experience of finding new things among their belongings that they do not remember buying.
   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

6. Some people sometimes find that they are approached by people who they do not know who call them by another name or insist that they have met them before.
   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

7. Some people sometimes have the experience of feeling as though they are standing next to themselves or watching themselves do something and they actually see themselves as if they were looking at another person.
   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
8. Some people are told that they sometimes do not recognize friends or family members.

9. Some people find that they have no memory for some important events in their lives (for example, a wedding or graduation).

10. Some people have the experience of being accused of lying when they do not think that they have lied.

11. Some people have the experience of looking in a mirror and not recognizing themselves.

12. Some people have the experience of feeling that other people, objects, and the world around them are not real.

13. Some people have the experience of feeling that their body does not seem to belong to them.

14. Some people have the experience of sometimes remembering a past event so vividly that they feel as if they were reliving that event.

15. Some people have the experience of not being sure whether things that they remember happening really did happen or whether they just dreamed them.

16. Some people have the experience of being in a familiar place but finding it strange and unfamiliar.

17. Some people find that when they are watching television or a movie they become so absorbed in the story that they are unaware of other events happening around them.

18. Some people find that they become so involved in a fantasy or daydream that it feels as though it were really happening to them.
19. Some people find that they sometimes are able to ignore pain.

20. Some people find that they sometimes sit staring off into space, thinking of nothing, and are not aware of the passage of time.

21. Some people sometimes find that when they are alone they talk out loud to themselves.

22. Some people find that in one situation they may act so differently compared with another situation that they feel almost as if they were two different people.

23. Some people sometimes find that in certain situations they are able to do things with amazing ease and spontaneity that would usually be difficult for them (for example, sports, work, social situations, etc.).

24. Some people sometimes find that they cannot remember whether they have done something or have just thought about doing that thing (for example, not knowing whether they have mailed a letter or have just thought about mailing it).

25. Some people find evidence that they have done things that they do not remember doing.

26. Some people sometimes find writings, drawings, or notes among their belongings that they must have done but cannot remember doing.

27. Some people sometimes find that they hear voices inside their head that tell them to do things or comment on things that they are doing.

28. Some people sometimes feel as if they are looking at the world through a fog so that people and objects appear far away or unclear.
PDS criterion A list

Many people have lived through or witnessed a very stressful and traumatic event at some point in their lives. Below is a list of traumatic events. Put a checkmark in the box next to ALL of the events that have happened to you or that you have witnessed.

(1) □ Serious accident, fire, or explosion (for example, an industrial, farm, car, plane, or boating accident).

(2) □ Natural disaster (for example, tornado, hurricane, flood, or major earthquake).

(3) □ Non-sexual assault by a family member or someone you know (for example, being mugged, physically attacked, shot, stabbed, or held at gunpoint).

(4) □ Non-sexual assault by a stranger (for example, being mugged, physically attacked, shot, stabbed, or held at gunpoint).

(5) □ Sexual assault by a family member or someone you know (for example, rape or attempted rape).

(6) □ Sexual assault by a stranger (for example, rape or attempted rape).

(7) □ Military combat or a war zone.

(8) □ Sexual contact when you were younger than 18 with someone who was 5 or more years older than you (for example, contact with genitals, breasts).

(9) □ Imprisonment (for example, prison inmate, prisoner of war, hostage).

(10) □ Torture.

(11) □ Life threatening illness.

(12) □ Other traumatic event.

(13) □ If you marked item 12, specify the traumatic event below.

__________________________________________________________________________

Have you ever been in a serious car accident? Y  N
If Yes, how many years ago was it? ________

Have you ever had a close friend or relative die due to a car accident? Y  N
If Yes, how many years ago was it? ________
Medical Cognitive Strategies Scale

To what extent are the following statements true of you:

During the film:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Medical thinking**

I thought about what the medical staff should be doing to treat the patient’s injuries. 1 2 3 4 5

I anticipated what medical technique the staff would use next. 1 2 3 4 5

Based on the patient’s injuries, I thought about what medical procedures had first priority. 1 2 3 4 5

I thought about other procedures the medical staff could have done. 1 2 3 4 5

I thought about how I would be able to apply my training in this situation. 1 2 3 4 5

**Medical focus of attention**

I focused on how the medical staff were treating the patient’s injuries. 1 2 3 4 5

I focused on the instruments the medical staff were using. 1 2 3 4 5

Despite how the situation made me feel, I was able to stick with the individual steps of the medical procedures. 1 2 3 4 5

I identified the medical procedures that the medical staff were doing. 1 2 3 4 5
Attention

How much attention did you pay to the film?

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>not at all</td>
<td>full attention</td>
<td></td>
<td></td>
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</table>

Demand characteristics

Please rate what effect your viewing instructions (that you received just before you watched the film) had on intrusions of the kind you reported in the diary, in comparison to watching the film with no instructions.

<table>
<thead>
<tr>
<th>intrusions</th>
<th>extremely reduce</th>
<th>no effect</th>
<th>extremely increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0</td>
<td>1 2 3 4 5 6 7 8 9 10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prior frequency of medical footage exposure

To what extent is this statement true of you?

I watch surgical TV programs, for example like those on The Learning Channel

<table>
<thead>
<tr>
<th>never</th>
<th>almost everyday</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7</td>
<td></td>
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</tbody>
</table>
Memory Diary

Over the course of the next week, starting as soon as you leave this room, please fill out the appropriate columns of the chart each time you spontaneously have a memory/image/thought about the film that occurs *when you do not intend to think about the film*.

*Each time this happens*, please enter the date and time, rate how distressing it was, give a description of its content, and indicate whether it took the form of a thought, image, or combination of the two. It is very important that you try to fill out the columns as soon as possible after it occurs. Please return this form to the experimenter at your appointment next week.

| Date and Time (please enter each one) | How distressing was it?  
0---------------10  
not extremely at all  
(please rate each one) | Description of its contents  
(please describe each one) | Was it a thought(T), image(I), or Combination (C)?  
(Please circle the appropriate letter for each one) |
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>T I C</td>
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<tr>
<td>2</td>
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<td>T I C</td>
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<tr>
<td>9</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>Date and Time (please enter each one)</td>
<td>How distressing was it? 0-------------10 not extremely at all (please rate each one)</td>
<td>Description of its contents (please describe each one)</td>
<td>Was it a thought(T), image(I), or Combination (C)? (Please circle the appropriate letter for each one)</td>
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<td>--------------------------------------</td>
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<td>-------------------------------------------------------------</td>
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<tr>
<td>10</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td>T I C</td>
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<tr>
<td>17</td>
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<td>T I C</td>
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<td>18</td>
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<td>T I C</td>
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<td>19</td>
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<td>T I C</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td>T I C</td>
</tr>
</tbody>
</table>

If you need more rows, please continue on the back of this sheet.
Please describe in detail the **most significant** intrusive recollection of the film you had over the week.

__________________________________________________________________________________

__________________________________________________________________________________

__________________________________________________________________________________

Was the intrusive recollection you described a **thought, image, or combination?** (please circle one)

How distressing was the intrusive recollection for you?

Not at all  

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Did the recollection consist of a **static snapshot or moving film sequence?** (please circle one)

Did the recollection consist of a **whole scene or detail?** (please circle one)

To what extent is this statement true of you: I was often unable (or forgot) to record my spontaneous memories/images/thoughts in the diary chart.

Not at all true of me  

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Extremely true of me |
Impact of Event Scale - Intrusion subscale

Please check each item, indicating how frequently these comments were true of you DURING THE PAST SEVEN DAYS. If they did not occur during that time, please mark the "not at all" column.

<table>
<thead>
<tr>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
</tr>
</tbody>
</table>

1. I thought about the film when I didn’t mean to.

2. I had trouble falling asleep or staying asleep because of picture or thoughts about the film that came into my mind.

3. I had waves of strong feelings about the film.

4. I had dreams about the film.

5. Pictures about the film popped into my mind.

6. Other things kept making me think about the film.

7. Any reminder brought back feelings about the film.
Please describe everything you can recall about the film using full sentences, paying attention to the correct sequence of events. If you need more space, please continue on the back of this sheet. You have 10 minutes to complete this task. If you are finished before that, please inform the experimenter that you are done.
Events for Temporal Sequence Task

1. patient comes into emergency department on stretcher, conscious
2. patient says I'm totally fine
3. staff tries to put on oxygen mask, but he is combative
4. staff puts IV into left arm
5. staff intubate and bag
6. see scalp laceration close up
7. take to CT scan
8. Dr. straddles him and starts CPR
9. disinfectant coats patient's stomach
10. cut left side of chest open
11. chest tube is inserted
12. throw towels on floor to soak up blood
13. clamping aorta, Dr. Rodriguez says "that's secure I hope, we're going to the OR"
14. take patient into elevator
15. Dr. Rodriguez and others scrub arms and hands
16. reach into chest and massage heart
17. shock heart for the 1st time
18. Dr. Rodriguez tells someone to contact the patient’s family
19. putting a graft in
20. Drs take off gloves, masks, gowns
Temporal Sequence Instructions

You will be given 20 slips of paper, each of which lists one event that occurred in the film you saw last week. Please arrange them in the order that they occurred in the film. Place the slip with the first event at the top of the desk, the slip with the second event underneath the first one, and so on.

(Please do not write anything on this page. The experimenter will record your order when you are finished)

1. ___
2. ___
3. ___
4. ___
5. ___
6. ___
7. ___
8. ___
9. ___
10. ___
11. ___
12. ___
13. ___
14. ___
15. ___
16. ___
17. ___
18. ___
19. ___
20. ___
Trauma Memory Questions - Disorganization

The following questions relate to the ways in which people sometimes describe their MEMORIES OF THE FILM. Please rate the extent to which these statements apply to YOUR MEMORIES OF THE FILM by circling the appropriate number. If the statement is not true for you, please circle 'not at all'. There are no right and no wrong answers to these questions.

<table>
<thead>
<tr>
<th>Statement applies to me....</th>
<th>Not at all</th>
<th>A little</th>
<th>Moderately</th>
<th>Strongly</th>
<th>Very Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel that my memory for the film is incomplete.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. There are periods of time during the film that I cannot account for.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. I have trouble remembering the order in which things happened during the film.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. My memory of the film is muddled.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. I cannot get what happened during the film straight in my mind.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
State-Trait Anxiety Inventory – State subscale

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best. Please use the following scale:

1= not at all     2= somewhat     3= moderately so     4= very much so

1. I feel calm .........................................................1 2 3 4
2. I feel secure .......................................................1 2 3 4
3. I am tense ..........................................................1 2 3 4
4. I feel strained ......................................................1 2 3 4
5. I feel at ease .........................................................1 2 3 4
6. I feel upset ..........................................................1 2 3 4
7. I am presently worrying over possible misfortunes ..........1 2 3 4
8. I feel satisfied ........................................................1 2 3 4
9. I feel frightened .....................................................1 2 3 4
10. I feel comfortable ..................................................1 2 3 4
11. I feel self-confident ...............................................1 2 3 4
12. I feel nervous .......................................................1 2 3 4
13. I am jittery ............................................................1 2 3 4
14. I feel indecisive ....................................................1 2 3 4
15. I am relaxed ..........................................................1 2 3 4
16. I feel content ........................................................1 2 3 4
17. I am worried ..........................................................1 2 3 4
18. I feel confused .......................................................1 2 3 4
19. I feel steady ..........................................................1 2 3 4
20. I feel pleasant .......................................................1 2 3 4
Appendix C Item Component Loadings of the Medical Cognitive Strategy Scale

<table>
<thead>
<tr>
<th>Item</th>
<th>Medical thinking</th>
<th>Medical focus of attention</th>
</tr>
</thead>
<tbody>
<tr>
<td>I thought about what the medical staff should be doing to treat the patient’s injuries.</td>
<td>.93</td>
<td></td>
</tr>
<tr>
<td>I anticipated what medical technique the staff would use next.</td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td>Based on the patient’s injuries, I thought about what medical procedures had first priority.</td>
<td>.69</td>
<td></td>
</tr>
<tr>
<td>I thought about other procedures the medical staff could have done.</td>
<td>.60</td>
<td></td>
</tr>
<tr>
<td>I thought about how I would be able to apply my training in this situation.</td>
<td>.56</td>
<td></td>
</tr>
<tr>
<td>I focused on how the medical staff were treating the patient’s injuries.</td>
<td></td>
<td>.90</td>
</tr>
<tr>
<td>I focused on the instruments the medical staff were using.</td>
<td></td>
<td>.75</td>
</tr>
<tr>
<td>Despite how the situation made me feel, I was able to stick with the individual steps of the medical procedures.</td>
<td></td>
<td>.70</td>
</tr>
<tr>
<td>I identified the medical procedures that the medical staff were doing.</td>
<td></td>
<td>.60</td>
</tr>
</tbody>
</table>
Appendix D List of Events in the Film

1. report of accident: 1a) outside the Heinz Ketchup plant,  
   1b) a speeding car slams into a concrete wall,  
   1c) unrestrained driver was coming down a ramp the wrong way and hit the wall head on,  
   1d) 3am  
   1e) trauma staff are told details of accident  
   1f) cut him out of the car  
2. meet head Dr., Dr. Aurelio Rodriguez (Hispanic)  
3. description of patient: 40 year old Michael Bar (white)  
4. patient comes into emergency department from ambulance on stretcher, conscious, see blood on hands, arms, face, head  
5. staff tell him to put his hands on his stomach and don’t move  
6. a) patient says I’m totally fine  
   b) voice over says it took rescue workers 30 minutes to extricate patient from the car  
7. bring patient into trauma room, transfer from paramedic stretcher to trauma bed  
8. check breathing  
9. cut open patient’s shirt, pants  
10. ask patient to move his legs  
11. a) staff says you had a car accident, you don’t remember?  
   b) Michael repeats I’m fine  
12. a) staff asks do you have any teeth loose?, presses on chest  
   b) Michael says what’s the problem?  
13. a) staff tries to put on oxygen mask to protect his airway  
   b) but he is combative  
14. staff puts IV into left arm  
15. staff injects sedative into left arm  
16. staff intubate and bag (only way to evaluate him because he’s combative and now they can evaluate his vital signs)  
17. see hands stitching his hip area  
18. see IV bags being attached  
19. see scalp laceration close up  
20. a) take to CT scan and  
   b) replace machine bag with hand held bag for airtube  
   c) (his erratic blood pressure could be a sign of severe internal bleeding)  
21. Dr. Rodriguez talks about why he chose to be a trauma surgeon (his sister died in accident)  
22. Blood pressure plummets suddenly  
23. Dr.s listen to his chest with stethoscope, feeling around his chest  
24. a) patient doesn’t have pulse;  
   b) Dr. straddles him and starts CPR,  
   c) orders the crash cart  
25. a) patient given epinephrine,  
   b) move patient down hall while doing CPR  
26. Dr. orders 2 minutes of CPR, then open the chest  
27. disinfectant coats patient’s stomach
28. adjust light
29. cut left side of chest open
30. put in spreader on left side of body, chest tube getting ready on right side
31. a) see spreader, snipping inside chest to insert spreader,
    b) Dr. says he thinks it’s a ruptured aorta
    c) Dr. says patient has less than 20% chance of survival
32. chest tube is inserted
33. Dr. asks for the light to be adjusted, someone to suction
34. spreader is in, more snipping inside chest
35. open spreader
36. blood splashes on floor
37. see open chest, hands inside chest
38. lots of blood on the floor
39. throw towels on floor to soak up blood
40. poking inside open cavity, 2 sets of hands go inside chest, clamping aorta, Dr. Rodriguez says that’s secure I hope, we’re going to the OR
41. start to move patient to the OR, see heart beating
42. a) bring up railing on bedside to move him,
    b) blood comes out of the stretcher
43. as move patient, blood drips off his arm onto the floor
44. take patient into elevator
45. a) come out of elevator, Dr. Rodriguez says it’s probably a ruptured aorta,
    b) the chance of survivability is almost 0, maybe this will be the first one, who knows, we can try
46. move down hallway to OR
47. in OR transfer patient from stretcher to operating table
48. Dr. Rodriguez and others scrub arms and hands
49. reach into chest and massage heart
50. a) adjust IV bags
    b) patient receives blood transfusion
51. put on blood pressure cuff
52. hands inside patient’s chest
53. shock heart
54. hands inside patient’s chest
55. patient’s heart start beating again, hands inside chest, still bleeding through torn aorta
56. Dr. Rodriguez tells someone to contact the patient’s family
57. a) put tube into hole in chest, compressions on heart because it’s stopped beating;
    b) patient’s aorta is essentially torn in half, so they’ve isolated it,
    c) and now they’re putting a graft in, stitching
58. shock heart again and massage it
59. a) inject something into an organ inside chest cavity with a needle
    b) voiceover of Dr. Rodriguez says only God can help him...we’re waiting to see if a miracle happens
60. massage heart and shock it again
61. Dr. Rodriguez says okay, we’re going to stop guys
62. a) patient dies
b) Dr. Rodriguez asks nurse for the time; 5:37 time of death
63. Drs take off gloves, masks, gowns, and drop them in the room
64. Drs leave OR room
65. a) see blood on floor, Dr. Rodriguez walking down hall,
    b) Dr. Rodriguez talks about how hard it is when a young person dies (life is very fragile...)
66. see picture of patient pre-injury