VOLUME 1

PERI-TRAUMATIC VERBAL PROCESSING AND THE DEVELOPMENT OF INTRUSIONS

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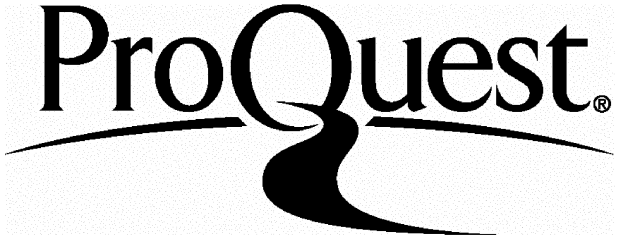

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ABSTRACT

A defining characteristic of post-traumatic stress disorder (PTSD) is the re-experiencing of distressing material in the form of memory intrusions. Dual Representation Theory (Brewin, Dalgleish & Joseph, 1996) suggests that the efficiency of peri-traumatic verbal processing (i.e. verbal processing *during* the traumatic event) is a key factor in the development of intrusions. This prediction was tested using a trauma analogue and a non-clinical sample. Sixty volunteers were exposed to a distressing film of the aftermath of road-traffic accidents and instructed to keep a diary of intrusions before returning for follow-up one week later. Verbal processing was manipulated across three experimental conditions, including: (1) Peri-traumatic verbal distraction via a concurrent backward counting task; (2) Peri-traumatic verbal enhancement via concurrent verbalisation in response to the film; and (3) No task control. In accordance with Dual Representation Theory, it was predicted that the verbal distraction task would compete for cognitive resources with verbally accessible memory (VAM), leading to more intrusions. Verbal enhancement was predicted to facilitate VAM encoding and lead to less intrusions. As predicted, the verbal distraction group reported significantly more intrusions than the control group and showed evidence of less conceptual processing of the meaning of the film. Contrary to predictions, the verbal enhancement group did not report less intrusions or show evidence of deeper conceptual processing of meaning. Further analysis indicated that across conditions verbal task performance was impaired during scenes of the film that gave rise to subsequent "most significant" intrusions. Theoretical and clinical implications of the study are discussed primarily in relation to Dual Representation Theory and Ehlers and Clark's (2000) cognitive model of PTSD.

INTRODUCTION

Post-traumatic stress disorder (PTSD) has become the focus of considerable research interest in recent years leading to the elaboration of theoretical frameworks of how individuals react to traumatic experiences and how best to intervene with those who present to services. Clinicians and researchers have argued that there is a need for the further development of models that can explain how the various factors understood as relevant to the development and maintenance of PTSD interact with each other and how the varied reactions to traumatic events come to be manifested. Naturally, cognitive models that attempt to account for some or all of the phenomena associated with reactions to trauma are valuable in understanding PTSD and in the development, evolution and evaluation of cognitive behavioural interventions. One such model is Dual Representation Theory (Brewin, Dalgleish & Joseph, 1996) and it is the aim of this thesis to test some predictions of this framework and to explore its implications for theory and treatment.

Aims of the current study

Recent research into PTSD has focused on the relationship between peri-traumatic psychological processing (i.e. processing *during* a traumatic event) and the subsequent development of intrusions[1]. As peri-traumatic processing can only be investigated retrospectively in the case of naturally occurring trauma, researchers have used the distressing film as an experimental analogue for real-life traumatic experiences to allow experimenters to study the theoretical implications of how what happens during distressing events effects the development of intrusions

[1] The term "intrusions" will be used throughout as a generic term for both intrusive thoughts and intrusive images. "Thoughts" refers to verbal (lexical) cognitions. "Images" refers to cognitions that take the form of mental images.

afterwards. Intrusions, especially intrusive imagery, have been focused on due to their status as the hallmark symptom, and treatment focus, of PTSD since its official recognition as a psychiatric disorder (see DSM-III; APA, 1980).

Dual Representation Theory (Brewin et al, 1996) suggests that the intrusions that occur in PTSD arise because trauma memories have been encoded into a primarily non-verbal form at the time of the traumatic event. Such memories lack a coherent narrative, are rich in sensory detail and are cued into consciousness by situational cues rather than voluntary processes. Therefore, Dual Representation Theory predicts that the efficiency of verbal processing during a traumatic event (i.e. "peri-traumatic verbal processing") will be related to the development and frequency of intrusions afterwards. The current study tests this prediction by manipulating the efficiency of peri-traumatic verbal processing across groups to allow a comparison of the quantity and quality of intrusions recorded in a diary within a one-week period after viewing a distressing film featuring the aftermath of road-traffic accidents. Participants are assigned to one of three different conditions including verbal distraction, verbal enhancement and a no-task control condition.

Relevant background information will be presented pertaining to theories of PTSD, with special attention to Dual Representation Theory. Previous experimental studies of peri-traumatic processing will be reviewed and predictions derived from theory and prior research will be stated. Finally, details of how the current study proposes to test experimental hypotheses will be elucidated and experimental hypotheses will be summarised.

Post-traumatic stress disorder (PTSD)

Features of PTSD

A diagnosis of PTSD using ICD-10 (International Classification of Diseases and Health Related Problems, Tenth revision, 1992, p. 168) requires that an individual have been exposed to a "stressful event or situation (either short- or long-lasting) of exceptionally threatening or catastrophic nature, which would be likely to cause pervasive distress in almost anyone". Therefore, although predisposing factors such as personality traits or history of mental illness may lower the threshold for developing the disorder, such factors are neither necessary nor sufficient to explain the occurrence of PTSD which hinges on memories of normatively traumatising events such as assault, rape and road-traffic accidents.

A diagnosis of PTSD is made when an individual experiences several symptoms not present before the trauma, including: persistent "reliving" of the stressor (e.g. in intrusions, flashbacks or dreams); avoidance of situations associated with the stressor; and the inability to recall some or all of the trauma and/or persistent symptoms of psychological sensitivity and arousal (ICD-10, 1992, p. 169). These experiences are relatively common within the general population with life-time PTSD prevalence estimates from community samples ranging from 1% to 14% depending on methodology and the sample used (American Psychiatric Association, 1994, p.425). As stated by Yule, Williams and Joseph (1999, p.12), "PTSD is a very common disorder - as common as schizophrenia and almost as common as depression. It makes one wonder how it was overlooked for so long!"

Intrusions in PTSD

Prior to official recognition of PTSD, accounts of traumatic stress reactions have often included vivid accounts of intrusive thoughts and images (e.g. Kardiner, 1941). Salkovskis (1990, p. 91) defines intrusions as "mental events which are perceived as interrupting a person's stream of consciousness by capturing the focus of attention" and notes, "These cognitive events can take the form of verbal thoughts, images or impulses or some combination of the three". Similarly, Rachman (1989) states that intrusions intrude into consciousness, interrupt ongoing activities, are difficult to control but are attributed to an internal origin.

Intrusions tend to feature physiological reactivity, psychological distress, more prominent perceptual features than normal autobiographical memories and contextual distortions that involve acting or feeling as if the event were happening again (Tromp, Koss, Figueredo & Tharan, 1995).

Individual reactions to trauma

Although the diagnosis of PTSD requires an individual to have experienced an event that would "cause pervasive distress in almost anybody" (ICD-10, 1992), not all individuals who experience trauma develop symptoms. For example, from 300 firefighters interviewed with the Diagnositic Interview Scale (Robins & Helzer, 1985) 42 months after being called to deal with a bush fire in Australia in which some of their colleagues were killed it was found that 18% had PTSD and 10% were depressed. Using the General Health Questionnaire (Goldberg & Hillier, 1979) at 4, 11 and 29 months after the fire, it was indicated that 50% never reached criteria for caseness for any psychiatric disorder.

Such differences between individuals may be the result of varying levels of significant predisposing factors (e.g. female gender, young age, previous mental illness, personality variables and previous experience of trauma [Yule, Williams & Joseph, 1999] and trait dissociative tendency as measured by the Trait Dissociative Questionnaire [Murray, 1997]) and varying levels of maintaining factors (e.g. avoidance, negative interpretation of symptoms, social reinforcement of physical disability, changed beliefs about self or the world, incomplete processing of the trauma and dissociation to intrusions [Yule, Williams & Joseph, 1999]). However, an equally important area is the nature of cognitive processing at the time of the trauma itself. Although it has been a fertile area of theorising, little research has directly investigated how peri-traumatic processing affects the quantity and quality of intrusive traumatic memories, despite the fact that PTSD arises due to memories of events that most people would be extremely distressed by and peri-traumatic processing determines the initial encoding of these representations (Holmes, 2000).

Theoretical models of PTSD

Single level models of PTSD assume that trauma memories are represented in a unitary form with all aspects of the trauma represented together in some form of "fear memory" that is poorly integrated with higher-level meaning structures. Although unitary models account for some of the phenomena associated with PTSD, it will be shown that Dual Representation Theory, as a multi-level model of trauma representations, is capable of providing a more comprehensive account of the full range of PTSD phenomena.

Single Level models

Some of the more influential single level models of PTSD will be summarised to provide relevant background to theorising in this area and to allow comparison with the multi-level Dual Representation Theory.

Horowitz's Formulation of Stress Response Syndromes

Although strongly influenced by the classical psychodynamic conceptualisation of trauma reactions (see Freud, 1920), Horowitz's (1986) theory is primarily concerned with the cognitive processing of thoughts, images and affects in relation to his concept of the "completion tendency". The completion tendency is defined as the, "need to match new information with inner models based on older information, and the revision of both until they agree" (Horowitz, 1986, p. 92). According to this model, PTSD arises when traumatic information incongruent with long-term meaning representation fails to be integrated due to psychological defence mechanisms (such as numbing and denial) that serve to keep the traumatic information out of conscious awareness. Therefore, traumatic material remains in

"active memory" where it gives rise to re-experiencing symptoms at points when psychological defences break down, leading to oscillation between intrusions and denial-numbing defences as the completion tendency attempts to integrate the trauma with prior knowledge.

Horowitz model holds considerable explanatory power but fails to account for why some individuals develop PTSD while others who experienced similar events do not, what peri-traumatic factors might account for such individual differences or how "active memory" relates to normal autobiographical representations.

Janoff-Bulman's Cognitive Appraisal Theory

Similarly to Horowitz, Janoff-Bulman (1985, 1992; Janoff-Bulman & Frieze, 1983) relates PTSD to incongruence between the meaning an individual attaches to a traumatic event and their pre-existing beliefs. However, cognitive-appraisal theory goes further to suggest PTSD arises from the "shattering" of basic assumptions about the self and the world such as the assumption of personal invulnerability, the perception of the world as meaningful and the view of the self in a positive light. Although this model is applicable to cases where individuals held such beliefs prior to trauma, it holds little explanatory power in the cases where trauma serves to confirm pre-existing negative beliefs and fails to specify cognitive architecture through which "shattering" occurs.

Foa's Fear Network

Influenced by Lang's (1977, 1985) theory of fear structures, Foa and Kozak's (1986) Fear Network model describes how PTSD representations include links

between the feared stimuli, physiological and behavioural responses, and verbally accessible appraisals, thereby accounting for why any stimulus associated with the trauma can activate the entire constellation of responses. When activated by cues the information enters consciousness in the form of intrusions leading to attempts to avoid reminders and suppress thoughts that maintain and exacerbate re-experiencing symptoms.

Similarly to earlier theorists, Foa argues that successful treatment involves the integration of the fear network into existing memory structures. However, Foa's model makes a significant step forwards by also proposing a cognitive framework through which this occurs requiring, first, the activation of the fear network so that it becomes accessible for modification and, second, the incorporation of new information into the fear network that allows assimulation into the individual's autobiographical memory. Foa also highlights the importance of peri-traumatic factors that may disrupt cognitive processing leading to fragmentation in the structure of trauma memories and greater incompatibility with normal memories in autobiographical memory that is structured by time and context (Conway, 1996). However, as a theory that conceptualises trauma memories as existing at a single level of representation, Foa's model does not *specify* the precise nature of peri-traumatic cognitive processes that result in trauma memories being poorly integrated into autobiographical memory and, therefore, lacks explanatory power regarding the central question of trauma theorising: why do some power develop PTSD while others do not?

Dissociation

The experience of peri-traumatic dissociation is often referred to in clinical literature as a factor that increases individual's vulnerability to developing PTSD (Foa & Hearst-Ikeda, 1996; Foa & Riggs 1993; van der Volk & van der Hart, 1989). Dissociation has often been characterised as a "defence mechanism" that helps an individual cope during the trauma through stress-reduction due to a sense of detachment and unreality but, for the same reasons, interferes with processing of the experience and exacerbates post-trauma pathology (van der Kolk and van der Hart, 1989; Foa and Hearst-Ikeda, 1996).

Dissociation may be defined as existing on a continuum (Ross, 1985) between "normal" dissociation such as day-dreaming to pathological dissociation such as fugue states and dissociative identity disorder (Putman, 1997) and has sometimes been used interchangeably with clinical phenomena such as depersonalisation, derealisation and psychogenic amnesia. In accordance with the broad use of the term, definitions of dissociation are vague and unclear regarding their relationship with cognitive models of PTSD. For example, the American Psychiatric Association conceptualises dissociation broadly as "disruption of the usually integrated functions of consciousness, identity, or perception of the environment" (DSM-IV, 1994) while Spiegel & Cardena (1990, p.367) define it as a "structured separation of mental processes (e.g. thoughts, emotions, connotations, memory and identity) that are ordinarily integrated". Therefore, the concept of dissociation currently lacks a clear definition and is a "complex and poorly understood topic" (Ehlers & Clark, 2000).

Dual Representation Theory

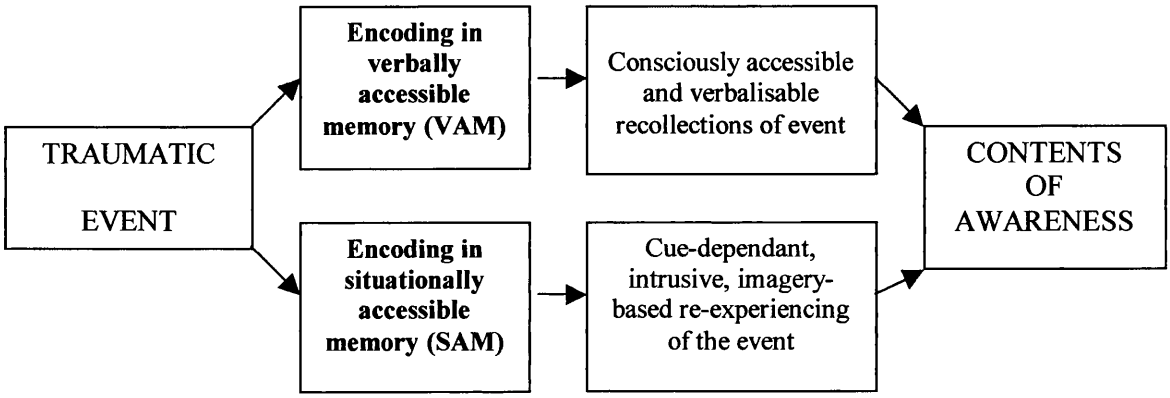
The notion that two fundamentally distinct types of memory for traumatic events was first suggested by Janet (1904) who distinguished between traumatic memories and ordinary narrative memories. Similarly, Pillemer, Desrochers and Ebanks (1997) have distinguished between narrative-based ordinary memories and image-based memories that have the quality of "re-living". Unlike single level models, Dual Representation Theory (DRT) (Brewin, Dalgleish & Joseph, 1996) suggests that traumatic memories can be stored in *two distinct representational formats*: verbally accessible memory (VAM) and situationally accessible memory (SAM).

VAM represents the person's conscious experience of the trauma, can be retrieved automatically or deliberately, can be verbally communicated, contains limited sensory information, supports ordinary autobiographical memory, can be edited and interacts with general autobiographical knowledge (i.e. VAM information is appropriately contextualised within time and place). VAMs contain information that the individual has attended to before, during and after the trauma and has received sufficient conscious processing to be integrated in normal long-term memory. Therefore, the amount of information stored in VAM representations is limited by limited-capacity, serial processes such as attention that are known to be adversely effected by high arousal (Eysenck & Keane, 1990). VAM incorporates consciously accessible and verbalisable cognitive appraisals, occurring both during the trauma and after the event that are accompanied by associated emotional responses (Brewin, 2000).

In contrast, SAM only contains information from processing at the time of the trauma, cannot be deliberately accessed, is difficult to control being dependent on internal or external cues, is difficult to communicate to others and contains extensive sensory information from lower-level perceptual processing (i.e. imagery which has received little conscious processing and autonomic and motor responses occurring at the time of the trauma). Crucially, SAM supports imagery-based re-experiencing symptoms and may promote distortions in personal context, such as feeling or acting as if the trauma is re-occurring in the present. The contextual distortions that arise during SAM-based re-experiencing symptoms results from its lack of integration within long-term, autobiographical memory structures which normally contextualise memories of personal experience. Furthermore, traumatic memories (i.e. SAM-based intrusions) may not change to any significant extent despite multiple retrievals (van der Kolk & van der Hart, 1991).

DRT proposes that VAM and SAM representations are encoded in parallel at the time of the trauma and can account for the full range of PTSD phenomenology (see Figure 1, below).

Figure 1. An illustration of Dual Representation Theory applied to PTSD phenomenology (based on Brewin et al., 1996).



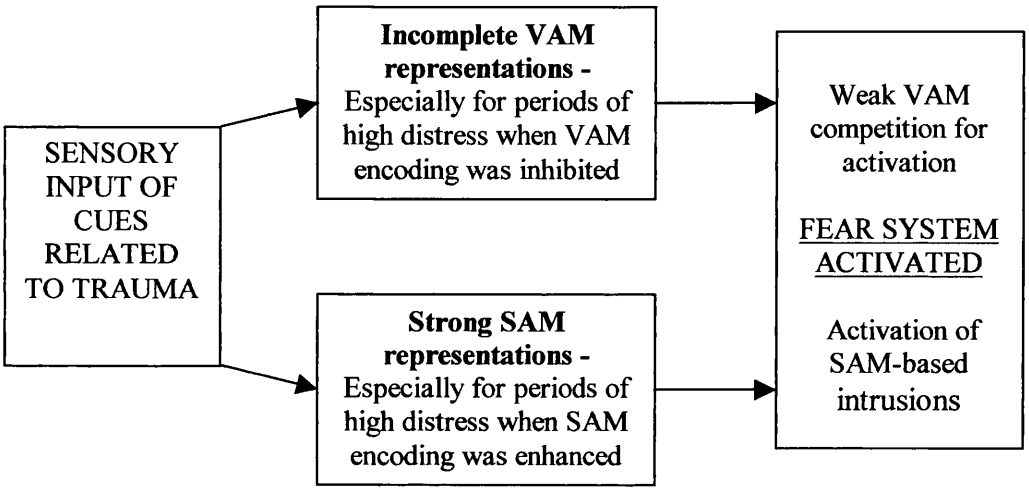
Brewin et al. (1996) propose that the effective emotional processing of trauma must occur in both the SAM and VAM representational formats in order to be successful. Essentially, this requires the transfer of information from the SAM store to the VAM store through the focusing of attention on the content of intrusions. Through conscious processing of traumatic material, elaborated VAM representations are hypothesised to acquire retrieval cues previously only associated with SAMs allowing them to compete for activation with SAM-based intrusions. Greater competition for activation between SAM and VAM in response to external and internal cues associated with the trauma is thought to lead to less frequent activation of SAM-based intrusive imagery and the fear associated with re-living symptoms. Importantly, the generation of autobiographically integrated, consciously accessible VAM representations provides trauma information with a context that includes temporal location in the past, cessation of immediate threat and the restoration of safety. Furthermore, the activation of VAMs is preferential to the activation of SAMs because VAM information is limited by serial processes such as attention

reducing the degree of sensory information attached to the memory and, therefore, the degree of subjective, imagery-based "re-living" attached to the experience.

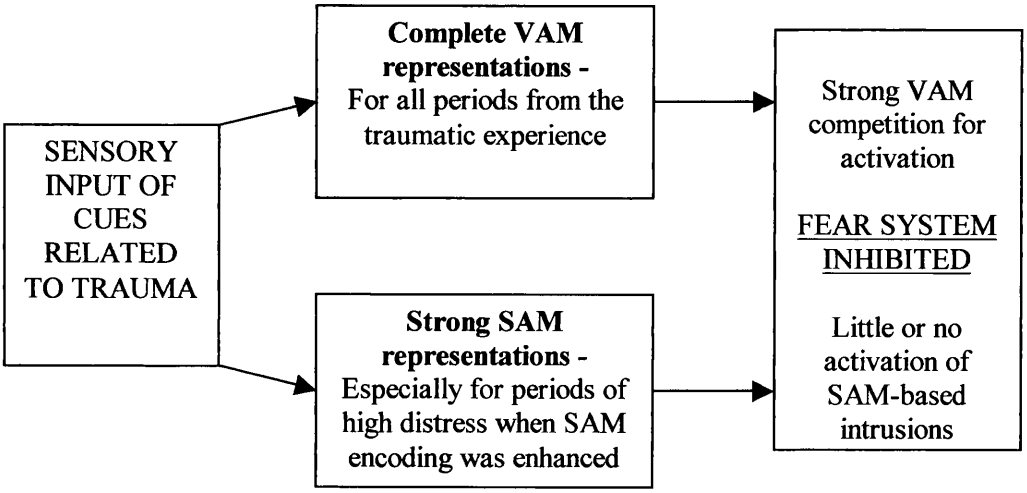
The relationship between the incompleteness of VAM representations in comparison to SAM representations and the activation of intrusions and the fear system is shown below in Figure 2.

Figure 2. The completeness of verbally accessible memory (VAM) in comparison to situationally accessible memory (SAM) and the activation of the fear system (based on Brewin, 2000).

(a) Incomplete VAM representation – fear system activated:



(b) Complete VAM representation – fear system inhibited:



Therefore, Brewin (2000, p.17-18) suggests that the frequency of SAM-based intrusive memories experienced by an individual is likely to depend on the extent of the discrepancy between the amount of information coded into verbally and situationally accessible forms of memory. As this depends on the efficiency of verbally accessible memory during critical periods of the trauma, any peri-traumatic manipulation that affects the efficiency of VAM can be predicted to affect the number of intrusive memories that are experienced.

It is also suggested that with repeated re-activation of the VAM system a more stable, permanent representation of the trauma will be consolidated that can exert the appropriate inhibitory influence on the fear system quickly and efficiently without the need for the VAM representation to be reconstructed each time the person encounters a trauma reminder (Brewin, 2001).

Ehlers and Clark's cognitive model of PTSD

There are several similarities between Ehlers and Clark's (2000) cognitive model of PTSD and Dual Representation Theory. They suggest that PTSD symptoms are maintained by the processing of trauma information in a way that leads to a sense of serious, ongoing, current threat and that this arises from: "(1) excessively negative appraisals of the trauma and/or it's sequelae; and (2) a disturbance of autobiographical memory characterised by poor elaboration and contextualisation, strong associative memory and strong perceptual priming" (Ehlers & Clark, 2000, p.319). They add that change in negative appraisals and in the trauma memory is prevented by maladaptive cognitive and behavioural coping strategies such as avoidance of internal and external reminders of the trauma.

From a DRT perspective, the first point (excessively negative appraisals) relates to the content of VAM representations of the trauma regarding its meaning to the individual. Brewin (2001) suggests that problems arise when individuals fail to "repeatedly process and compare pre-trauma and post-trauma information within the VAM system" and that this failure to integrate trauma appraisals with pre-existing beliefs can lead to "catastrophic interference with previous beliefs and assumptions". The second point (disturbance of autobiographical memory characterised by poor elaboration and contextualisation, strong associative memory and strong perceptual priming) may be understood in DRT terms as relating to poorly elaborated and integrated VAMs combined with strong, easily triggered SAM representations.

Importantly, Ehlers and Clark's model is also a dual level model that distinguishes between two routes to the retrieval of autobiographical information. The first is through higher-level meaning-based retrieval strategies (known in DRT as VAM) and has the capacity to inhibit the second that is only activated through direct triggering by stimuli that were associated with the event (know in DRT as SAM). This represents a convergence of ideas in the theoretical understanding of PTSD. However, Ehlers and Clark's model may be drawn upon to make an important contribution to DRT regarding the precise characteristics of VAM processing which are likely to have the capacity to inhibit SAM-based intrusions, as discussed below.

Conceptual processing and Dual Representation Theory

Brewin et al.'s (1996) model gives rise to the question of precisely what kind of cognitive processing is likely to give rise to strong VAM representations. As described above, according to DRT this simply requires the association of retrieval cues with VAMs that were previously only associated with SAMs. Ehlers and Clark (2000) go further and use Roediger's (1990) distinction between conceptual and data-driven processing to suggest that the inhibition of intrusions requires greater in-depth processing of the meaning and context of the trauma.

Ehlers and Clark (2000) describe conceptual processing as processing the meaning of a situation, processing it in an organised way and placing it into context and suggest that the degree to which this occurs peri-traumatically, and post-traumatically, determines how far the experience can be retrieved intentionally rather than unintentionally in response to external or internal cues. If Ehlers and Clark are correct in their prediction that deeper conceptual processing is required for the resolution of re-experiencing symptoms, it is reasonable to hypothesise that lower levels of peri-traumatic conceptual processing will lead to memories being primarily encoded into SAM with poorly elaborated and integrated VAMs that are unlikely to inhibit intrusions. Data-driven processing, where an individual focuses on processing sensory impressions, may be conceptualised as giving rise to representations encoded in the SAM format.

Experimental investigation of the development of intrusions

The distressing film as a trauma analogue

Murray (1997) experimentally examined the relationship between what happens during the encoding of a distressing event and the development of intrusions afterwards. As this can only be examined retrospectively with naturally occurring PTSD, he used a distressing film (containing footage of the aftermath of road-traffic accidents) as an experimental analogue to real-life trauma and attempted to manipulate participants' levels of peri-traumatic dissociation. Murray predicted that the dissociation group would report lower levels of initial distress but a higher level of spontaneous intrusions over a two-week follow-up period than those in a no-task control condition.

His dissociation condition involved describing dissociation to the participants and asking them to attempt to dissociate voluntarily by self-inducing a state of emotional numbness. Contrary to predictions, he found no differences between conditions and attributed this to the inability of participants to dissociate voluntarily under laboratory conditions. However, in another experiment Murray did find that Trait Dissociation, measured using his Trait Dissociation Questionnaire, predicted the development of intrusive memories.

The concurrent visuo-spatial tapping task

Brewin and Saunders (2001) used the same distressing film and intrusion diary paradigm as Murray and agreed with his interpretation that simply instructing participants to dissociate was not a successful manipulation of peri-traumatic dissociation. As an alternative, they used a dual-task paradigm in an attempt to

demonstrate the effect of an experimental analogue of dissociation on participants' memory intrusions for a distressing film. The dual task involved tapping repetitive sequences on a hidden key-pad (Moar, 1978). They predicted that a concurrent visuo-spatial tapping task would approximate the decrement in conscious processing that exemplifies dissociation and, therefore, lead to more intrusions in their dissociation group compared to a no-task control. Brewin and Saunders made this prediction on the basis that the visuo-spatial task would mimic real-life dissociation by "reducing the amount of attention and conceptual processing given to the traumatic scene and hence leading to less well-organised memory records and greater numbers of memory intrusions over the following days" (2001, p. 468).

Contrary to predictions, the concurrent task actually exerted a highly significant protective effect as the dissociation group recorded *less* intrusions than the control group, indicating that their divided attention paradigm was a poor analogue of the kind of dissociation encountered during traumatic events. Regarding the unexpected protective effect of the visuospatial tapping task, Brewin and Saunders reject the possibility that this finding might be the result of less information about the film being encoded in the dual-task group on the basis that scores on an explicit memory questionnaire for the film did not differ between groups and also state that the finding was unlikely to be the result of arousal as level of distress did not differ either.

The dual task paradigm is commonly used to test the extent to which performance during a basic primary task is affected when it is performed concurrently with a secondary task, compared to when the primary task is performed alone. Changes in

performance of the primary task are used to determine the extent to which the two task utilise the same cognitive resources (Brook, 1968). The concurrent use of the Moar box tapping task (which requires visuo-spatial resources related to maintaining a mental representation of the pattern to be tapped) has been found to disrupt imagery (Baddeley, 1990) and to reduce the vividness and emotiveness of traumatic imagery (Andrade, Kavanagh & Baddeley, 1997) indicating that the tapping task competes for resources with the visuospatial sketchpad component of working memory and, thus, inhibits the creation and maintenance of imagery. Therefore, Brewin and Saunders suggest that their finding supports the hypothesis that at least some PTSD intrusions are mediated by an imagery-based memory system and that the protective effect of the tapping task was due to it's capacity to compete for visuospatial processing resources leading to the encoding of the trauma in a less vivid and less emotive form. Clearly, this account is supportive of dual representation theory as summarised in Brewin and Saunder's suggestion that "the tapping task may selectively interfere with encoding into situationally accessible memory, resulting in a reduction in intrusions, while leaving intact encoding into verbally accessible memory, so that explicit recall of the film is unimpaired" (2001, p. 471).

Brewin and Saunder's explanation of the protective effect of a visuospatial tapping task is not possible using older single level models of memory that do not distinguish between language-based and imagery-based memory systems. Furthermore, although central to the original rationale for their experiment, the concept of dissociation is irrelevant to this Dual Representation Theory account of the Brewin and Saunder's unexpected finding.

Further experimentation using a distressing film

Holmes (2000) also used the stressful film and one-week intrusion diary approach to explore peri-traumatic processes in intrusion development. The first experimental condition used a modified visuo-spatial Moar box, tapping task while the second experimental condition employed a dot-staring staring task intended to induce dissociation. All participants heard a description of dissociation and were screened for their ability to dissociate in response to the dot-staring task before being randomly assigned to the experimental conditions or a no-task control group. Additionally, Holmes elaborated the distressing film approach by drawing on findings from recent research that has employed psycho-physiological measures in the study of PTSD. Heart rate drops were used as an objective indication of state dissociation on the basis of research showing a relationship between drops in heart rate and high peri-traumatic dissociation among rape-victims (Griffin, Resick & Mechanic,1997).

Holmes (2000) replicated Brewin and Saunder's (2001) finding that a concurrent visuo-spatial tapping task results in less intrusive recollections of the film than a no-task control condition and controlled for a potential confounding variable present in Brewin and Saunder's original procedure. Although Holmes dot-staring task did induce dissociation, it only resulted in a non-significant trend for participants in this condition to record a greater number of intrusions. Like Murray (1997), Holmes attributed this to the difficulty of experimentally manipulating a phenomenon that usually occurs involuntarily. Holmes (2000) also found that peri-traumatic state dissociation (as indicated objectively by drops in heart rate) occurred at points in the film that were associated with subsequent intrusions and built on Murray's

(1997) finding that trait dissociation predicts intrusion rates by demonstrating that subjectively measured state dissociation independently predicts intrusion development. The finding that peri-traumatic moments of dissociation were associated with subsequent intrusive thoughts emphasises the importance of peri-traumatic "hot-spots" within trauma representations (Holmes, 2000).

It is possible that the relationship between peri-traumatic dissociation and the development of intrusions is mediated by impairment in the efficiency of verbal processing. Dual Representation Theory predicts that impairment in the efficiency of verbal processing during trauma for any reason (including dissociation) will increase the likelihood of subsequent PTSD symptomology.

Early research on the role of verbal processing

Limited evidence for the relationship between peri-traumatic verbal processing and individual responses to distressing material may be drawn from early research into peri-traumatic processing that used concurrent tasks to manipulate the encoding of trauma analogue films. Lazarus, Opton, Nomikos and Ramkin (1965) used physiological measures to compare participants stress levels during a film portraying an industrial accident but did not measure levels of distress after the film or the number of intrusive thoughts experienced. There were three conditions in this study including: "intellectualisation", where participants were told to adopt a detached, analytical attitude during the film and think from a psychological and sociological perspective; "denial", where participants were informed that the events were staged with actors and encouraged to remind themselves of this throughout the film; and control, where the film was watched without any instructions.

Interestingly, intellectualisation led to less distress during the film, as indicated by skin conductance and heart rate, and involved participants reminding themselves it was just a film, attributing blame, thinking about technical aspects and finding humour in the events (Koriat, Melkman, Averill and Lazarus, 1972).

From a contemporary theoretical perspective, it can be argued that the distress reducing effect of the intellectualisation condition was due to enhanced conceptual processing of the film leading to better elaborated VAM representations in contrast to the control condition, where participants would have been free to avoid processing of the trauma, and the denial condition, where denial of the reality of the footage may have inhibited conceptual processing and VAM encoding. However, the lack of any measures of post-film development of intrusions in these studies of peri-traumatic verbal encoding means the post-traumatic impact of enhanced verbal/ conceptual processing during trauma is an area of speculation in previous literature and an area of enquiry for the current thesis.

Other experimentation using concurrent tasks

Rather than using the stressful film paradigm, Hellawell and Brewin (2001) tested Dual Representation Theory by instructing participants diagnosed with PTSD to write narratives of their traumatic experiences and compared their performance on a verbal and a visuo-spatial concurrent task between time points when they were experiencing flashbacks and time-points when they were not. In accordance with DRT, they predicted that within a trauma narrative periods of flashback should selectively utilise visuo-spatial cognitive processing resources where as periods of ordinary memory should selectively utilise verbal cognitive processing resources.

They also predicted that during flashback periods participants would should greater amounts of observable autonomic and motor activity.

To test these predictions, Hellawell and Brewin described the clinical phenomenology of flashbacks to patients with PTSD and asked them to write a detailed narrative of their traumatic experience. Afterwards, they were asked to retrospectively identify periods in the narrative when flashbacks occurred and periods of normal memory. Participants performed the verbal and visuospatial cognitive tasks prior to the trauma narrative, following a period of ordinary memory in the trauma narrative, following a period of flashback in the trauma narrative, and at the end of the trauma narrative. The visuospatial task used was the trail making test which forms part of the Halstead Battery (Reitan & Wolfson, 1985) and the verbal task was the commonly used oral subtraction task of counting backwards in threes from a specified number. Hellawell and Brewin confirmed the prediction that flashbacks selectively competed for visuospatial resources compared to ordinary memory (as indicated by poorer performance on the trail making test) but did not find that the two types of memory differed in their utilisation of verbal resources (as indicated by performance on the oral subtraction task). They also confirmed that flashbacks were associated with greater autonomic arousal and motor behavioural associated with re-living experiences.

This provides further support for the hypothesis that re-experiencing symptoms, including intrusive imagery and flashbacks, are supported by a SAM system where information is encoded in a relatively unprocessed sensory form that will compete for resources with tasks that utilise visuo-spatial resources. Hellawell and Brewin

suggest that their failure to find that ordinary memory utilised greater verbal resources was an artefact of their task demands which required all participants to write verbally accessible details of periods of flashback and ordinary memory, thereby demanding an equal amount of verbal processing (Hellawell and Brewin, 2001, p. 11).

Summary of key empirical findings

Research using the stressful film paradigm has demonstrated: the intrusion-reducing effect of a peri-traumatic visuo-spatial tapping task (Brewin & Sanders, 2001; Holmes, 2000); the selective use of visuo-spatial cognitive resources during re-experiencing (Hellawell & Brewin, 2001); a connection between verbal processing and peri-traumatic stress (Lazarus, Opton, Nomikos and Ramkin, 1965); and the capacity of both subjective (DSS change) and objective (heart rate change) naturally occurring, peri-traumatic dissociation to independently predict intrusion development (Holmes, 2000).

Prior findings and the current study

The studies conducted so far have tended to emphasise experimental manipulations intended to either promote dissociation (i.e. inhibiting the formation of VAMs) or compete for visuo-spatial resources (i.e. inhibiting the formation of SAMs). No study has directly explored the impact of enhanced or inhibited peri-traumatic verbal processing of trauma in relation to the subsequent development of intrusive memories. As stated earlier, the primary aim of this study is to test the prediction of Dual Representation Theory (DRT) that the number of SAM-based intrusions a person experiences post-trauma is related to "the efficiency of verbally accessible memory during critical periods of the trauma" (Brewin, 2000, p.17-18).

The finding that a peri-traumatic, visuo-spatial tapping task leads to less post-film intrusive memories supports DRT and is of particular relevance to the current study. As discussed earlier, the SAM system depends on lower-level perceptual processing and the protective effect of peri-traumatic visuo-spatial tapping may be mediated by

competition with the SAM system for visuo-spatial resources (Brewin & Saunders, 2001; Holmes 2000; Hellawell & Brewin, 2001). This is hypothesized to disrupt the formation of SAMs making memories less visuo-spatial, more verbal and less likely to be triggered by reminders (Holmes, 2000).

It is difficult to account for the intrusion-reducing effect of a concurrent visuo-spatial task as the results of simple competition for the attentional resources of the central executive (Baddeley, 1986) as participants in Holmes' (2000) visuo-spatial distraction condition scored equally to other conditions on an explicit memory test of the film. However, it can be argued that Holmes' explicit memory test was insensitive to group differences in explicit memory recall for the film and that the intrusion-reducing effect of the concurrent visuo-spatial task was attributable to simple distraction that could be accounted for using a single level model of PTSD without recourse to DRT. Part of the rationale for the current study is to test whether a verbal concurrent task exerts the same intrusion reducing effect as the well replicated protective effect of the concurrent visuo-spatial tapping task (as one would predict if simple distraction could account for prior findings) or exerts the counter-intuitive *opposite effect* of actually increasing intrusion rates (as predicted by DRT). The equally counter-intuitive DRT prediction that enhanced verbal processing of the traumatic stimulus will lead to less intrusions will also be tested.

Predictions from Dual Representation Theory regarding inhibited, and enhanced, peri-traumatic verbal processing will be discussed fully in the next section and followed by details of how these predictions will be tested in the current study.

Predictions from Dual Representation Theory

In the current thesis, Dual Representation Theory (Brewin et al., 1996) is used to generate two main hypotheses regarding the effect of verbal distraction and verbal enhancement on peri-traumatic processing of the film and the development of intrusive memories in the one-week period afterwards.

Inhibited peri-traumatic verbal processing

A verbal distraction task performed while watching the film will interfere with conceptual processing of the traumatic scenes and, therefore, lead to poorly elaborated, poorly integrated VAMs compared to watching the film with no task. This is hypothesised because conceptual processing is understood as a self-referential process that involves integrating traumatic experience into autobiographical context primarily through verbal elaboration, accessible to conscious awareness. Due to the importance of verbal elaboration in the creation of VAMs, a concurrent verbal task that taps language-based, attentional resources is expected to inhibit their creation.

Participants who engage in a concurrent verbal distraction task are predicted to experience more intrusive memories compared to no task controls because internal and external cues related to the film are more likely to trigger SAM representations because their VAM representations are less well developed (see Figure 2a, p. 15). Furthermore, the intrusive memories experienced after peri-traumatic verbal distraction are predicted to be experienced as possessing more characteristics of the SAM system in the absence of strong VAMs; as indicated by memories of a more vivid, sensory nature with greater associated distress, feeling of happening now and

automacy. Indeed, through suppression of conceptual processing, and the inhibition of VAM representations, a peri-traumatic verbal task is predicted to lead to the generation of intrusive memories of a more "PTSD-like" nature.

Additionally, it is possible to form hypotheses regarding the effect of inhibited peri-traumatic verbal processing on attention, memory, emotion/distress and dissociation. Because inhibited verbal processing is predicted to inhibit VAM encoding it is also predicted that it would result in lower subjective ratings of attention paid to a stimulus and worse explicit memory for the stimulus (because conscious verbal processing resources are inhibited). It can also be tentatively predicted that inhibited peri-traumatic verbal processing will also be associated with lower levels of emotion and distress (due to less distraction of conscious processing resources) and higher state dissociation (because dissociation has been defined as a "structured separation of mental processes... that are ordinarily integrated" [Spiegel & Cardena, 1990, p.367] and it may be argued that inhibited verbal processing is associated with lesser integration of mental processes).

Enhanced peri-traumatic verbal processing

In direct contrast to verbal distraction, participants who engage in a peri-traumatic verbal task that enhances their conceptual processing of the film are predicted to form better elaborated and better integrated VAMs than no-task controls through verbal description, contextualising and interpretation of meaning. When encountering external or internal cues related to the trauma well developed VAM representation will compete for activation with SAM mediated intrusive recollections thereby, reducing the rate of intrusions experienced (see Figure 2b,

p.15). Furthermore, greater activation of competition from the VAM system is predicted to reduce the PTSD-like nature of intrusions (i.e. lower vividness, distress, feeling of happening now and automacy) due to the hypothesised capacity of VAM recollections to undermine the impact of re-experiencing symptoms by contextualising the individual in their autobiographical context.

Additionally, it is possible to form hypotheses regarding the effect of enhanced peri-traumatic verbal processing on attention, memory, emotion/distress and dissociation. Because enhanced verbal processing is predicted to facilitate VAM encoding it is also predicted that it would result in higher subjective ratings of attention paid to a stimulus and better explicit memory for the stimulus (because conscious verbal processing resources are facilitated). It can also be tentatively predicted that inhibited peri-traumatic verbal processing would also be associated with higher levels of emotion and distress (because individuals are forced to engage with the distressing material) and lower state dissociation (because dissociation has been defined as a "structured separation of mental processes... that are ordinarily integrated" [Spiegel & Cardena, 1990, p.367] and it may be argued that enhanced verbal processing is associated with greater integration of mental processes).

Summary of main predictions

The essential elements of the model and predictions are represented diagrammatically in Figure 4, below. Additionally, the prior finding of the intrusion reducing effect of a peri-traumatic visuo-spatial, tapping task (Holmes, 2000) is shown for comparison in Figure 3. It is important to re-iterate that unlike single level models of trauma, Dual Representation Theory predicts that a peri-traumatic verbal distraction task will have the *opposite* effect on intrusion rate to a peri-traumatic visuo-spatial task.

Figure 3. Prediction of Dual Representation Theory confirmed by prior experimentation (Holmes, 2000) regarding the protective effect of a peri-traumatic visuo-spatial distraction task (based on Holmes, 2000).

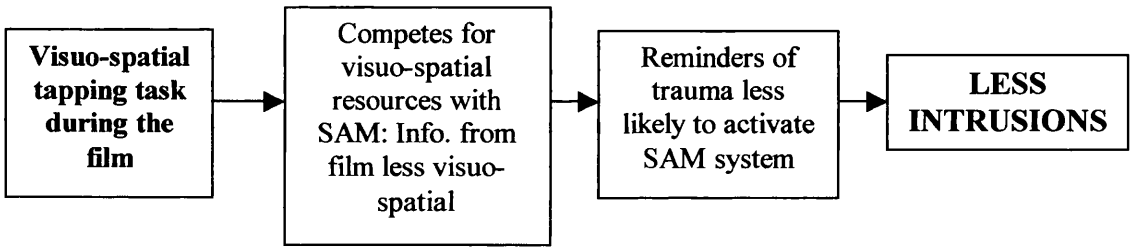
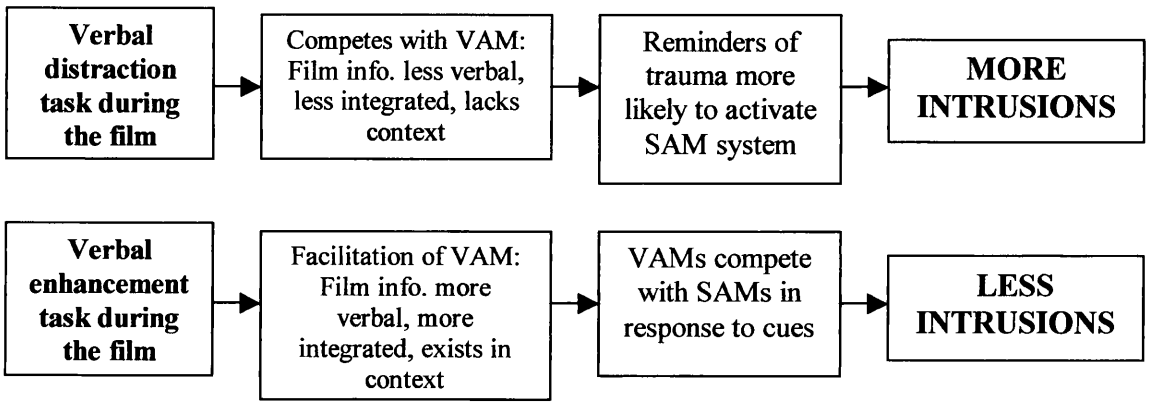


Figure 4. Hypotheses from Dual Representation Theory to be tested in the current study regarding the effects of peri-traumatic manipulation of verbal encoding variables on intrusion rates.



Experimental investigation of the thesis hypotheses

Peri-traumatic verbal processing

The proposed design involves a modification of Holmes' (2000) distressing film and intrusion diary experiment using new peri-traumatic concurrent tasks intended to manipulate the efficiency verbally accessible memory. A related aim of the proposed study is to control for the possibility that the protective effect of a concurrent visuo-spatial task was due to simple distraction effects that would arise from a non-visuo-spatial concurrent task that could be accounted for with a single level model of PTSD. Conceptual processing of the film will be measured using questions regarding the meaning of the film to self, others and the world in order to explore the relationship between peri-traumatic verbal processing and this factor. Additionally, participants verbal task performance (for both the verbal distraction and verbal enhancement tasks) will be recorded and scored to allow a comparison of task performance during periods of the video that give rise to intrusions later and those that do not. The Dual Representation prediction that verbal processing will be inhibited during these "intrusion-sequences" will be directly tested using this novel approach.

Three between-subject conditions will be employed including: (1) a peri-traumatic verbal distraction task intended compete for verbal resources (to reduce the efficiency of VAM); (2) a peri-traumatic verbal enhancement task intended to promote verbal encoding of trauma (to enhance the efficiency VAM); and (3) a control condition (watching the film with no concurrent task).

Peri-traumatic tasks

Verbal distraction

The commonly used oral subtraction verbal task of counting backwards in threes from a specified number (e.g. Hellawell & Brewin, 2001; Meudell, Butters & Montgomery, 1978) will be used in the verbal distraction condition. A simple articulatory suppression task (i.e. repetitious production of an irrelevant speech sound) was not used because of evidence that blocking of the phonological loop component of working memory (see Baddeley, 1999) may not satisfactorily inhibit verbal memory encoding under some conditions (Vallar & Baddeley, 1982). In contrast, oral subtraction in threes requires greater verbal attentional resources and was predicted to act as an effective verbal distraction task with most participants.

Verbal enhancement

The verbal enhancement condition participants will be instructed to verbalise a continuous verbal narrative while they watch the film. In order to maximise external validity, the instructions for this task will allow participants the freedom to "say what comes naturally" during the film and include the suggestion that they can describe: the physical characteristics of the film during viewing (eg. actions of people, appearance of objects, etc); any thoughts they have while watching the film regarding its meaning to them; any emotions they experience; any memories they have in relation to the film; and what they think people in the film are thinking or feeling. These instructions are deliberately similar to those given to patients engaged in prolonged exposure therapy (Foa, Rothbaum, Riggs & Murdock, 1991) for PTSD who gain therapeutic benefit from the development, and repeated exposure to, a coherent verbal narrative of the full traumatic event, using maximum

detail regarding stimulus characteristics and including any thoughts or feelings arising during the process (see Richards & Lovell, 1999).

Summary of hypotheses

Experimental hypotheses developed from the preceding literature review are summarised in greater detail below and operationalised in terms of the measures to be used. The main predictions of Experiment 1 are:

Intrusion quantity

- *Hypothesis 1:* Participants in the verbal distraction condition will experience a significantly greater total number of intrusions in one week and more days with intrusions in comparison to the control condition as recorded in the intrusion diaries.

- *Hypothesis 2:* Participants in the verbal enhancement condition will experience a significantly smaller total number of intrusions in one week and less days with intrusions in comparison to the control condition as recorded in the intrusion diaries.

Intrusion quality

- *Hypothesis 3:* Participants in the verbal distraction condition will rate their intrusions significantly higher on mean diary scores of distress, vividness, feeling of happening now and automacy/spontaneity compared to the control condition as recorded in the intrusion diaries. Additionally, the verbal distraction group "most significant" intrusions will be higher on a score of intrusion characteristics summed from self-ratings of intrusion vividness, nowness, distress, unwellcomeness and fragmentation.

- *Hypothesis 4:* Participants in the verbal enhancement condition will rate their intrusions lower on mean diary scores for distress vividness, feeling of happening now and automacy/spontaneity compared to the control condition as recorded in the intrusion diaries. Additionally, the verbal enhancement group "most significant" intrusions will be lower on a score of intrusion characteristics summed from self-ratings of intrusion vividness, nowness, distress, unwellcomeness and fragmentation.

Conceptual processing

- *Hypothesis 5:* Verbal distraction participants will experience impaired conceptual processing of the film as indicated by responding "yes" to significantly less meaning questions than control participants

- *Hypothesis 6:* Verbal enhancement participants will experience facilitated conceptual processing of the film as indicated by responding "yes" to significantly more meaning questions than control participants.

Attention and memory

- *Hypothesis 7:* Participants in the verbal distraction will rate their attention paid to the film as significantly lower than participants in the control group and also show significantly poorer scores on the recognition and recall memory tests than the verbal enhancement group.

- *Hypothesis 8:* Participants in the verbal enhancement condition will rate their attention paid to the film as significantly higher than participants in the control group and also show significantly better scores on the recognition and recall memory tests than the verbal distraction group.

Peri-traumatic verbal processing

- *Hypothesis 9:* Participants in the verbal distraction and verbal enhancement conditions will spend a greater percentage of time in pauses longer than 2 seconds during film periods associated with subsequent "most significant" intrusions (i.e. most significant intrusion sequences or "MSIS") than during the film as a whole. Additionally, the VD group will show proportionally more errors in counting during MSIS.

Emotion, distress and dissociation

- *Hypothesis 10:* Participants in the verbal distraction condition will experience less negative emotion, less distress and more dissociation in response to the video compared to the control group as indicated by self-rating on emotion and distress scales.

- *Hypothesis 11:* Participants in the verbal enhancement condition will experience more negative emotion, more distress and less dissociation in response to the video compared to the control group as indicated by self-rating on emotion and distress scales.

METHOD

Participants

The 60 participants were recruited through the placement of adverts around University College London (UCL), Queen Mary's University and University of London sites, and various sites not associated with a University (e.g. notice boards in shops and libraries). Additionally, "face-to-face" recruitment was conducted by the author at the UCL student's Union. As a non-clinical sample of healthy volunteers was required, the only exclusion criteria were: age under 18 years; having participated in a similar experiment; and a prior history of treatment for mental illness. The last exclusion criterion was included to reduce the small possibility of harm to participants through the viewing of the distressing video by excluding potentially vulnerable individuals who had suffered from diagnosed mental health problems in the past. Ethical approval for the study was obtained from UCL/UCLH Joint Committees on the Ethics of Human Research (see Appendix 11, p. 149)

Thirty-three women and twenty-seven men participated in the experiment. The age range was from 18 to 51 (mean age: 26.5, SD = 8.7). Of those initially recruited, two participants did not take part due to a current or past treatment for a mental health problem and one participant did not take part due to being unable to attend on the days when the study was being run. Only one participant who completed part one of the experiment failed to return for the follow-up. However, they posted their completed diary form and this was included in the complete data set, with other follow-up measures coded as missing data. Additionally, four participants were

unable to return for follow-up but were able to complete the full follow-up over the telephone.

Of the 60 participants included in the study, 20 were randomly assigned to the verbal distraction condition, 20 to the verbal enhancement condition and 20 to the control condition.

Experimenter

The author tested all 60 participants.

Apparatus

Equipment

The equipment used in the experiment consisted of:

- A computer, keyboard, visual display unit (VDU) with linked video and a television.
- Computer administered questionnaires and on screen experimental instructions with software modified from a previous experiment (Holmes, 2000).
- An audio tape-recorder (Sony TCM-40DV) with cassettes.
- A sports timer stopwatch (Quantum, Model 694 974).
- Several questionnaires administered on paper.
- 12.5 minute stressful film containing scenes from after road-traffic accidents (as used by Brewin & Saunders, 2001; and Holmes, 2000).

Computer software

This was composed of two programmes, originally developed for the methodologically similar study by Holmes (2000). The computer software was developed in collaboration with a computer programmer for Holmes' study and was modified for use with the current study. Programme one ran the main experiment and programme two extracted the data for a database. Programme one presented a series of individually displayed questions on the VDU. One copy of the two programmes was made for each condition to accommodate differing on screen instructions across conditions. Participants responded via a standard keyboard and also completed paper-and-pen questionnaires.

Task compliance monitoring

Participants in the verbal distraction and verbal enhancement conditions were monitored for task performance by tape-recording their verbalisation for subsequent analysis.

Procedure

Summary of measures

Intrusion quantity and quality

Participants kept a record of all intrusions occurring over a seven-day period in an intrusion diary (see Appendix 6a and 6b, p. 139). The diary included a cover sheet with full instructions for keeping the diary and one page per day divided into spaces for morning, afternoon, evening and night. For each intrusion participants were instructed to record: the number of times the intrusion occurred; whether it was primarily an image, thought or both; and a brief description of the content of the intrusion. Additionally, participants recorded four numeric ratings between 0 (not at all) and 100 (extremely) for each intrusion regarding how distressed they were by the intrusion, how much it felt like the intrusion was "happening now", how vivid it was and how automatic/spontaneous the intrusion felt.

Diary compliance rating

Participants were asked, "To what extent is the following true of you: I have often been unable (or forgot) to record my intrusive thought or images in the diary". They responded with a rating between 1 (not at all true of me) and 10 (extremely true of me).

Intrusion Description Questionnaire (incorporating the meaning questions)

Participants were asked to select one intrusion from the diary that was the most "important/ significant" for them and were told, "I am interested in what this intrusion you have experienced as a result of the film appears like to you and what it means to you. Now try to imagine the intrusion. Please close your eyes". The

experimenter then verbally administered the Intrusion Description Questionnaire (see Appendix 8, p. 145) which included 0 (not at all) to 5 (somewhat) to 10 (extremely) ratings of how vivid, distressing, unwelcome/unwanted, fragmented and how much it feels like they are "seeing it happen again now". They also wrote brief descriptions of the intrusion and the thoughts that occurred the first time they saw the image while watching the film and gave ratings between 0 (not at all) and 10 (extremely) regarding emotions they were feeling while seeing the image. The emotions that were rated at this point included how unhappy, anxious, depressed, angry, fearful, horrified, helpless, disgusted and ashamed/guilt they currently felt.

An extremely important additional aspect to the Intrusion Description Questionnaire was the five "meaning questions". Participants were asked to respond yes or no to the following questions about their most significant intrusion:

1) Does it mean anything about people in the film?

2) Does it mean anything about you, yourself?

3) Does it mean anything about other people you know?

4) Does it mean anything about other people in general?

5) Does it mean anything about the World in general?

The meaning questions are intended as a simple assessment of how far participants had engaged in conceptual processing of the meaning of their most significant intrusion in relation to themselves, other and the World. A score between 0 and 5 was derived from this measure for each participant representing the number of meaning questions they answered "yes" to.

Verbal task performance

The verbal task performance of both VD and VE participants was recorded on audio tape while they watched the film. The tapes were coded by the experimenter at a later date in order to determine whether participants complied appropriately with task instructions and to allow a comparison of task performance during the whole film compared to task performance during film sequences associated with subsequent most significant intrusions or "most significant intrusion sequences" (MSIS).

Both VD and VE task performance coding included measurement of pauses in verbalisation of 2 seconds or longer. These were measured using a stopwatch and converted into percentages of time spent in pauses longer than two seconds for the whole film and for the MSIS for each participant.

Specifically to the VD task, the number of errors in the counting task was coded for the whole film and for participants' MSIS. The mean number of errors in counting per 10 seconds was calculated to provide a comparable score between the whole film and MSIS.

Specifically to the VE task, the percentage of total time and of MSIS time spent in data-driven processing and conceptually-driven processing was coded. Data-driven processing was defined as verbalisation focused on description of sensory impressions of the film while conceptually-driven processing was defined as anything going beyond simple description (e.g. verbalisation of thoughts about the films meaning, linking the film to personal memories or making attributions about

people in the film). The scores derived from the recording of VE and VD participant task performance are summarised below.

Verbal Distraction participant task performance:

1) Pausing -
    a. The percentage the whole film spent in pauses lasting two seconds or longer.
    b. The percentage of the most significant intrusion sequence spent in pauses of two seconds or longer.
2) Errors -
    a. The mean number of errors in counting per 10 seconds during the whole film.
    b. The mean number of errors in counting per 10 seconds during the most significant intrusion sequence.

Verbal Enhancement participant task performance:

1) Pauses -
    a. The percentage the whole film spent in pauses lasting two seconds or longer.
    b. The percentage of the most significant intrusion sequence spent in pauses of two seconds or longer.
3) Data-driven processing -
    a. The percentage the whole film spent in data-driven processing.
    b. The percentage of the most significant intrusion sequence spent in data-driven processing.
4) Conceptually-driven processing -
    a. The percentage the whole film spent in conceptually-driven processing.
    b. The percentage of the most significant intrusion spent in conceptually-driven processing.

Expectations regarding the effects of verbal tasks

VD group participants were asked, "How much do you predict that performing the backwards counting task during a distressing film (rather than watching it normally) would increase or decrease intrusive images of the film of the type you recorded in your diary?" and responded with a number between –10 (extremely decrease), 0 (do nothing) and 10 (extremely increase).

VE group participants were asked, "How much do you predict that performing the verbal enhancement task during a distressing film (rather than watching it normally) would increase or decrease intrusive images of the film of the type you recorded in your diary?" and responded with a number between –10 (extremely decrease), 0 (do nothing) and 10 (extremely increase).

Attention

Attention paid to the film was assessed using a self-rating of attention paid to the film on a scale of 0 (paid no attention to film) to 10 (paid total attention to the film) administered via the computer.

Memory

Explicit memory for the film was accessed using a recognition memory questionnaire and a cued recall explicit memory questionnaire of the film administered on paper (see Appendix 7a and 7b, p. 141). The recognition memory questionnaire included 20 items consisting of statements about events from the film. Participants were instructed to indicate which items did occur in the film and which did not by writing "Yes" or "No" by each item. Half the items were genuine and

half did not actually occur in the film. The cued recall memory questionnaire was a modification of Holmes' (2000) explicit memory questionnaire that included more cueing information within each of the 15 items in order to reduce the difficultly level so that potential differences could be determined between the conditions.

Emotion and distress

Computer-administered 11-point self-rating scales between 0 (not at all) and 10 (extremely) were used to assess mood and distress caused by the film. Participants rated themselves in this way regarding how unhappy, anxious, depressed, angry, fearful, horrified, helpless, disgusted, ashamed and guilty they felt before and after the film. Additionally, they rated how distressed they felt by the film after viewing.

Peri-traumatic State Dissociation

The Dissociative State Subscale (DSS) was completed on the computer by participants before and after the film in order to assess change in state dissociation (see Appendix 2, p. 129). The DSS consists of 19 items from Bremner et al.'s (1998) Clinician-Administered Dissociative States Scale (CADSS) that was developed specifically for use as a repeat measure of state dissociation. It includes items related to derealisation, depersonalisation and amnesia which participants respond to using a scale between 0 (not at all) and 4 (extremely). The DSS has satisfactory validity and reliability with an intraclass correlation coefficient of 0.99 and a Cronbach alpha coefficient of 0.94 (Bremner et al., 1998).

Trait Dissociation

The 38 item Trait Dissociation Questionnaire (TDQ; Murray, 1997) is designed to measure trait dissociation using 7 factors (see Appendix 3, p. 133). These include detachment from the world and others, sense of split self, lability of mood and impulsivity, inattention and memory lapses, emotional numbing, confusion and altered time-sense, and amnesia for important life events. The items used in the TDQ are drawn from pre-existing questionnaires including the Dissociative Experiences Scale (Bernstein & Putnam, 1986). It has an alpha coefficient of 0.93 and a test/re-test reliability of 0.87 in an undergraduate sample and has been shown to predict development of PTSD (Murray, 1997). The TDQ was also computer-administered.

Exposure to trauma history

The 12 computer-administered items used to determine exposure to prior trauma were extracted from the Posttraumatic Stress Diagnostic Scale (Foa, 1995), featured questions on common traumatising occurrences and indicated the amount, type, recency and severity of trauma experienced (see Appendix 4, p. 136). If participants indicated they had experienced a traumatic event further details were taken including when it happened, who was injured, if they believed their life to be at risk and whether feelings of helplessness and terror were present.

Personal relevance of car crashes

Participants gave a rating between 0 (not at all relevant) and 10 (extremely relevant) in response to the computer-administered question, "How relevant are car crashes to you?".

Talking, thinking, and avoiding thinking about the film

Participants were asked by the experimenter how much they: (1) Talked about the film; (2) Deliberately thought about the film; and (3) Deliberately avoided thinking about the film during the one-week period before follow-up. For each question they responded with a rating between 0 (not at all) and 10 (extremely).

Fear of blood and injury

Participants were asked by the experimenter, "How fearful are you of blood, injury and the like?" and responded with a rating between 0 (not at all) and 10 (extremely).

Initial Contact

Participants were contacted by telephone after leaving their details on an answer phone having heard about the study from adverts or face-to-face recruitment. At this point, two participants were excluded from the study due to past or current treatment for a mental health problem and one was excluded due to being unavailable on days when the study was being administered.

Main experiment

Randomisation of condition

Participants were randomly assigned to conditions using a random number chart generated in advance. The experimenter then set-up the appropriate version of the programme.

Introduction and information exchange

Upon arrival, participants were given an information form to read (see Appendix 9a, p. 147) and asked to state if they have any questions for the experimenter before starting the experiment. After questions had been answered, participants completed and signed the consent form (see Appendix 9b, p. 148), gave their full name, address and ethnicity. After filling in the consent form, the experimenter reminded participants:

"You can leave at any stage without needing to give a reason".

If a participant expressed concerns about potential harmful effects of viewing the video they were told:

"No one has yet suffered long term effects from this film in this or previous research using the same film".

Experimental task instructions

Prior to the main section of the experiment, all participants were told:

"After some questions on the computer, you will see a film depicting real police footage of road-traffic accident scenes, and finally answer a few more questions. There are many questions to answer so try to give the first response that comes to mind and answer as swiftly as possible without rushing. You cannot change answer or go backwards, but tell the experimenter at the end if necessary. Do not look around the room. At the beginning of the video there is a short narrative with no picture. Note that the experimenter will be outside the door. You can stop at any point and ring the bell to get the experimenter. This section should take about 35 minutes".

Participants in the verbal enhancement and verbal distraction conditions were then given the following verbal instructions according to condition:

Table 1. Verbal instructions read to participants according to experimental condition.

CONDITION	VERBAL INSTRUCTIONS
Verbal Distraction (VD)	"While you are watching the film, you are required to count backwards, out-loud, in three's from 958. This is not a test of your mathematical ability but please try to be as accurate as possible. It is important that you perform the task continuously through each scene of the film but do not count through the short verbal introductions that introduce each scene (when the screen is blank). If you make a mistake, or loose track of what number you are up to, just carry on from where you think you left off. Please count out load, clearly, because you will be recorded as part of the experiment. Do you have any questions?"
Verbal Enhancement (VE)	"While you are watching the film, you are required to verbally describe, out-loud, what goes through your mind in response to the film. This may include describing what you see and hear happening in the film, thoughts that go through your mind, emotions you feel, memories you have in relation to the film or what you think people in the film are thinking or feeling. It is important that you perform the task continuously through each scene of the film but do not speak through the short verbal introductions that introduce each scene (when the screen is blank). Please speak clearly because you will be recorded as part of the experiment. Do you have any questions?"

Pre-film measures

Prior to viewing the video, participants completed the following additional questions and questionnaires in the following sequence:

- Baseline Dissociative State Subscale.
- Age, gender, number of car crashes involved in.
- Exposure to trauma history.
- Self-rated personal relevance of car crashes.
- Trait dissociation questionnaire.

- 0-10 ratings for how unhappy, anxious, depressed, angry, fearful, horrified, helpless, disgusted, ashamed and guilty they currently felt.

Viewing of the film

After completing the computer-administered questionnaires, participants read the following instructions on the computer screen:

Table 2. Verbal task instructions for each condition.

CONDITION	ON-SCREEN INSTRUCTIONS
Verbal Distraction (VD)	You will now see a twelve minute film showing road-traffic accidents. Imagine you are there, a bystander at the scene of the accident. Watch the film and do not look away or shut your eyes. Please perform the counting task while watching the video. The scenes of the video are separated by short introductions - stop performing the task while you listen to them and re-start counting at the number you previously reached when each new scene begins. If you loose track of what number you are up to, at any time, simply count from your best guess of where you got to. Do your best to be accurate and to perform the task continuously during all scenes. Your compliance with the task will be taped as part of the experiment. Please begin the task as soon as the first scene begins, after the short introduction.
Verbal Enhancement (VE)	You will now see a twelve minute film showing road-traffic accidents. Imagine you are there, a bystander at the scene of the accident. Watch the film and do not look away or shut your eyes. Please perform the verbal describing task while watching the video. The scenes of the video are separated by short introductions – stop performing the task while you listen to them and re-start when each new scene begins. Do your best to perform the task continuously during all scenes. Your compliance with the task will be taped as part of the experiment. Please begin the task as soon as the first scene begins, after the short introduction.
Control (C)	You will now see a twelve minute film showing road-traffic accidents. Imagine you are there, a bystander at the scene of the accident. Watch the film and do not look away or shut your eyes.

Whilst watching the film, participants conducting concurrent verbal tasks (conditions 1 and 2) were tape recorded to provide a record of task compliance.

After the film

After viewing the film, participants completed:

- Post-film Dissociative State Subscale.
- 0-10 ratings for how unhappy, anxious, depressed, angry, fearful, horrified, helpless, disgustred, ashamed and guilty they currently felt.
- 0-10 ratings for how much attention they paid to the film and how distressing it was.

Finally, participants were read the instructions printed on the cover-sheet of the intrusion diary (see Appendix 6a, p.139) and a date was arranged to return for follow-up one week later.

Intrusion Diary

The intrusion diary had full instructions printed on the cover-sheet and a contact number for reaching the experimenter if participants had any problems or concerns. Participants were encouraged to complete the diary each day and keep it with them to reduce the possibility of forgetting to record intrusions.

Follow-up (1 week later):

The following measures were taken in the following sequence:

- Diary compliance rating.
- Cued recall memory questionnaire.
- Intrusion Description questionnaire.
- Recognition memory questionnaire.
- Expectations regarding the effects of verbal tasks.

Participants were given an opportunity to ask questions about the study in a debriefing. Finally, they were given contact details of experimenters should they wish to make contact with any additional questions or concerns. None did so.

RESULTS

The results are presented in three sections: (1) Missing data and outliers; (2) Comparability of groups; and (3) Results of main experiment with follow-up. References to experimental hypothesis are made at appropriate points to clarify the relationship between experimental findings and the aims of the study.

In all analyses, parametric tests (including independent t-tests, paired t-tests, one way analyses of variance and two by three mixed analyses of variance) were used where the assumptions were met. Bonferroni tests were used for post-hoc analyses. Non-parametric tests (including Mann-Whitney and Chi Squared tests) were employed where assumptions for normality of distribution were not met but are only reported if they produced a different level of significance. Normality was assessed using Kolmogorov-Smirnov tests and non-parametric tests were used where the significance of deviance from normality was at the 0.01 level or lower. Additionally, Pearson's correlations were employed where reported. All analyses were run using SPSS, Version 10.

Section 1: Missing data and outliers

Missing data

Only one participant who completed part one of the experiment failed to return for the follow-up. However, they posted their completed diary form and this was included in the complete data set, with other follow-up measures coded as missing data. Additionally, four participants were unable to return for follow-up but were able to complete the full follow-up over the telephone.

The follow-up questions on how much participants talked, thought and avoided thinking about the film were only introduced into the design from participant five onwards and the question on blood fear was introduced from participant nine onwards. Additionally, there are 5 missing data points in the database due to apparatus failure (see Appendix 10, p. 148 for details).

Treatment of outliers

Outliers were defined as item scores which were more, or less, than three standard deviations than the mean of the experimental group they belonged to and were changed to one unit larger, or smaller, than the next most extreme score in the distribution (Tabachnick and Fidell, 1996, p67). Seven changes were made (see Appendix 10, p. 148 for details).

Section 2: Comparability of groups

Participant details

There were no significant differences in age between the verbal enhancement and control groups, Z (2) = -1.779, 0.075, or between the verbal distraction and verbal enhancement groups, Z (2) = -0.353, 0.724. However, there was a significant difference between the age of participants in the verbal distraction condition compared to those in the control condition as shown by Mann-Whitney tests, Z (2) = -1.980, p.=0.048. Therefore, it is necessary to check whether age is correlated with dependent variables to determine whether difference in groups may be attributed to age rather than experimental manipulations (see Table 5, p. 64).

A Chi Squared test found no significant difference between group for number of men and women, Chi squared (1) = 0.600, 0.44. Therefore, there is no indication that any significant differences found between conditions on dependent variables are confounded by this factor.

Table 3. Sex and mean age in the three experimental conditions

	Condition 1: No task	**Condition 2: Verbal distraction**	**Condition 3: Verbal enhancement**
Age	30.25 (10.7)	24.70 (7.8)	24.45 (5.9)
Male	N = 9	N = 8	N = 10
Female	N = 11	N = 12	N = 10

Initial measures and experimental groups

Table 4 shows that no significant differences were found between experimental conditions for any of the initial measures, using one-way ANOVAs or Kruskal-Wallis tests.

Therefore, with the exception of participant age, the randomisation procedure was effective and any significances found between conditions on dependent variables may be attributed to the experimental manipulation and rather than to differences between groups for any of the variables listed in Table 4.

Table 4. Comparability of initial measures between the three conditions

Measures	**Condition 1: No task**	**Condition 2: VD**	**Condition 3: VE**	**ANOVA Statistic (F)**
Trait Dissociation Questionnaire	39.00 (28.71)	26.75 (17.50)	36.20 (20.72)	F(2,57) = 1.585, p = 0.214
Dissociative Experiences Scale	10.44 (6.39)	9.75 (6.92)	10.44 (8.34)	F(2,57) = 0.061, p = 0.941
Dissociative State Subscale at baseline	3.65 (5.12)	3.35 (3.08)	2.60 (3.00)	F(2,57) = 0.392, p = 0.677
Number of car crashes experienced	0.20 (0.41)	0.35 (0.59)	0.30 (0.57)	F(2,57) 0.417, p = 0.661
Number of traumas experienced	3.20 (1.94)	3.00 (1.97)	3.30 (1.90)	F(2,57) = 0.125, p = 0.883
Visual intrusions experienced	3.56 (2.82)	3.75 (2.17)	3.85 (2.11)	F(2,57) = 0.082, p = 0.922
Personal relevance of car crashes	3.35 (2.70)	2.80 (2.35)	3.35 (2.25)	F(2,57) = 0.338, p = 0.715
Initial happiness rating	5.40 (2.04)	5.85 (1.73)	5.35 (1.63)	F(2,57) = 0.465, p = 0.630
Initial anxiety rating	2.75 (2.10)	3.10 (2.27)	3.05 (2.26)	F(2,57) = 0.148, p = 0.863
Initial depression rating	1.65 (2.13)	1.70 (2.23)	2.10 (2.34)	F(2,57) = 0.244, p = 0.785
Initial anger rating	0.20 (0.41)	0.85 (1.63)	1.25 (2.22)	F(2,57) = 2.171, p = 0.123
Initial fear rating	1.05 (1.67)	0.85 (1.27)	0.90 (0.968)	F (2,57) = 0.122, p = 0.885
Initial horror rating	0.30 (0.92)	0.20 (0.52)	0.10 (0.45)	F(2,57) = 0.452, p = 0.638
Initial helplessness rating	0.50 (1.05)	0.60 (1.54)	0.45 (0.60)	F(2,57) = 0.091 = 0.913

Initial distress rating	0.50 (0.22)	0.55 (1.43)	0.15 (0.49)	F (2,57) = 1.795, p = 0.175
Initial ashamed rating	0.15 (0.36)	0.55 (1.50)	0.25 (0.72)	F(2,57) = 0.894, p = 0.415
Initial guilt Rating	0.35 (0.75)	0.80 (1.74)	0.85 (1.42)	F(2,57) = 0.813, p = 0.448

Note. All comparisons were non-significant.

Correlations between initial measures and dependent variables

Pearson correlations were used in order to determine whether any participant characteristics predicted intrusion development (in terms of total intrusions and number of days with intrusions) independently of experimental condition. This was of particular importance for participant age as this was the only variable that varied significantly between groups.

Several of the initial measures were correlated with intrusion rate measures including initial anger, guilt, helplessness and disgust but none of these baselines varied significantly between groups (see Table 4, p. 61). Age was not significantly correlated with either total number of intrusions or number of days when intrusions occurred (see Table 5, p. 64).

These comparisons indicate that differences in dependant variables between groups cannot be attributed to either participant age (which varied between groups but did not predict intrusion development) or the impact of confounding variables such as initial anger, guilt, helplessness or disgust (which predicted intrusion development but did not vary between groups). Therefore, this supports the validity of subsequent analyses of the effects of independent variables (no task; verbal

distraction task; or verbal enhancement task) on the dependent variable of intrusion development.

Table 5. Pearson correlation coefficients (r) between initial measures and dependant variables

Measure	**Total number of intrusions**	**Number of days with intrusions**
Trait Dissociation Questionnaire	0.038	0.071
Dissociative Experiences Scale	-0.087	-0.134
Dissociative Subscale at baseline	-0.049	-0.012
Heart rate baseline	-0.016	-0.098
Number of traumas experienced	0.115	0.175
Personal relevance of car crashes	-0.060	-0.022
Initial happiness rating	0.012	0.006
Initial anxiety rating	0.048	-0.022
Initial depression rating	0.224	0.160
Initial anger rating	0.283*	0.258*
Initial fear rating	0.199	0.191
Initial horror rating	0.149	0.017
Initial helplessness rating	0.305*	0.231
Initial disgust rating	0.300*	0.240
Initial ashamed rating	0.184	0.225
Initial guilt rating	0.272*	0.271*
Age	0.221	0.093

Note. * = significant correlation at $p = <0.05$.

Results of main experiment and follow-up

Experimental effects

Intrusions

Diary compliance:

There was no significance in participants' self-rating of how compliant they were in completing the intrusion diary, F (2,56) = 2.571, 0.085. and the mean diary compliance across conditions of 1.95 (on a scale between 1 and 10 where 1 was perfect compliance and 10 was very poor compliance) indicated very good diary compliance in most cases and that the majority of intrusions were recorded.

Intrusion quantity:

The mean total number of intrusions experienced by participants in each condition is shown in Figure 2, with 3.10 for the control group, 9.95 for the verbal distraction group and 5.10 for the verbal enhancement group. This general pattern of results is as predicted regarding the effect of the verbal distraction manipulation but runs contrary to the prediction that the verbal enhancement manipulation would reduce intrusion rates.

There is a highly significant difference between the total number of intrusions and the total number of days when intrusions occurred between conditions, indicated by two one-way ANOVAs, $F(2,57) = 4.983$, $p=0.010$ (total intrusions) and $F(2,57) = 6.383$, $p=0.003$ (number of days with intrusions). As predicted, post-hoc comparisons showed that participants in the verbal distraction condition experienced significantly more intrusions than those in the control condition, $p= 0.01$, and more days with intrusions, $p=0.004$.

Contrary to predictions, verbal enhancement participants did not significantly differ from either the control or verbal distraction conditions on total intrusions and only differ with the control condition for number of days with intrusions, $p=0.04$, with no significant difference compared to verbal distraction. This significant effect of the verbal enhancement task in increasing the number of days on which intrusions occurred compared to control is in opposition to the predicted protective effect of this task.

It is unlikely that the intrusion increasing effect of the VD task was due to participants being influenced by their beliefs regarding the likely effects of the task. This is because when VD participants were asked what effect they had expected the task to have in comparison to watching the film with no task (on a scale of –10 to 10 where –10 is extremely reduce intrusions whereas 10 is extremely increase intrusions) the VD group showed a mean score of –3.79. Therefore, although the VD group reported the most intrusions they generally predicted that the VD task would lead to somewhat *less* intrusions.

It is possible that greater number of days when intrusions occurred in comparison to control reported by the VE group is related to experimental demand because they generally predicted that the VE task would lead to somewhat more intrusions, with a mean score of 2.21 (where -10 = extremely reduce intrusions, 0 = make no difference and 10 = extremely increase intrusions, in comparison to watching the film with no task).

Figure 5. The mean total number of intrusions for each condition.

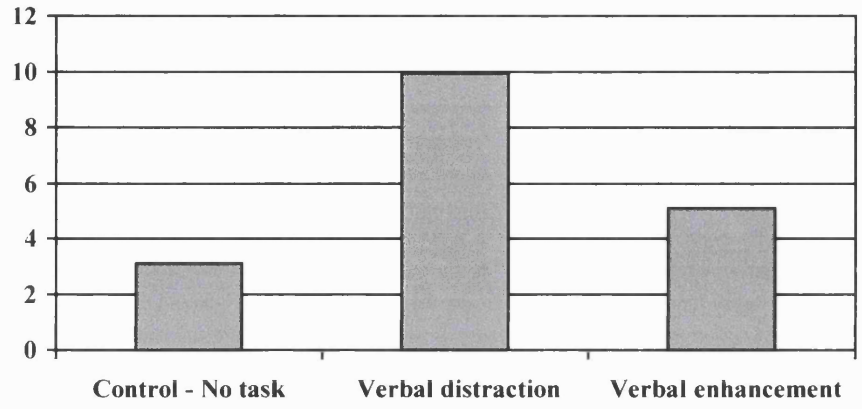
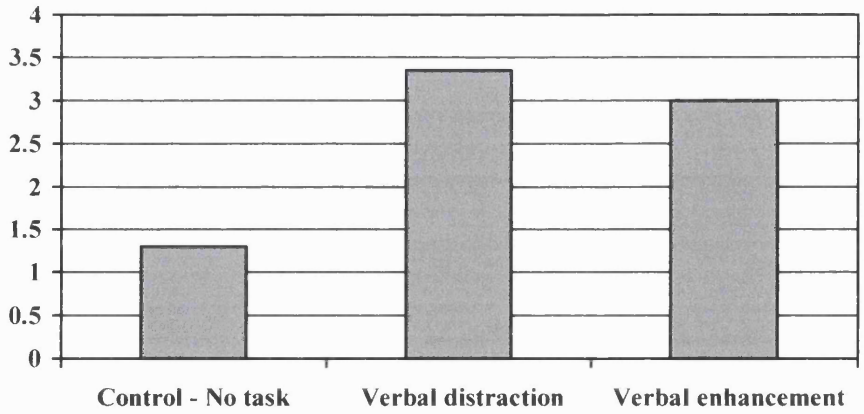


Figure 6. The mean total number of days in one week with at least one intrusion for each condition.



- Hypothesis 1 was supported: Participants in the verbal distraction condition experienced a significantly greater total number of intrusions in one week and more days with intrusions in comparison to the control condition (as recorded in intrusion diaries).

- Hypothesis 2 was not supported: Participants in the verbal enhancement condition did not experience a significantly smaller total number of intrusions in one week and less days with intrusions in comparison to the control condition. Contrary to predictions, verbal enhancement participants experienced significantly more days with intrusions than control participants (as recorded in intrusion diaries).

Intrusion quality:

For intrusion quality of all intrusions a one-way ANOVAs indicated that mean scores for intrusion distress, vividness, "nowness" and automacy did not vary significantly between conditions.

Additionally, for each participant's "most significant intrusion", 0 – 10 scores intrusion vividness, feeling of happening now, distress, unwellcomness and fragmentation were summed to create the variable "sum of significant intrusion scores"; a mean score reflecting the "PTSD-likeness" of these intrusions. Sum of significant intrusion scores did not vary significantly between conditions, $t(31) = 1.528$, $p.= 0.137$.

Table 6. The mean distress, vividness, nowness and automacy for *all intrusions* and and sum of *significant intrusion* scores (a sum of the mean vividness, feeling of happening now, distress, unwelcomeness, fragmentation rated for each participant's most significant intrusion) for each condition.

Measure	**Condition 1: No task**	**Condition 2: Verbal distraction**	**Condition 3: Verbal enhancement**	**ANOVA Statistic (F) And Significance**
Mean distress for intrusions	24.83 (20.92)	24.85 (17.67)	14.34 (19.21)	F (2, 42) = 1.604, p = 0.213
Mean vividness for intrusions	32.5 (30.05)	38.36 (24.32)	31.42 (27.98)	F (2, 42) = 0.273, p = 0.762
Mean nowness for intrusions	24.56 (23.87)	19.95 (20.62)	13.98 (20.01)	F (2,42) = 0.948, p = 0.396
Mean automacy for intrusions	66.10 (28.50)	45.27 (23.60)	51.63 (32.32)	F (2,42) = 1.857, p = 0.169
Sum of Significant Intrusion Scores	22.78 (6.23)	22.29 (6.49)	18.47 (7.76)	F (2,39) = 1.327, p = 0.277

Note. All comparisons were non-significant.

- Hypothesis 3 was not supported: Participants in the verbal distraction condition did not rate their intrusions significantly higher on mean diary scores of distress, vividness, feeling of happening now and automacy/spontaneity compared to the control condition. Additionally, they did not differ on sum of significant intrusion scores (summed from self-ratings of intrusion vividness, nowness, distress, unwellcomeness and fragmentation).

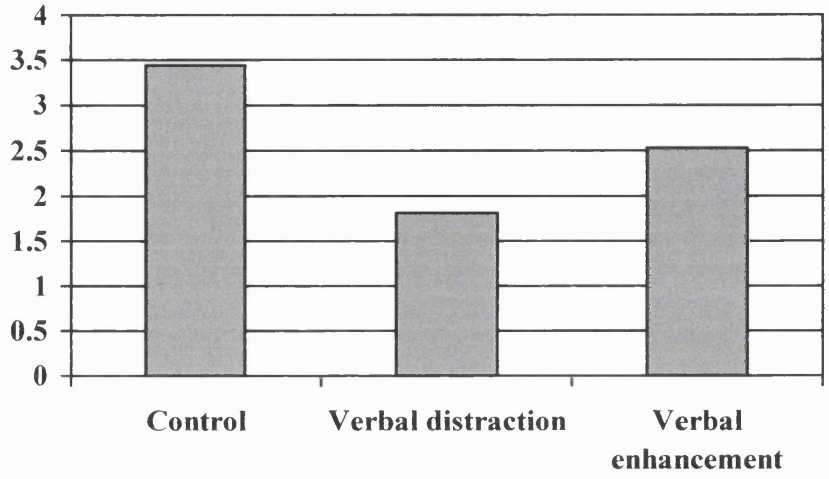
- Hypothesis 4 was not supported: Participants in the verbal enhancement condition did not rate their intrusions lower on mean diary scores for distress vividness, feeling of happening now and automacy/spontaneity compared to the control condition. Additionally, they did not differ on sum of significant intrusion scores (summed from self-ratings of intrusion vividness, nowness, distress, unwellcomeness and fragmentation).

Intrusion meaning

One way ANOVA showed that the number of meaning questions answered "yes" differed significantly between conditions, $F(2,39) = 3.327$, $p = 0.046$ (see Figure 4). Post-hoc tests showed that verbal distraction participants responded with "yes" answers to significantly less meaning questions than control participants, $p = 0.043$, but did not differ significantly from the verbal enhancement participants. The verbal enhancement participants did not differ significantly from those in the verbal distraction condition.

It is interesting to not that the pattern of meaning scores (Control – No task > Verbal enhancement > Verbal distraction) is the inverse of the pattern shown between conditions for total intrusion rates (see Figure 5, p.67, and Figure 7, below).

Figure 7. Mean number of meaning questions answered "yes" in each condition.



- Hypothesis 5 was supported: Verbal distraction participants experienced impaired conceptual processing of the film as indicated by responding "yes" to significantly less meaning questions than control participants

- Hypothesis 6 was not supported: Verbal enhancement participants did not experience facilitated conceptual processing of the film as indicated by not responding "yes" to significantly more meaning questions than control participants.

Peri-traumatic verbal task performance

"Most significant" intrusion sequences:

For both the VE and VD task performance was recorded and rated accorded to the criteria described below. This was to allow objective assessment of how far participants complied with task instructions and to allow a comparison of whether task performance during participants' "most significant" intrusion sequence differed

from their task performance across all the scenes of the film so that the hypothesis that participants will experience impaired peri-traumatic verbal processing during traumatic "hot-spots" could be tested.

Verbal distraction:

The verbal distraction (VD) manipulation involved counting backwards in three's from 958. Participants' mean score on a self-rating scale of the attention they paid to the VD task (on a 0-10 scale) was 7.35 indicating that they made appropriate efforts to perform the task. Task compliance was objectively monitored via tape recording of participants' verbalisation during the film and rated according to accuracy of counting and pauses longer than 2 seconds. This showed that the mean percentage of the all the scenes spent in pauses longer than 2 seconds was 3.42% and that the mean number of counting errors per 10 seconds was 0.11. There were no incidences of verbalisation other than performing the counting task. Therefore, participants were able to perform the VD manipulation successfully.

Paired t-tests showed that there was a non-significant trend, $p = < 0.10$, for the mean percentage of time spent in pauses longer than 2 seconds to be greater during most significant intrusion sequences (MSIS), compared to during all scenes, $T(14) = -1.952$, $p = 0.071$ (see Table 7, p. 73, and Figure 8, p. 76).

Table 7. A table to show verbal distraction task performance during all scenes compared to during periods of the film matched with participants' "most significant" intrusion sequence (MSIS).

Measure	**During all scenes**	**During MSIS**	**T-Test Statistic (t)**
% of time spent in pauses longer than 2 seconds	3.42 (3.39)	11.65 (18.99)	t (14) = -1.952, p = 0.071*
% of time spent in non-counting verbalisations	0 (0)	0 (0)	---
Mean no. of errors per 10 seconds	0.11 (0.16)	0.19 (0.27)	T (14) = -1.209, p = 0.247

Note. * = non-significant trend, p = < 0.10.

Verbal enhancement:

The verbal enhancement (VE) condition involved participants continuously verbalising what "went through their mind" as they watched the film including description of what they could see and hear happening in the film, thoughts and feelings about the film, memories evoked by the film, and any thoughts and feelings they thought people in the film experienced. Participants' mean score on a self-rating scale of the attention they paid to the VE task (on a 0-10 scale) was 7.50 indicating that they made appropriate efforts to perform the task. Task compliance was objectively monitored via tape recording of participants' verbalisation during the film and rated according to percentage of time spent in pauses longer than 2 seconds, percentage of time spent in data-driven processing and percentage of time spent in conceptually driven processing. This showed that the mean percentage of

the all the scenes spent in pauses longer than 2 seconds was 17.91%. This indicates they were reasonably successful in maintaining an ongoing narrative. However, participants spent the majority for their time engaged in data-driven processing of film information (62.19%) and a limited amount of time in conceptual processing (19.78%). Therefore, the VE manipulation prompted participants to produce verbal narratives that concentrated on physical description of the film rather than consideration of the meaning of the film.

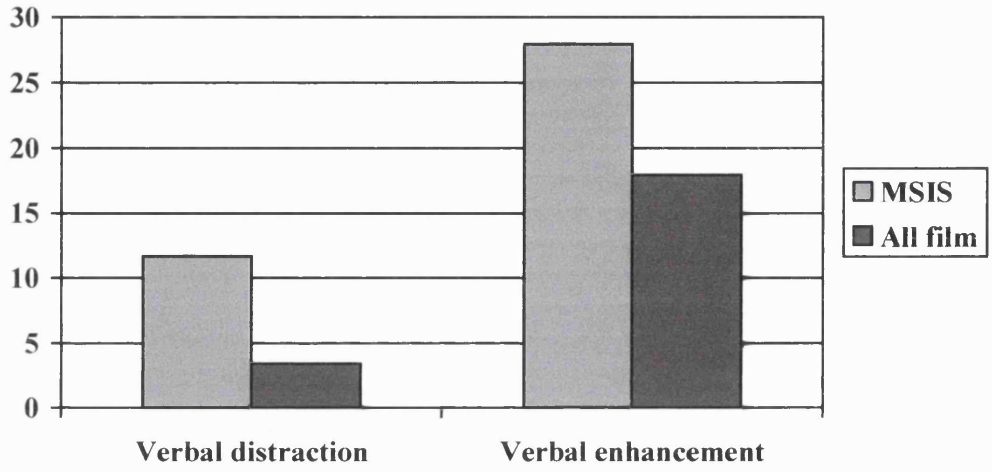
Paired t-tests showed that the mean percentage of time spent in pauses longer than 2 seconds per 10 seconds was significantly greater during the most significant intrusion sequences (MSIS), compared to during all scenes, T (14) = -3.203, p = 0.007 (see Table 8 and Figure 8, below).

Table 8. A table to show verbal enhancement task performance during all scenes compared to during periods of the film matched with participants' "most significant" intrusion sequence (MSIS)

Measure	**During all scenes**	**During MSIS**	**T-Test Statistic (T)**
% of time spent in pauses longer than 2 seconds	17.91 (16.92)	27.97 (18.94)	T (13) = -3.203, p = 0.007**
% of time spent in data-driven verbal processing	62.19 (23.57)	56.65 (28.70)	T (13) = 1.314, p = 0.212
% of time spent in conceptually-driven verbal processing	19.78 (21.54)	13.88 (18.91)	T (13) = 1.689, p = 0.115

Note. ** = $p < 0.01$.

Figure 8. The mean percentage of time spent in pauses longer than 2 seconds during the whole film (All film) compared to during the most significant intrusion (MSIS), for the VD and VE conditions.



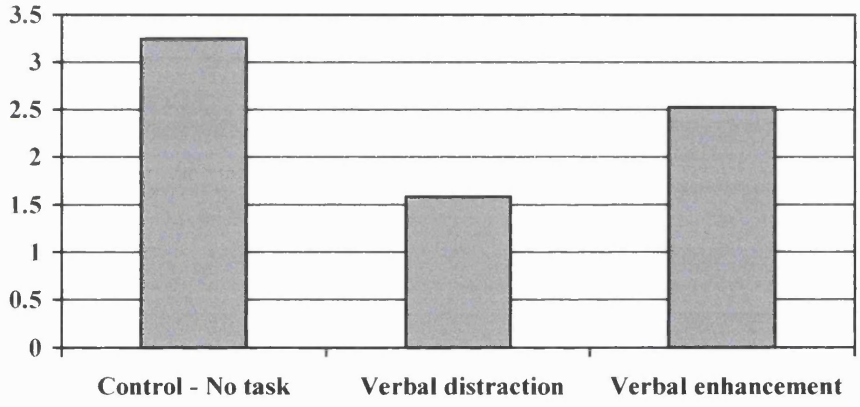
- Hypothesis 9 was partially supported: Participants in the verbal enhancement condition spent a significantly greater mean percentage of their time pausing during most significant intrusion sequences than during the whole film indicating that their verbal processing was disrupted during traumatic hot-spots. Verbal distraction participants did not spend a significantly greater mean percentage of time pausing during most significant intrusion sequences but there was a non-significant trend for them to do so, $p < 0.10$.

Attention and memory

Attention:

Self-rated attention paid to the film differed significantly between conditions, $F(2,55) = 10.043$, $p<0.000$, and planned comparisons showed that attention was significantly lower in the verbal distraction condition compared to the control group, $p=0.003$, and compared to the verbal enhancement group, $p<0.000$. Verbal enhancement mean attention was higher than the control group but not at a significant level.

Figure 9. Attention paid to film in each condition.



Memory:

One-way ANOVAs showed that there was no significant difference between conditions for recall memory and a significant difference between conditions on recognition memory, $F(2,56) = 6.211$, $p<0.004$. Post-hoc tests showed that mean recognition memory for the verbal distraction condition was significantly lower than in the verbal enhancement condition, $p=0.003$.

Recall memory scores did not differ significantly across groups, F(2,56) = 2.211, n.s. However, the means followed a similar pattern to those for recognition memory and attention (see Figures 9, p.76, and 10, below).

Figure 10. Recognition and recall memory scores in each condition.

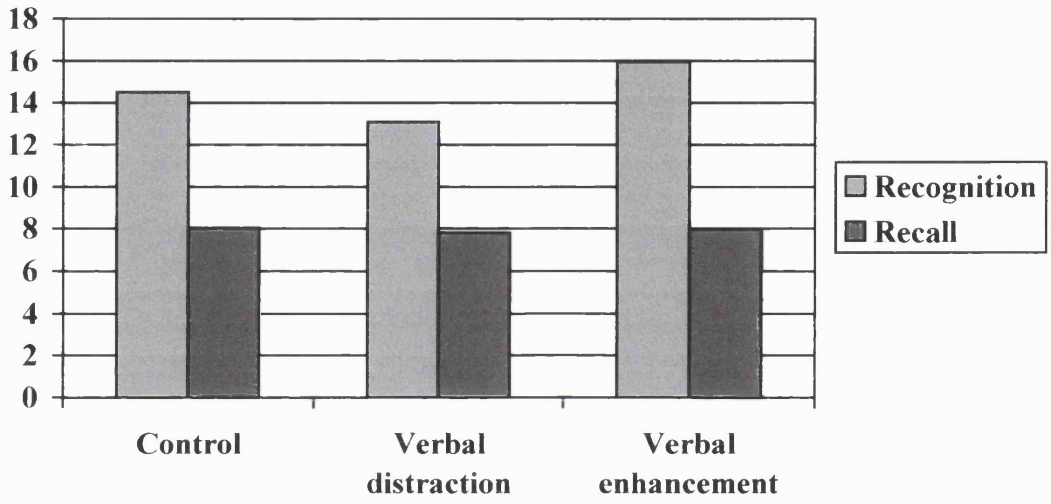


Table 9. Attention paid to the film, recognition memory score and recall memory.

Measure	No task	Verbal distraction	Verbal enhancement	ANOVA (F) and p.
Attention paid to film	8.94 (1.59)	7.50 (1.28)	9.20 (0.95)	F (2,55) = 10.043, **p = 0.000****
Recognition memory	14.50 (2.25)	13.10 (3.26)	15.95 (1.50)	F (2,56) = 6.211, **p = 0.004****
Recall Memory	8.05 (1.70)	7.79 (2.32)	7.98 (9.20)	F (2,55) = 2.211, p = 0.119.

Note. **= p<0.01.

- Hypothesis 7 was partially supported: Participants in the verbal distraction rated their attention paid to the film as significantly lower than participants in the control group and also showed significantly poorer recognition memory than the verbal enhancement group. However, there was no significant difference in mean recall memory.

- Hypothesis 8 was partially supported: Participants in the verbal enhancement condition rated their attention paid to the film as significantly higher than participants in the control group and also showed significantly better recognition memory than the verbal distraction group. However, there was no significant difference in mean recall memory.

Emotion, distress and dissociation

Distress:

Post-film distress did not significantly differ between conditions, $F(2,55) = 0.118$, $p = 0.889$. Therefore, between-group differences on dependent variables cannot be attributed to this variable.

Summed negative emotion:

For this analysis, mood scores for anxiety, depression, anger, fear, horrified, helplessness disgust, ashamed, guilt and unhappiness were summed and divided by ten to yield pre- and post-film summed negative mood scores. As the mood scores were rated at two time points (before and after the film), 2 x 3 mixed ANOVAs were used. The main effect of mood change across the two time points was significant, Wilk's Lambda = 0.514; $F(1,57) = 53.971$, $p = <0.000$. The main effect

of group was non-significant, F(2,57) = 0.860, p = 0.428. The interaction was non-significant, Wilk's Lambda = 0.514; F(2,57) = 1.777, p = 0.178. In summary, this indicates that mood did not vary between groups or interact with group. Across groups there was a strong increase in negative emotion when pre-film scores were compared to post-film scores.

The absence of variation between groups on measures of negative emotion, combined with the absence of significant difference between groups for post-film distress indicates that differences between groups in total intrusions and total number of days with intrusions cannot be attributed to simple variation in distress and negative mood.

Dissociative State Subscale (DSS):

As subjective dissociation was rated at two time-points (pre- and post-film) a 2 x 3 mixed ANOVA was used to determine whether dissociation varied between time points and across conditions. The main effect of state dissociation change across the two time points was significant, Wilk's Lambda = 0.648; F(1,57) = 30.982, p = 0.000. The main effect of group was non-significant, F(2,57) = 0.431, p = 0.652. The interaction was non-significant, Wilk's Lambda = 0.985; F(2,57) = 0.427, p = 0.654. In summary, this indicates that dissociation did not vary between groups or interact with group. Across groups, there was a strong increase in state dissociation when pre-film scores were compared to post-film scores.

There was a significant main effect of time, Wilk's Lambda = 0.648, F(1,57) = 30.982, p<0.000, with an overall increase in mean DSS score from 3.20 to 8.35. However, the interaction between time and condition was not significant, Wilk's Lambda = 0.985, F (2,57) = 0.427, p = 0.654, and the main effect of condition was not significant, F (2,57) = 0.431, p = 0.652. Therefore, differences between groups on dependent variables cannot be attributed to differences in state dissociation.

- Hypothesis 10 was not supported: Participants in the verbal distraction condition did not experience less negative emotion, less distress or more dissociation in response to the video compared to the control group.

- Hypothesis 11 was not supported: Participants in the verbal enhancement condition did not experience more negative emotion, more distress or less dissociation in response to the video compared to the control group.

Correlations between state dissociation and dependent variables

Dissociation:

Across conditions, change in state dissociation (post-film DSS minus pre-film DSS score) was not correlated with total intrusions, r = 0.098, p = 0.458, or number of days with intrusions, r = 0.114, p = 0.384. The absence of correlation between change in DSS score and dependant variables provides further evidence that differences between group intrusion rates are unlikely to be due to dissociation.

Thought about, talked about and avoided thinking about the film

One-way ANOVAs showed no significant differences between groups for participants self-rating of how much they: thought about the film, $F(2,52) = 2.488$, $p = 0.093$; talked about the film, $F(2,52) = 0.056$, $p = 0.946$; or avoided thinking about the film, $F(2,52) = 1.753$, $p = 0.183$. Therefore, differences between conditions on dependent variables cannot be attributed to these factors. However, across conditions thinking about the film was significantly correlated with number of days with intrusions, $r = 0.272$, $p<0.05$, and avoiding thinking about the film was highly correlated with total intrusions, $r = 0.469$, $p<0.01$, and number of days with intrusions, $r = 0.399$, $p<0.01$. Talked about the film was not significantly correlated with either total intrusions, $r = 0.028$, n.s., or number of days with intrusions, $r = 0.126$, n.s (see Table 10, below, for summary).

Table 10. Pearson correlation coefficients (r) between talked, thought, and avoided thinking about the film and dependent variables across conditions.

Measure	Total number of intrusions	Number of days with intrusions
Talked about film	0.028	0.126
Thought about film	0.199	0.272*
Avoided thinking about film	0.469**	0.399**

Note. * = $p < 0.05$. ** = $p < 0.01$.

DISCUSSION

This study involved the manipulation of peri-traumatic verbal processing across conditions using a distressing film as an analogue for real-life trauma. Participants were split into a verbal distraction group (who concurrently counted backwards in threes while watching the film), a verbal enhancement group (who continuously verbalised a narrative in response to the film) and the control group (no task). The dependent variables of primary interest were quantity of intrusions and quality of intrusions as indicated by one-week intrusion diaries. Comments on each hypothesis are shown below and followed by a summary of main findings. Subsequent sections include broader discussion of results in relation to: theoretical implications; clinical implications; limitations of the study; and suggestions for future research.

Comment on each hypothesis

Intrusion quantity

- Hypothesis 1 was supported: Participants in the verbal distraction condition experienced a significantly greater total number of intrusions in one week and more days with intrusions in comparison to the control condition as recorded in the intrusion diaries.

The finding that the verbal distraction (VD) group showed a highly significant elevation in total intrusions and number of days with intrusions compared to the no-task control is supportive of the predictions of Dual Representation Theory (Brewin, Dalgleish & Joseph, 1996) shown in Figure 4, p. 32. According to Dual Representation Theory, the intrusion facilitating effect of the VD backward counting task is the result of peri-traumatic competition for resources with verbally accessible memory (VAM) leading to poorer elaboration and integration of VAM representations while situationally accessible memory (SAM) encoding remains unaffected. During the one-week post-trauma period, internal and external cues that serve as reminders are hypothesised to have been more likely to trigger SAM representations due to less well integrated and elaborated VAMs than in the control condition (see Figure 2a and 2b, p. 15). SAM activation leads to the subjective experience of a greater number of intrusive memories entering conscious awareness in response to reminders. In contrast, control participants, whose VAM representations of the traumatic film are hypothesised to be more fully developed (due to the absence of any verbal distraction task), were less likely to experience intrusions as VAMs would compete with SAMs in response to cues, reducing the likelihood of VAM activation.

It is unlikely that the intrusion rate increasing effect of the VD task was due to participants' expectations regarding the effect of counting backwards while watching the film as most participants predicted that the VD task would exert an intrusion reducing effect.

- Hypothesis 2 was not supported: Participants in the verbal enhancement condition did not experience a significantly smaller total number of intrusions in one week and less days with intrusions in comparison to the control condition as recorded in the intrusion diaries. Contrary to predictions, verbal enhancement participants showed no significant difference in total intrusions compared to control and significantly more days with intrusions than control participants.

The lack of experimental support for this hypothesis, and the unexpected finding that verbal enhancement (VE) participants experienced significantly more days with intrusions, requires careful re-consideration of the precise nature of the VE task, of how control participants may have reacted to the film and of relevant theory. According to Dual Representation Theory, the efficiency of peri-traumatic verbal processing will predict the development of SAM-based intrusions because more efficient verbal processing is understood to lead to less intrusions. Various other theorists have drawn links between lack of complexity in verbal narratives of trauma and the development of PTSD (e.g. Gray, 2001; Nader, Stafford, Feshman & Foa, 1998) and between the post-trauma elaboration and integration of a verbal narrative and the decline of symptoms (e.g. Foa, Molnar & Cashman, 1995; van der Kolk, Bessel & Fisler, 1995). Therefore, it was logical to predict that the VE task, which involved continuous verbalisation of a narrative (including description,

thoughts, feelings and memories) in response to the film would facilitate better elaborated and integrated VAMs, and, therefore, lead to less intrusions (see Figure 4, p. 33).

The failure to support this hypothesis may have been due to conditions in the no-task control group being more, rather than less, conducive to formation of well developed VAMs with the capacity to inhibit SAM activation. It is possible that this is because a more intrusion-protective, peri-traumatic verbal strategy would have been to allow participants to verbalise their thoughts and feelings on the parts of the video they found most distressing rather than instructing them to concurrently verbalise their response to every moment of the film. For example, it is likely that a VE participant who was particularly distressed by the period of a scene where bodies were placed in coffins would have interpreted the task instructions as allowing them to only verbalise their response to this distressing material while it was on screen before going on to describe subsequent parts of the scene which they might not find distressing at all. In contrast, participants in the control condition were free to focus on verbal processing of whatever aspects of the film they chose. From this perspective, the finding that VE manipulation participants experienced significantly more days with intrusions than control participants may be interpreted as a result of the VE manipulation actually serving to inhibit the effective VAM processing of moments of peak distress, or "traumatic hot-spots" (Holmes, 2000) in comparison to more effective, unrestricted verbal processing by the control group.

Consideration of Holmes's (2000) findings on peri-traumatic "hot-spots" and the emerging emphasis on traumatic hot-spots in recent PTSD clinical literature (e.g.

Grey, Holmes & Brewin, 2001) is central to this argument. Hot-spots are understood to be periods of peak distress during the trauma which manifest themselves clinically as the primary source material for re-experiencing symptoms. Treatment recommendations drawn from acknowledgement of the importance of hot-spots in trauma memories emphasise that interventions may be more effective if behavioural exposure and cognitive restructuring focus on periods rather than the entire sequence of events (e.g. Grey, Brewin & Holmes, 2001). The broad focus of attention across a whole trauma narrative may allow patients to avoid focusing on these key periods, thereby reducing therapeutic efficacy in some cases.

Another possible reason for the failure of the VE task is that did not promote sufficient conceptual processing of the film, especially with regard to hot-spots. This account is supported by the finding (from the coding of tape-recordings of VE task performance) that across the whole film VE participants spent only about 20% of the time engaged in conceptual processing and over 60% of the time engaged in data-driven processing (the remaining time was spent in pauses) and the finding that the VE group did not answer "yes" to more of the meaning questions than the control group (see Hypothesis, 6, p. 91). Furthermore, it should be noted that the definition of conceptual processing used in the current study was extremely broad to aid objective coding (it was defined as any statement going beyond simple description of the film) and, therefore, may have over-estimated how far participants really processed the meaning of the film and placed it into a personal context.

Finally, the DRT prediction that enhanced peri-traumatic verbal processing will aid the integration and elaboration of VAMs and lead to less intrusions may be incorrect. It is possible that both very high and low peri-traumatic conceptual processing is associated with poorer outcome and that the most adaptive response is a mid-range level of engagement that allows individuals to process the meaning film gradually and at their own pace. Although this account is plausible, the failure to find that the VE group answered "yes" to more meaning questions than the control group (see Hypothesis 6, p. 91) indicates that they did not engage in greater consideration of the meaning of the film and that the absence of a lower rate of intrusion in the VE group is unlikely to be due to "excessive" peri-traumatic conceptual processing.

Intrusion quality

- Hypothesis 3 was not supported: Participants in the verbal distraction condition did not rate their intrusions significantly higher on mean diary scores of distress, vividness, feeling of happening now and automacy/spontaneity compared to the control condition as recorded in the intrusion diaries. However, there was a non-significant trend for verbal distraction participants to experience more vivid intrusions than those in the control group. The verbal distraction group's "most significant" intrusions did not differ from the control group on a score of intrusion characteristics summed from self-ratings of intrusion vividness, nowness, distress, unwelcomeness and fragmentation.

Although VD participants experienced more intrusions and more days with intrusions than the control group, the quality of intrusions did not significantly

differ with the control group for all intrusions or participants' most significant intrusions. A re-consideration of DRT can provide a plausible account for why the VD manipulation led to an increase in the quantity of intrusions without a commensurate change in the "PTSD-like" quality of intrusions.

As described earlier, inhibition of peri-traumatic verbal processing will lead to weaker VAM representations and, therefore, less inhibition of SAM-based intrusions (see Figure 2a and 2b, p. 15). However, the qualities of distress, vividness, automaticity and nowness attached to SAM-based intrusions are still dependent on encoding in the SAM system; something that the VD task, by design, was not predicted to interfere with. This close re-consideration of DRT shows that there is no reason to expect a parallel increase in the quality of intrusions as the model predicts that SAM encoding will proceed uninhibited under verbal concurrent task conditions while VAM encoding is selectively inhibited. From this perspective, the failure to confirm Hypothesis 3 is congruent with DRT as this finding would be extremely difficult to account for using a single level model of memory processes in PTSD. However, it should be noted that although DRT literature makes clear predictions on the relationship between the frequency of intrusions and the incompleteness of VAMs there is a lack of clear predictions on the relationship between verbal processing and the quality of intrusions. The finding that inhibited VAM processing leads to less intrusions but no significant change in intrusion quality is a step forward in clarifying this relationship.

In contrast, it is hypothesised that the visuospatial tapping task used in some previous trauma analogue studies (Brewin & Saunders, 2001; Holmes, 2000) would

lead to a commensurate reduction in intrusion severity in addition to a reduction in intrusion frequency. This is because it is understood to directly compete for attentional resources with the SAM system that supports intrusions rather than exerting its effect via the VAM system. Unfortunately, intrusion quality was not measured in previous studies and this remains a question for future research.

- Hypothesis 4 was not supported: Participants in the verbal enhancement condition did not rate their intrusions lower on mean diary scores for distress, vividness, feeling of happening now and automaticity/spontaneity compared to the control condition as recorded in the intrusion diaries. Similarly, the verbal enhancement group's "most significant" intrusions did not differ from the control group on a score of intrusion characteristics summed from self-ratings of intrusion vividness, nowness, distress, unwelcomeness and fragmentation.

The same re-consideration of the predictions of DRT that was applied to the failure to support hypothesis 3 may be applied to this hypothesis – as the VE task was designed to influence VAM encoding there is no reason to predict that it should affect the quality of intrusions which are understood as arising from the SAM system.

Conceptual processing

- Hypothesis 5 was supported: Verbal distraction participants experienced impaired conceptual processing of the film as indicated by responding "yes" to significantly less meaning questions than control participants. The five meaning

questions involved asking participants if the film meant anything to them about themselves, others and the World.

The finding that the VD group gave affirmative responses to less meaning questions than the control group supports the suggestion that they had experienced impaired peri-traumatic conceptual processing (Ehlers & Clark, 2000) of the meaning of the film in relation to themselves, others and the world. This is compatible with the suggestion that the intrusion-reducing effect of the VD task was due to impaired conceptual processing (because of competition for verbal resources) resulting in poorly integrated VAM representations hypothesised to result in less effective inhibition of SAM-based intrusions. This account is congruent with the findings from recent studies examining the relationship between PTSD and the degree to which individuals engage in conceptual processing of the meaning of their experiences. For example, among 82 persons exposed to a mass shooting incident lower levels of conceptual processing were found to be associated with greater persistence of PTSD symptoms (Sewell, 1996).

The VD finding indicates the need for elaboration of the DRT model regarding the precise nature of VAM representations that have, or do not have, the capacity to inhibit intrusions. The DRT hypothesis that the formation of intrusion-inhibiting VAMs requires "elaboration and integration" so that trauma information can acquire a temporal context in the past is unclear regarding how far it is also necessary for the broader integration of these consciously held representations into pre-trauma beliefs. The current findings are consistent the suggestion that deeper

conceptually-driven processing may be required for the formation of intrusion inhibiting VAMs.

- Hypothesis 6 was not supported: Verbal enhancement participants did not experience facilitated conceptual processing of the film as indicated by not responding "yes" to significantly more meaning questions than control participants. The five meaning questions involved asking participants if the film meant anything to them about themselves, others and the World.

The finding that VE participants did not experience enhanced conceptual processing of the film (as indicated by responses to meaning questions) provides a theoretical account for why the VE manipulation failed to result in lower intrusion rates. The failure to find evidence of enhanced conceptual processing in comparison to the control group suggests that the VE manipulation may not have been effective in promoting the formation of better elaborated or integrated VAM representations and may have even inhibited spontaneous conceptual processing. It is also congruent with the suggestion that peri-traumatic verbal narratives require characteristics associated with deeper conceptual processing if they are to exert an intrusion-reducing effect.

Attention and memory

- Hypothesis 7 was partially supported: Participants in the verbal distraction group rated their attention paid to the film as significantly lower than participants in the control group and also showed significantly poorer recognition memory than the

verbal enhancement group. However, there was no significant difference in mean recall memory.

The counter-intuitive finding that the VD group showed lower self-rated attention paid to the film than the control group and poorer explicit memory than the verbal enhancement group, but experienced more intrusions, is supportive of DRT and incongruent with single level models of PTSD. The poorer attention and recognition memory is consistent with impaired peri-traumatic verbal processing leading to weaker VAM representations that form the basis of verbally accessible, explicit memory.

The failure to find poorer recall memory for the VD group may be because the recall test, administered at the one-week follow-up, contained some items which were very easy (so most participants were correct) and some which were extremely difficult (so most participants were incorrect) and may, therefore, have been insensitive to differences in explicit memory which were detected by the more sensitive recognition memory questionnaire.

- Hypothesis 8 was partially supported: Participants in the verbal enhancement condition rated their attention paid to the film as significantly higher than participants in the control group and also showed significantly better recognition memory than the verbal distraction group. However, there was no significant difference in mean recall memory.

Intriguingly, although the VE manipulation did not result in the predicted reduction in intrusions, or enhanced conceptual processing, it did result in higher self-rated attention to the film and better explicit memory on the recognition test compared to the VD group. This is supportive of the suggestion that it is not the enhancement of any form of peri-traumatic verbal processing that can lead to intrusion-inhibiting VAMs but the combination of enhanced VAM encoding with deeper conceptual processing. Therefore, the presence of better explicit recognition memory in the VE group, despite the fact that VE participants did not show enhanced conceptual processing, suggests that it is possible to generate VAM representations through primarily data-driven processing, that support better explicit memory, without leading to deeper conceptual processing or significantly greater inhibition of the activation of SAM-based intrusive imagery.

Peri-traumatic verbal processing

- Hypothesis 9 was partially supported: Participants in the verbal enhancement condition spent a greater percentage of time in pauses longer than 2 seconds during film periods associated with subsequent "most significant" intrusions (i.e. most significant intrusion sequences or "MSIS") than during the film as a whole. VD participants showed a non-significant trend to pause more during MSIS than the rest of the film. The VD group did not make significantly more errors in counting per 10 seconds during MSIS compared to the whole film.

The finding that VE participants paused more during MSIS than the film as a whole supports the hypothesis that inhibited verbal processing is associated with peri-traumatic hot-spots that give rise to subsequent re-experiencing symptoms. This

supports the DRT prediction that verbal processing is likely to be inhibited during trauma periods of peak distress leading to poorly elaborated and integrated VAMs (i.e. poor conceptual processing) and ineffective inhibition of SAM-based intrusions for these periods of the film.

Emotion, distress and dissociation

- Hypothesis 10 was not supported: Participants in the verbal distraction condition did not experience less negative emotion, less distress or more dissociation in response to the video compared to the control group as indicated by self-rating on emotion and distress scales.

- Hypothesis 11 was not supported: Participants in the verbal enhancement condition did not experience more negative emotion, more distress or more dissociation in response to the video compared to the control group as indicated by self-rating on emotion and distress scales.

Although it was tentatively predicted that the verbal processing manipulations would affect levels of emotion and distress associated with the film, DRT does not make explicit predictions on how the manipulation of peri-traumatic verbal processing may effect these factors. In the current study, the absence of differences in levels of emotion or distress between conditions shows that neither the VD nor the VE tasks had the capacity to reduce emotion and distress during the stimulus. Generally, the absence of group differences in emotion and distress is supportive of conclusions regarding the relationship between conditions in dependent variables as group differences cannot be simply attributed to varying levels of arousal. It should

be noted that the effect on distress, emotion and dissociation of a VE task that does enhance deeper conceptual processing remains unknown.

As stated in the introduction, the predicted relationship between dissociation and verbal processing was highly prospective as previous experimentation has not explored this area. Never the less, the absence of group differences in state dissociation means that experimental effect on dependent variables cannot be attributed to this factor. The finding that state dissociation was not correlated with intrusion frequency across conditions contrasts with the prior findings that subjective state dissociation is predictive of intrusions (Holmes, 2000). However, this difference may be because Holmes screened participants for their ability to dissociate whereas the current sample underwent no such procedure. The question of whether dissociation is only a significant predictor of intrusion development in "high-dissociator" samples is a matter for future research.

Other findings of note

It is interesting to note that across groups there was a highly significant positive association between participants' self-rating of how much they avoided thinking about the film with the total number of intrusions experienced and the number of days when intrusions occurred. This may be interpreted as a further indication of the importance of the importance of verbal and conceptual processing of a traumatic stimulus in reducing intrusion rates.

Summary of main findings

- The peri-traumatic verbal counting task led to a significant increase in the frequency of intrusions compared to the control group. Therefore, it has been shown that a verbal concurrent task exerts the opposite effect to the previously demonstrated intrusion-reducing effect of the visuospatial tapping task.

- The verbal distraction group experienced inhibited conceptual processing of the film as indicated by responding "yes" to less meaning questions than the control group.

- Peri-traumatic verbal processing was inhibited during periods of film associated with subsequent "most significant" intrusions, as indicated by more pauses in verbal distraction and verbal enhancement task performance.

Theoretical implications

The results of the current study are supportive of the predictions of Dual Representation Theory (DRT) and suggest that the development of theoretical models of PTSD proposing the existence of two distinct representational formats constitutes a significant advancement of understanding beyond earlier single level models. Furthermore, the current findings have theoretical implications for DRT regarding the character of VAMs that are likely to inhibit the activation of SAM-based intrusions. This is discussed with reference to the distinction between data-driven processing and conceptually-driven processing (Ehlers & Clark, 2000) and in relation to the notion of peri-traumatic emotional "hot-spots" (Ehlers & Clark, 2000; Grey, Holmes & Brewin, 2001). Specifically, theoretical implications will be discussed below in relation to: (1) the effects of verbal versus visuospatial concurrent tasks; (2) conceptual processing and VAMs; (3) peri-traumatic verbal processing; (4) attention and memory; and (5) peri-traumatic emotion, distress and dissociation.

Effects of verbal versus visuospatial concurrent tasks

Experimental support for the prediction that a peri-traumatic verbal counting task would promote an increase in intrusions compliments the prior finding that a peri-traumatic visuo-spatial task (tapping a sequence of keys on a hidden moar-box [1978]) led to a significant reduction in intrusion frequency compared to a no-task control (Brewin & Saunders, 2001; Holmes, 2000). Holmes interpreted this finding

as supportive of the Dual Representation Theory prediction that the peri-traumatic visuo-spatial tapping task competes for visuo-spatial cognitive resources and, therefore, interferes with the encoding of SAM representations that give rise to intrusions while leaving VAM encoding unaffected. However, as noted by Holmes, this finding was open to the criticism that it could be reinterpreted as the result of simple distraction where any attention requiring dual task would impair any memory encoding and therefore result in less intrusions without the need for recourse to DRT. Holmes argued that the simple distraction interpretation of their findings was incongruent with the finding that participants who performed the visuo-spatial task did not differ from the other groups in their self-rating of attention paid to the film and remembered as much as other conditions on an explicit recall memory questionnaire of film details. However, it is possible that the memory questionnaire may have been insensitive to group differences in explicit memory for the film.

The finding in the current study that a peri-traumatic verbal concurrent task exerted the opposite effect to the previously demonstrated effect of a visuo-spatial task supports Holmes interpretation. Taken together, the findings are incongruent with the argument that simple distraction of global attentional resources are responsible because the verbal concurrent task used in the VD condition of the current study led to an increase in intrusions as opposed to the decrease associated with the visuo-spatial tapping task. Therefore, the current study has provided strong support for the DRT model as single level models do not predict that verbal and visuospatial peri-traumatic tasks will produce opposing effects on intrusion rates. Although previous studies have indicated that SAM-based intrusions selectively utilise visuo-spatial

resources (Brewin & Saunders, 2001; Hellawell & Brewin, 2000; Holmes, 2000), this is the first study to demonstrate the intrusion-increasing affect of a peri-traumatic *verbal* task and, therefore, indicate the selective use of verbal resources by the VAM-system.

Another interesting theoretical implication is that although the VD task led to lower intrusion frequency it did not seem to effect intrusion quality. This suggests that inhibition of VAM encoding does not effect the characteristics of intrusions because this is hypothesised to depend upon SAM encoding which is thought to be relatively unaffected by a verbal concurrent task. This suggests that the nature of the inhibition produced by VAMs is not characterised by a graded capacity to reduce the severity of intrusions but, rather, involves "all-or-nothing" competition for activation with SAMs that leads to the total inhibition of some SAM-based intrusions and little or no affect on those that are activated despite VAM competition. The next section will consider the precise characteristics of VAM representations that may make them more, or less, likely to inhibit the activation of SAM-based intrusions.

Conceptual processing and intrusion-inhibiting VAMs

According to DRT, the number of SAM-based intrusions experienced after a trauma is largely dependent on the efficiency of VAM encoding at the time of the event (Brewin, 2000). Regarding what is meant by "efficiency" in this context, Brewin suggests that VAMs that are likely to inhibit the activation of SAM-based intrusions need to be associated with the same retrieval cues as SAM-based intrusions and to be elaborated and integrated into autobiographical knowledge in a way that

contextualises the trauma information as pertaining to an event in the past that does not constitute an ongoing threat.

Similarly, Ehlers and Clark (2000) suggest that the development of trauma memories that are well elaborated and integrated into "context in time, place, subsequent and previous information and other autobiographical memories" will form an intentional retrieval route to trauma information that will inhibit the automatic triggering of trauma memories by sensory cues associated with the traumatic event. However, they go further than DRT by proposing that this requires deep integration into pre-exiting meaning structures and broader contextualisation of the event into autobiographical knowledge. They refer to Roegiger's (1990) distinction between conceptual and data-driven processing and suggest that:

"the degree of conceptual processing (i.e. processing the meaning of the situation, processing it in an organised way and placing it into context) during a traumatic event determines the nature of the memory and thus the ability to intentionally retrieve information from the memory. If the individual lacks conceptual processing and engages in mainly data-driven processing (i.e. processing sensory impressions), then the trauma memory will be relatively difficult to retrieve intentionally and at the same time there will be relatively strong perceptual priming for accompanying stimuli" (Ehlers & Clark, 2000, p. 331).

As suggested earlier, conceptual processing may be understood as the process by which VAMs are more likely to be formed while data-driven processing is understood as being more likely to give rise to SAMs. This conceptual framework is congruent with the finding that the intrusion-facilitating effect of the VD group

verbal counting task was accompanied by apparently poorer conceptual processing as measured by the "meaning questions". This supports an elaboration DRT to incorporate the distinction between data-driven and conceptual processing advanced by Ehlers and Clark (2000).

In summary, it is suggested that the efficiency of VAM mediated SAM inhibition is not a simple matter of whether or not a person is consciously processing a verbal narrative of a traumatic event but how far that verbal narrative allows integration of the traumatic information into higher-level structures in a manner that elaborates the memory with regard to it's meaning for the self, others and the world and it's context in time, place and person allowing greater probability to accessibility via deliberate, meaning-based retrieval routes.

Although the current study is primarily concerned with the nature of peri-traumatic processing (i.e. VAM versus SAM, conceptual versus data-driven processing), the specific content of VAMs is clearly significant to PTSD prognosis. For example, it has been suggested that verbally accessible attributions related to shame, guilt, anger and disgust are extremely important in determining individual reactions to trauma (Lee, Scragg & Turner, 2001). From the current theoretical perspective, such attributions can be understood as factors that inhibit the successful conceptual processing and, therefore, the successful elaboration and integration of VAMs into long-term meaning structures due to incompatibility with positive views of the self, others and the world or excessive compatibility with negative beliefs (Lee, Scragg & Turner, 2001).

Therefore, it is suggested that the compatibility or incompatibility of verbally accessible trauma information with pre-existing beliefs may mediate the capacity of individuals to engage in successful conceptual processing and develop SAM-intrusion inhibiting VAMs. As this goes beyond the scope of the current study, it is a matter for future research.

Peri-traumatic verbal processing and traumatic "hot-spots"

The current thesis has contributed to the study of peri-traumatic hot-spots by showing that verbal processing appears to be inhibited (as indicated by more pausing in VE task performance) during periods of peak distress associated with subsequent "most significant intrusions". This is congruent with the DRT prediction that peri-traumatic hot-spots will be associated with inefficient verbal processing and, therefore, incomplete VAMs (Brewin, 2000).

Attention and explicit memory

The finding that the VD group showed lower self-rated attention paid to the film and scored lower on a test of explicit, recognition memory, despite experiencing more intrusions, suggests SAM encoding may proceed unihibited while encoding into VAM (which supports ordinary explicit autobiographical memory) is inhibited due to a concurrent task that competes for verbal attentional resources. This provides further support for the notion that trauma information is encoded into two distinct representational formats.

The difference in self-rated attention paid to the film between the VD and control group also indicates the unconscious nature of SAM encoding because VD

participants accurately perceived that the counting task reduced their capacity to pay conscious attention to the film but were seemingly unaware that encoding into SAM was unaffected by the task. This suggestion is supported by the finding that VD participants generally predicted that the counting task would lead to less intrusions rather than more.

Emotion and distress

The lack of group differences in self-rated negative emotion and distress associated with the film despite the differences in intrusion rates suggests that the results cannot be explained by varying levels of arousal. Taken with the finding described above, this has the implication that peri-traumatic verbal processing may be manipulated and exert an effect on memory encoding that leads to significant differences in the occurrence of intrusions without major effects on peri-traumatic arousal, as indicated by self-rating measures. It also suggests that peri-traumatic distraction of verbal resources does not produce a short-term benefit in reduction of distress or negative emotion.

State dissociation

Ehlers and Clark (2000, p. 330) write, "We speculate that the derealisation, depersonalisation and emotional numbing experienced during dissociation may impede the elaboration of the trauma memory and its integration into the autobiographical memory knowledge base". The finding that change in peri-traumatic state dissociation did not vary across conditions despite the fact that the VD group recorded more intrusions and showed evidence of poorer conceptual processing does not contradict evidence that dissociation is an important factor in

the development of intrusions. However, it does support the DRT prediction that the efficiency of peri-traumatic verbal processing is an important factor in the development of intrusions and, therefore, provides an example of a factor other than peri-traumatic dissociation that may influence intrusion rates. As stated by Brewin (2000), "any factor that interferes with the construction of a detailed, consciously accessible memory for intense moments of the trauma would be predicted to lead to a worse outcome" (p. 22). Whether or not the efficiency of VAM system encoding is the mechanism through which dissociative phenomena exert their previously demonstrated influence (Murray, 1997; Holmes, 2000) on the development of intrusions is a matter for future research.

Clinical implications

Outcome studies examining the efficacy of psychological treatment for PTSD have demonstrated the effectiveness of prolonged exposure therapy (Foa, Rothbaum, Riggs & Murdock, 1991), exposure therapy combined with cognitive re-structuring and cognitive therapy alone (Marks, Lovell, Noshirvani, Livanou & Thrasher, 1996). Therefore, it seems that effective treatment requires interventions that involve repeated exposure to traumatic memories and/or challenging and change of dysfunctional beliefs and maladaptive coping strategies. This section will consider the implications of the current findings for behavioural and cognitive interventions for PTSD and discuss possible theory-driven developments of clinical practice.

Verbal distraction and verbal enhancement

Various single-level model PTSD theorists have suggested that the efficacy of prolonged exposure therapy is mediated by the incorporation of new adaptive information into the original trauma memory (Foa & Rothbaum, 1998) or the elaboration and integration of the original representation into general autobiographical knowledge (Conway & Pleydell-Pearce, In Press). As a dual-level model, DRT suggests that effective therapy requires the re-coding of trauma information from the SAM system into the VAM system so that better elaborated and integrated VAM representations can acquire retrieval cues associated with SAMs and exert inhibitory control over SAM-based re-experiencing symptoms through competition for activation (see Figure 2a and 2b, p. 15). Therefore, the *original* "trauma memory", encoded largely in the SAM system, may remain relatively unchanged but become less accessible (and less problematic) because cues that would have activated SAM-based intrusions come to activate VAM-based

recollections. As described earlier, activation of VAM-based recollections is less problematic because, due to their integration into current and past autobiographical knowledge, they do not feature the temporal distortions associated with SAM activation that create re-experiencing symptoms and a sense of ongoing threat.

Similarly, Ehlers and Clark's cognitive model of PTSD suggests that successful treatment revolves around "putting the trauma into the past" (Ehlers & Clark, 2000, p. 335) so that the patients' current lives are no longer blighted by an ongoing sense of threat and danger. They suggest this requires change in three areas, including:

1) The elaboration and integration of the trauma memory into the context of the individual's prior and subsequent experience so that it becomes more accessible via "higher-order meaning-based retrieval strategies" (analogous to VAM activation) and less likely to be directly triggered by stimuli associated with the trauma (analogous to SAM activation).

2) Modification of the problematic appraisals of the trauma and/ or it's sequelae that maintain the sense of ongoing threat.

3) Change in dysfunctional cognitive and behavioural coping strategies that prevent memory elaboration, exacerbate symptoms or hinder challenging of maladaptive appraisals.

The current findings regarding the intrusion-increasing effect of peri-traumatic verbal distraction and the failure of the verbal enhancement task to reduce

intrusions, or promote significant conceptual processing, are relevant to all three of Ehlers and Clark's mechanisms for change as discussed below:

1) Elaboration and integration of VAMs

Verbal distraction findings:

The verbal distraction findings are congruent with the DRT prediction that the frequency of intrusions is related to less well integrated and elaborated verbally accessible representations of a distressing experience. The current findings also indicate that the intrusion-increasing effect of peri-traumatic verbal distraction may be mediated by impaired conceptually processing of the experience regarding it's meaning for the self, others and the World. Therefore, it is likely that the distraction of verbal cognitive resources during re-experiencing of a traumatic event may also inhibit conceptual processing and the elaborated and integration of VAMs and, potentially, undermine the effectiveness of exposure therapy. For example, a patient who engages in exposure therapy but uses verbal distraction as a coping strategy (e.g. sub-vocalising "This isn't happening", ruminating on repetitive negative self-statement such as "I'm worthless" or reciting irrelevant verbal information such as times-tables) would be expected to experience the full range of distress associated with SAM activation without therapeutic benefit due to the failure to develop more complete VAM representations. They would be expected to experience no short-term, distress-reduction benefit from the use of verbal distraction because the current findings indicate that it is not associated with reduced peri-traumatic negative emotion or distress. Two recent studies provide support for the above predictions from investigation of the cognitive coping strategies used by 159 and 138 survivors of real-life road-traffic accidents. It was found that distraction,

thought suppression and rumination during intrusions were substantially correlated with PTSD severity, as was behavioural avoidance of reminders of the accident (Steil & Ehlers, 2000).

It may be possible to reduce the likelihood of exposure therapy being undermined by verbal distraction, and to partially protect individuals who are likely to be involved in traumatic events (e.g. emergency service personnel), by providing psycho-education on the maladaptive impact of using verbal distraction as peri-traumatic, or peri-reliving, coping strategy.

Verbal enhancement findings:

It is interesting to note that many effective treatments for PTSD involve the reconstruction and elaboration of a verbally accessible written or oral trauma narrative. Indeed, even primarily behavioural interventions such as prolonged exposure generally incorporate the development of a detailed verbal narrative (including imagery, thoughts, emotions, sensations and appraisal of meaning) that is recorded and listened to on a regular basis to reduce anxiety (Foa & Meadows, 1997).

The finding from the current study that a continuously verbalised narrative apparently failed to enhance conceptual processing of the film, and did not lead to any reduction in intrusions, indicates that clinicians should take care to give instructions that truly promote conceptual processing and, it is hypothesised, VAM formation. Therefore, the verbal enhancement group findings suggest that a patient who only verbalises physical descriptions of the trauma (i.e. data-driven processing)

without significant consideration of the meaning and context of the trauma (i.e. conceptual processing) might not benefit due to the failure to generate VAMs that are well integrated with prior and subsequent knowledge.

It should be noted, however, that it was not possible to demonstrate any intrusion-reducing effect in the current study. The failure of the verbal enhancement task to promote deeper conceptual-processing compared to the control group means it is not possible to draw conclusions regarding what effect on intrusion frequency or on peri-traumatic arousal a more successful verbal enhancement task (i.e. one that promotes deeper conceptually processing) would have, beyond theoretical predictions.

2) Problematic appraisals and pre-existing beliefs

According to DRT, the problematic appraisals of the trauma and/or its sequelae that are amenable to change through standard cognitive therapy techniques are represented in the VAM system. As VAMs are understood to be accessible to deliberate retrieval and open to editing, standard CBT questions are likely to promote conceptual processing of the meaning and context of the traumatic event and should lead to challenging of problematic beliefs. However, because VAM formation may require the conceptual integration of trauma information with pre-existing beliefs it is likely that the successful treatment of problematic appraisals will depend on the degree of congruence, or incongruence between trauma information and the individual's pre-existing beliefs or "schemas" (Horowitz, 1986; Lee et al., 2001). Therefore, therapeutic efficacy may be enhanced in some cases by the use of cognitive therapy techniques that aid integration of VAMs with pre-

existing beliefs through challenging of trauma appraisals and/or schema-focused techniques (Young, 1990) that facilitate the modification of pre-existing beliefs so that they can more easily accommodate VAMs-based appraisals. One possible avenue of future research is to use the distressing film paradigm to examine the relationship between schema-congruence of trauma information and intrusion rates.

3) Dysfunctional cognitive and behavioural coping strategies

Some studies have found that cognitive therapy without exposure can be as successful as prolonged exposure (Marks, Noshirvani, Livanou & Thrasher, 1998; Tarrier, Sommerfield, Pilgrim & Humphreys, 1999). Within the DRT model this is understood as being due to the challenging of secondary negative appraisals that provide rationales for VAM-development inhibiting, dysfunctional cognitive and behavioural coping strategies such as verbal distraction (e.g. "It's better to think of something else than to think about what happened"), thought-suppression (e.g. "If I try not to think about it there will be less intrusions") and for the behavioural avoidance of SAM activating reminders (e.g.; "I can't cope with being reminded of what happened"). This is therapeutic because cognitive, peri-reliving, coping strategies such as verbal distraction, thought suppression and rumination may serve to maintain intrusions by preventing change in the meaning of the trauma and of the meaning of the intrusions themselves (Ehlers & Steil, 1995). By challenging maladaptive coping strategies and beliefs in cognitive therapy clients may become less likely to engage in avoidant coping strategies and engage in activities that lead to spontaneous exposure to re-living and conceptual processing. Studies showing that cognitive behavioural therapy is not more efficacious than prolonged exposure do not indicate that change in appraisals is unimportant to therapeutic efficacy as

spontaneous appraisals of the meaning of exposure sessions (e.g. "I *can* cope with thinking about what happened") may mediate outcome.

Traumatic hot-spots

It is possible that some CBT treatment failures occur because clients engaged in prolonged exposure therapy perform the re-living tasks but do not engage in sufficient conscious, VAM processing of traumatic hot-spots. In addition to the failure to promote greater conceptual processing, the verbal enhancement task employed in the current study may have also prevented participants from adaptive verbal encoding of hot-spots by instructing them to verbalise a constant narrative in response to the film (this may account for why the verbal enhancement group experienced significantly more days with intrusions than the control group who were free to focus on what ever aspects of the film they wished). This is clinically relevant because the VE task instructions were similar to those given in standard prolonged exposure therapy, involving ongoing detailed description of the physical characteristics of the film and verbalisation of thoughts, feelings and memories. If the verbal enhancement task did inhibit natural, verbal processing of hot-spots, this suggests that a possible danger of standard exposure therapy is that patients may fail to focus on key hot-spots in response to certain instruction from the therapist. For example, a traumatised victim of an assault might give a lengthy account of the events prior to and after the incident but a vague account of the attack itself due to a desire to avoid triggering re-experiencing symptoms. Furthermore, the finding in the current study that peri-traumatic verbal processing is inhibited during hot-spots, and the DRT prediction that hot-spots are characterised by poorly developed VAMs, means that patients are likely to be pre-disposed to giving a poor verbal

account of precisely the periods of the trauma narrative that most need to by processed into a VAM format. This supports the treatment implication that therapists should ensure that hot-spots are not left out of the trauma narrative (or "whizzed through") during the creation of exposure therapy tapes. It is also likely that several tapes will need to be created as therapy progresses and increasing amounts of information is transferred from the SAM to the VAM format and previously inaccessible parts of the trauma memory become consciously accessible and verbalisable (Ehlers & Clark, 2000). Several authors have gone further and suggested that the global organisation of the entire trauma memory may not be critical to treatment success and that exposure work should focus exclusively on hot-spot material to maximise therapeutic efficacy (Brewin, In Press; Ehlers & Clark, 2000; Grey, Holmes & Brewin, 2001). However, it has also been suggested that a graduated approach be taken to ensure that distress levels do not become excessive and disrupt verbal processing and VAM development (Brewin, 2000).

Assessment and understanding

Similarly to previous research on peri-traumatic cognitive processes, the current study emphasises the importance of in-depth assessment of an individual's peri-traumatic experience especially in relation to hot-spots in the trauma when extreme fear, helplessness or horror appears to have inhibited verbal processing of the event and led to incomplete VAM representations. As described earlier, the importance of identifying traumatic emotional hotspots has been emphasised by several recent authors (Ehlers & Clark, 2000; Richards & Lovell, 1999; Grey, Young & Holmes, 2002). Experimental findings supportive of DRT strengthen the case for PTSD treatment models that include assessment of how much and what type of trauma

information is coded into the VAM compared to SAM system, especially for hot-spots, and that use this knowledge to guide treatment strategies, estimate prognosis and enhance clients' understanding of the nature of their difficulties and the rationale for treatment interventions (Ehlers & Clark, 2000; Grey, Young & Holmes, 2002).

The finding that the VD task led to less intrusions suggests that poorer, verbal peri-traumatic conceptual processing and, therefore, a poorer VAM representation, may be predictive of the development of intrusions and may allow clinicians to distinguish which individuals are likely to develop PTSD after a traumatic event. In individuals who are likely to develop PTSD the verbally accessible account of the trauma expressed early in the course of treatment is likely to include little detail and poor conceptual processing of the traumatic hot-spots that form the primary basis of SAM-based re-experiencing symptoms. This suggests that when assessing PTSD, the clinician should be mindful of what is missing from the trauma narrative in terms of content and depth of conceptual processing and attempt to determine if this corresponds to the content of re-experiencing symptoms (Brewin, 2001). In practice, this might involve monitoring for periods of incoherence, fragmentation and data-driven processing in the trauma narrative and observing the client for behaviour indications (signs of fear and anxiety) that they have entered a hot-spot in the trauma memory. It has been recommended that therapeutic efficacy may be enhanced by identifying hot-spots as a treatment focus for intervention in cognitive behaviour therapy (Brewin, 2000; Ehlers & Clark, 2000; Grey, Holmes & Brewin, 2001).

Limitations of the study

External validity of trauma analogues

The distressing film paradigm used in this study has several advantages and follows the precedent of numerous early and recent studies that have employed this approach (e.g. Lazarus, 1963; Butler et al., 1995; Davies and Clark, 1998). The use of a trauma analogue has the advantages of allowing the ethical observation and manipulation of a standardised distressing stimulus and, therefore, benefits from strong internal validity. However, the external validity of this approach has been questioned on the basis that distressing films witnessed in a safe laboratory environment are not a meaningful way to study PTSD which features the experiencing of events in which individuals feel that their usual coping mechanisms are overwhelmed (van der Kolk & Fisler, 1995).

Although it is important to acknowledge such limitations when attempting to generalise from the findings of a trauma analogue study to real-life trauma, it is also important to acknowledge that studies employing the distressing film paradigm are not attempting to directly study full-blown, PTSD phenomena (which could not be ethically induced in an experimental design) but, rather, to test predictions of theories about PTSD that attempt to account for both sub-clinical trauma reactions arising from a distressing film and reactions to real-life trauma. The fact that the film used in the current study has been shown to reliably produce intrusions in a non-clinical sample, indicates that intrusions can be induced and studied using a laboratory setting. Although it is likely that experimentally induced intrusions are less severe than those arising from real-life trauma, there is no reason to believe they differ qualitatively or arise from distinct cognitive processes. Furthermore,

there is no a priori reason why the characteristics of the sample used in the current study should make a significant difference in the peri-traumatic processing phenomena being investigated in relation to Dual Representation Theory (DRT). This makes it possible to use a laboratory setting to test the predictions of theories of PTSD such as DRT, which attempt to account for how and why intrusions develop.

Trauma analogue studies are highly relevant to PTSD because they are the best available approach to evaluation research questions related to peri-traumatic cognitive processing and because they are an important method for evaluating PTSD theories that have important implications for real-life-trauma reactions. Naturally, it is important to attempt to integrate the findings from analogue studies with those based on observations of clinical samples and treatment approaches, as has been attempted in the current study. In this way, the findings of experimental analogue studies can be useful in evaluation of PTSD theories and in generating novel theory-driven treatment options that can be tested in subsequent outcome studies.

Verbal enhancement task instructions

The unexpected finding that the VE group manipulation did not lead to significantly less intrusions or better conceptual processing of the film was interesting in suggesting that the development of any peri-traumatic verbal narrative per se did not show the capacity to generate the predicted effects. As discussed earlier, although it was logically that the VE task instruction would lead to enhanced conceptual processing of the film, participants' performance of the task, based on

their interpretation of those instructions, may have led to somewhat worse conceptual processing of the film by inhibiting their capacity to focus on traumatic hot-spots compared to the no-task control group. Although the apparent failure of the VE task to produce enhanced conceptual processing is a limitation of the study, it is important to acknowledge that this was the first attempt to test DRT predictions regarding enhanced verbal processing and has generated several suggestions for other verbal enhancement tasks that are discussed in the section on future research.

Assessment of conceptual processing

The definition used for conceptual processing in the coding of VE group task-performance tape-recordings was very broad and deliberately simple (it was defined as any statement that went beyond physical description of the film). Ehlers and Clark are more specific and define conceptual processing as "processing the meaning of a situation, processing it in an organised way, and placing it into context" (Ehlers & Clark, 2000, p. 331). Therefore, future research might benefit from the development of more precise coding systems. Additionally, the meaning questions (used as a measure of conceptual processing) focused on enquiring into how far participants had processed the meaning of the film in relation to themselves, others and the World but did not measure the degree to which trauma information was processed in an organised way or placed into context. Therefore, future research might benefit from further exploration of how to measure this aspect of verbal behaviour. Better assessment of conceptual processing might allow direct testing of how this variable interacts with the quantity and quality of intrusions.

Coding of verbal task performance

The coding of the VD task performance was based on objective coding of recordings of task-performance regarding pauses longer than two seconds and the number of errors in counting. However, the coding of the VE task included some degree of subjectivity as in addition to the recording of the length of pauses longer than two seconds, the amount of time spent in conceptual processing compared to data-driven processing was measured by the experimenter. Although this was based on simple criteria, the coding of this aspect of VE task performance entailed a degree of subjectivity. The experimental design could be improved with regard to this aspect of the data coding by measuring the agreement between multiple ratters for a subset of tapes. This was not possible in the current study due to limitations of time and resources.

Measurement of verbal ability

Numerous participant characteristics were assessed to ensure that the groups did not differ on any extraneous variable that might account for group differences and confound the experiment. However, participants' verbal ability was overlooked. There is no a priori reason to expect that the groups differed in mean verbal ability and no prior research to suggest that within a sample composed primarily of students that verbal ability would vary to an extent that might lead to greater or lesser efficiency of verbal processing in relation to the predictions of DRT. Never the less, the possibility that higher verbal ability might be associated with greater efficiency of verbal processing and deeper conceptual processing and might led to lower intrusion rates (see McNally & Shin, 1995) would have been an interesting additional research question within the current study.

Future research

Various suggestions for future research have been made at appropriate points in the preceding text. The development and testing of new peri-traumatic verbal enhancement tasks is discussed below as a particularly interesting area of future research derived from the current thesis. Finally, it is suggested that the clinical implications of trauma analogue studies can contribute to the evolution of CBT through PTSD treatment outcome research.

New peri-traumatic verbal enhancement tasks

The development of new VE task for future research in trauma analogue studies could address a variety of interesting research questions related to Dual Representation Theory (DRT) and PTSD. One possible variation derived from the interpretation of the current experimental findings would be to use the same task instructions as used in the current study but to instruct participants to focus their ongoing narrative on aspects of the film that they find the most distressing (i.e. traumatic hot-spots) rather than allowing them to respond to each and every moment of the film. This would test the prediction that enhanced peri-traumatic processing of traumatic hot-spots will lead to lower intrusion rates. Alternatively, entirely new verbal enhancement task instructions could be tested that go beyond simply asking participants to continuously verbalise a narrative (including thoughts, emotions, memories, descriptions, etc) to task instructions specifically focused on enhancing conceptual processing of the traumatic information. For example, participants could be instructed to consider what the most distressing aspects of the film mean about themselves, others and the world and to place the experience of watching the video with their current personal, temporal and spatial context.

Such manipulations of enhanced verbal processing of traumatic information could be also tested at various time-points in relation to the trauma such as during the one-week follow-up period rather than within the peri-traumatic period. If peri-traumatic verbal task instructions were developed that enhanced conceptual processing and demonstrated a subsequently lower rate of intrusions this would have important clinical implication for both PTSD prevention and treatment.

Another interesting area is the exploration of whether certain *styles* of verbal processing influence intrusion rates. For example, "intellectualisation" (adopting a detached, analytical attitude during the film and thinking from a psychological and sociological perspective) has been found to be associated with less peri-traumatic stress (Lazarus, Opton, Nomikos and Ramkin, 1965). It would be interesting to test what effect different verbal processing styles such as rationalisation or denial have on the development of intrusions.

Theory driven development of CBT for trauma

The study of peri-traumatic verbal processing through trauma-analogue studies is a rich source of clinical implications for cognitive behaviour therapy (CBT) that could be evaluated in future research using single case studies or randomised controlled trials. This applies to the all the clinical implications discussed earlier. It is certainly in keeping with the ethos of CBT to develop new interventions based on relevant cognitive theory and empirical findings and it is hoped that the current study may contribute to this tradition.

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APPENDICES

Appendix 1: Video tape commentary

Scene 1

After a sudden rain-storm, several collisions occurred at one spot on the motorway due to the slippery conditions and bad visibility. Eight people died, and of these four died before they could be taken to hospital. Here is a 21-year old women who was trapped in her car. Unfortunately she died before she could be taken to hospital. The baby survived the accident. The parents, 26 and 30 years old, also died during the accident.

Scene 2

Here a 58-year old man skidded onto the wrong side of the road because he was driving too fast around a corner. He hit a minibus which was coming the other way, and the occupants, a 51-year old woman and her adult daughter, were both injured. The daughter was knocked unconscious but received only cuts and bruises. By the time this video was taken, the man and the older woman, both severely injured, had been trapped in their vehicles for over an hour, since because of the remote location ambulance and fire crews took 20 minutes to reach them. The women was permanently disabled by her injuries, due to spinal cord damage, although the man did recover completely.

Scene 3

These two men were involved in a multiple pile up on the motor way. Their wives, who were sitting in the back of the car, survived the accident although they sustained major injuries. Both men had grown up children who were still financially dependent on them.

Scene 4

This 56-year old man and his 52-year old wife were on the way to visit their son, a student, in a near by town when their car went out of control on the motorway after one tyre was punctured. They skidded and crashed. The woman died shortly after the accident as a result of the injuries she received. The man remained conscious throughout the accident, although he had suffered extremely severe injuries. However, he was trapped in the car next to his wife and it proved too difficult to rescue him in time. He died of internal bleeding about 30 minutes after the accident, and could only be removed from the wreckage when he was already dead.

Scene 5

This woman, a 20-year old student, and her friend, were on the way to Italy in a car during the summer. On a major road they drove straight into the rear of a traffic jam going round a blind corner. Both women were not hurt by this. However, a lorry which had they had overtaken earlier also came around the corner and hit them from behind. Both women suffered very serious injuries. The student sustained massive internal injuries, and injured skull and deep cuts to her face. The lorry driver was not hurt.

Appendix 2: The Dissociation State Subscale (DSS)

Please answer the following questions as you feel AT THIS MOMENT IN TIME, in this room. The following questions concern dissociation and how you feel at the moment

1.At this moment in time: Do things seem to be moving in slow motion?

not at all	slightly	moderately	considerably	extremely
0	1	2	3	4

2. At this moment in time: Do things seem to be unreal to you, as if you are in a dream?

not at all	slightly	moderately	considerably	extremely
0	1	2	3	4

3. At this moment in time: Do you have some experience that separates you from what is happening; for instance, do you feel as if you are in a movie or a play, or as if you are a robot?

not at all	slightly	moderately	considerably	extremely
0	1	2	3	4

4. At this moment in time: Do you feel as if you are looking at things from outside of your body?

not at all	slightly	moderately	considerably	extremely
0	1	2	3	4

5. At this moment in time: Do you feel as if you are watching the situation as an observer or spectator?

not at all	slightly	moderately	considerably	extremely
0	1	2	3	4

6. At this moment in time: Do you feel disconnected from your own body?

not at all	slightly	moderately	considerably	extremely
0	1	2	3	4

7. At this moment in time: Does your sense of your own body feel changed: for instance, does your own body feel unusually large or unusually small?

not at all	slightly	moderately	considerably	extremely
0	1	2	3	4

8*. At this moment in time: Would people seem motionless, dead, or mechanical?

not at all	slightly	moderately	considerably	extremely
0	1	2	3	4

9. At this moment in time: Do objects look different than you would expect?

not at all, slightly, moderately, considerably, extremely
0 1 2 3 4

10. At this moment in time: Do colours seem to be diminished in intensity ?

not at all, slightly, moderately, considerably, extremely
0 1 2 3 4

11. At this moment in time: Do you see things as if you were in a tunnel, or looking through a wide angle photographic lens?

not at all, slightly, moderately, considerably, extremely
0 1 2 3 4

12. At this moment in time: Does this experience seem to take much longer than you would have expected?

not at all, slightly, moderately, considerably, extremely
0 1 2 3 4

13. At this moment in time: Do things seem to be happening very quickly, as if there is a lifetime in a moment?

not at all, slightly, moderately, considerably, extremely
0 1 2 3 4

14. At this moment in time: Do things happen that you later cannot account for?

not at all, slightly, moderately, considerably, extremely
0 1 2 3 4

15. At this moment in time: Do you space out, or in some other way lose track of what is going on?

not at all, slightly, moderately, considerably, extremely
0 1 2 3 4

16. At this moment in time: Do sounds almost disappear or become much stronger than you would have expected?

not at all, slightly, moderately, considerably, extremely
0 1 2 3 4

17. At this moment in time: Do things seem to be very real, as if there is a special sense of clarity?

not at all, slightly, moderately, considerably, extremely
0 1 2 3 4

18. At this moment in time: Does it seem as if you are looking at the world through a fog, so that people or objects seem far away or unclear?

not at all, slightly, moderately, considerably, extremely
0 1 2 3 4

19. At this moment in time: Do colours seem much brighter than you would have expected?

not at all, slightly, moderately, considerably, extremely
0 1 2 3 4

* The wording was changed for item 8 from "Do people seem motionless, dead or mechanical" to "Would people seem motionless, dead or mechanical", as the participant was alone for three administrations.

Appendix 3: The Trait Dissociation Questionnaire (TDQ)

The following questions are concerned with how often people have certain experiences. Please read each question carefully, but do not spend too much time on each one. Respond to each question by pressing a number key in the range from 0 to 5. (For example, if you OFTEN find yourself doing things without knowing why, press key 3 at the first question). Remember there are no right or wrong answers.

We are interested in your personal experience IN GENERAL.(in general - i.e. NOT just at this moment in time). press SPACE when ready to start

1. I find myself doing things without knowing why.

never	rarely	sometimes	often	mostly	always
0	1	2	3	4	5

2.I cannot get angry about the things that should annoy me.

never	rarely	sometimes	often	mostly	always
0	1	2	3	4	5

3. I do many things which I regret afterwards.

never	rarely	sometimes	often	mostly	always
0	1	2	3	4	5

4.I feel that I am more than one person.

never	rarely	sometimes	often	mostly	always
0	1	2	3	4	5

5. I feel as if other people live in a different world.

never	rarely	sometimes	often	mostly	always
0	1	2	3	4	5

6. I feel that my mind is divided.

never	rarely	sometimes	often	mostly	always
0	1	2	3	4	5

7. I can't understand why I get so cross and grouchy.

never	rarely	sometimes	often	mostly	always
0	1	2	3	4	5

8. I feel distant from my own emotions.

never	rarely	sometimes	often	mostly	always
0	1	2	3	4	5

9. I don't know how to stop myself from doing something.

never	rarely	sometimes	often	mostly	always
0	1	2	3	4	5

10. I have problems remembering important details of stressful events.

never	rarely	sometimes	often	mostly	always
0	1	2	3	4	5

11. I have conflicting desires.

never rarely sometimes often mostly always
0 1 2 3 4 5

12. I feel as if I am standing next to myself or watching myself do something and I actually see myself do something and I actually see myself as if I were looking at another person.
never rarely sometimes often mostly always
0 1 2 3 4 5

13. I feel unable to think straight.
never rarely sometimes often mostly always
0 1 2 3 4 5

14. I feel emotionally numb (e.g. feel sad but can't cry, unable to have loving feelings).
never rarely sometimes often mostly always
0 1 2 3 4 5

15. I feel that I am floating beside my body, and watching it from "outside".
never rarely sometimes often mostly always
0 1 2 3 4 5

16. I feel that my personality is split into distinct parts.
never rarely sometimes often mostly always
0 1 2 3 4 5

17. I find it difficult to feel real emotions, such as pain, happiness, sadness or anger.
never rarely sometimes often mostly always
0 1 2 3 4 5

18. I feel that other people, objects, and the world around me are not real.
never rarely sometimes often mostly always
0 1 2 3 4 5

19. I find it difficult to respond to others in a sympathetic way.
never rarely sometimes often mostly always
0 1 2 3 4 5

20. Things seem to go by faster or slower than they really do.
never rarely sometimes often mostly always
0 1 2 3 4 5

21. I find myself dressed in clothes that I don't remember putting on
never rarely sometimes often mostly always
0 1 2 3 4 5

22. I find myself in a place and have no idea how I got there.
never rarely sometimes often mostly always
0 1 2 3 4 5

23. I find new things among my belongings that I do not remember buying.
never rarely sometimes often mostly always
0 1 2 3 4 5

24. My moods can really change.

never rarely sometimes often mostly always
0 1 2 3 4 5

25. I find writings, drawings, or notes among my belongings that I must have done but cannot remember doing.
never rarely sometimes often mostly always0 1 2 3 4 5
26. I have no memory for some important events in my life(for example, a wedding or graduation).never rarely sometimes often mostly always
0 1 2 3 4 5

27. I live in a world of my own where no one can reach me.
never rarely sometimes often mostly always
0 1 2 3 4 5

28. I look at my watch and am surprised at the time it shows.
never rarely sometimes often mostly always
0 1 2 3 4 5

29. My memory of upsetting events is patchy.
never rarely sometimes often mostly always
0 1 2 3 4 5

30. I say things without meaning to.
never rarely sometimes often mostly always
0 1 2 3 4 5

31. I underestimate or overestimate the amount of time that has passed.
never rarely sometimes often mostly always
0 1 2 3 4 5

32. If something upsetting happens, I find it difficult to remember afterwards.
never rarely sometimes often mostly always
0 1 2 3 4 5

33. I feel like I don't belong.
never rarely sometimes often mostly always
0 1 2 3 4 5

34. The world seems unreal or strange.
never rarely sometimes often mostly always
0 1 2 3 4 5

35. I am unable to ignore pain.
never rarely sometimes often mostly always
0 1 2 3 4 5

36. I feel that there are two of me.
never rarely sometimes often mostly always
0 1 2 3 4 5

37. I feel distant and cut off from others around.
never rarely sometimes often mostly always
0 1 2 3 4 5

38. I have difficulty concentrating.
never rarely sometimes often mostly always
0 1 2 3 4 5

Appendix 4: Traumatic experiences questionnaire

Many people have lived through or witnessed a very stressful and traumatic event at some point in their lives. Coming next is a sequence of descriptions of traumatic events.

When you see an event that has happened to you, or you have witnessed
please press key Y (for Yes. Otherwise, press key N (for No) if that event is not relevant to you. (press SPACE when ready to start)

1. Have you experienced or witnessed: Serious accident, fire, or explosion? (for example, an industrial, farm, car, plane, or boating accident). key Y or N

2. Have you experienced or witnessed: Natural disaster ? (for example, tornado, hurricane, flood, or major earthquake.key Y or N

3. Have you experienced or witnessed: Non-sexual assault by a family member or someone you know? (for example, being mugged, physically attacked, shot, stabbed, or held at gunpoint. key Y or N

4. Have you experienced or witnessed: Non-sexual assault by a stranger?(for example, being mugged, physically attacked, shot, stabbed, or held at gunpoint). key Y or N

5. Have you experienced or witnessed: Sexual assault by a family member or someone you know?(for example, rape or attempted rape. key Y or N

6. Have you experienced or witnessed: Sexual assault by a stranger? (for example, rape or attempted rape. key Y or N

7. Have you experienced or witnessed: Military combat or a war zone? key Y or N
8. Have you experienced or witnessed: 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. key Y or N

9. Have you experienced or witnessed: Imprisonment? (for example, prison inmate, prisoner of war, hostage. key Y or N

10. Have you experienced or witnessed: Torture?. key Y or N
11. Have you experienced or witnessed: Life-threatening illness ? key Y or N
12. Have you experienced or witnessed: Any other traumatic event ? key Y or N

Please specify the traumatic event

(Enter brief description. Then press RETURN)

If participants responded "Yes" to any of the above questions, they were also asked:

How long ago did the traumatic event happen?(1) Less than 1 month
(2) 1 to 3 months
(3) 3 to 6 months
(4) 6 months to 3 years
(5) 3 to 5 years
(6) More than 5 years
(press a key from 1 to 6)

The following questions are about the traumatic event

Were you physically injured? key Y or N
Was someone else physically injured? key Y or N
Did you think that your life was in danger? key Y or N
Did you think that someone else's life was in danger? key Y or N
Did you feel helpless? key Y or N
Did you feel terrified? key Y or N

Appendix 5: Mood ratings

The next four questions concern your mood. Please answer them according to how you feel NOW at this moment in time. Try to answer quickly without thinking for too long. (press SPACE when ready to start)

1. Please indicate how happy you currently feel
0 1 2 3 4 5 6 7 8 9 10
(0 = not at all happy) (10 = extremely happy)
2. Please indicate how anxious you currently feel
0 1 2 3 4 5 6 7 8 9 10
(0 = not at all anxious) (10 = extremely anxious)

3. Please indicate how depressed you currently feel
0 1 2 3 4 5 6 7 8 9 10
(0 = not at all depressed) (10 = extremely depressed)

4. Please indicate how angry you currently feel
0 1 2 3 4 5 6 7 8 9 10
(0 = not at all angry) (10 = extremely angry)

Appendix 6a: Intrusion diary - front page

CONFIDENTIAL

INSTRUCTIONS FOR DIARY OF INTRUSIVE MEMORIES

(Please try to keep this diary: it is vital for the experiment. THANKYOU!)

Volunteer number:..... Date:..... Experimenter and their contact details.....

(the experiment will fill in the day and date for each sheet in your diary)

*******************Date, day and time of follow-up:.....********************

* If over the next week you experience any **spontaneously occurring intrusions** about the film you have just watched, I would be very grateful if you could note them down in the diary. By **"intrusions"** I mean intrusive memories of the video that suddenly pop into mind spontaneously. I do not mean times when you deliberately think about it or mull it over. Intrusions may take the form of pictures of the film you have just seen. You may find it useful to set aside a certain time each day when you can fill in the diary.

* Please record the total number of intrusions experienced in each time period (Box 1) and, for each individual intrusion, whether it was primarily an image or a thought or both (Box 2) and what the intrusion was of (Box 3). Also:

- ☐ Fill in the boxes on level of distress, 'howness", sensory detail (i.e. vividness) and automacy (i.e. spontaneity) that accompany each intrusion by entering a number between zero and one hundred that reflects your experience.
- ☐ **Please note: 0 = not at all; 50 = moderately; 100 = extremely.**

* Please use one diary sheet per day. If you cannot fit all the intrusions for one time of day into the space provided please continue on another sheet.

* If you are on occasion unable to record details, please make sure you note that an intrusion has occurred and the date.

* IF YOU HAVE NO INTRUSIONS PUT ZERO (0) FOR THAT TIME OF DAY

Thank you for your help.

Appendix 6b: Intrusion diary – daily form (7 provided)

DIARY OF INTRUSIONS (Please try to keep this diary: it is vital for the experiment. THANK YOU!)

Volunteer number:..... Day 1: day of week:..... date:.....

TIME OF DAY (if you cannot fit in all intrusions please use reverse side of the paper)	TOTAL NUMBER of intrusions	Was the intrusion an IMAGE (I) THOUGHT (T) or BOTH (IT)?	CONTENT: What was each intrusion of (please describe briefly):	How DISTRESSED were you by the intrusion (0 = not at all, 100 = extremely)	How much did it feel as if you were experiencing the event again NOW during the intrusion (0 = not at all, 100 = extremely)	How VIVID was the intrusion (ie how rich in sensory detail)? (0 = not at all, 100 = extremely)	How AUTOMATIC / OR SPONTANEOUS did it feel (ie how much did it pop into your head without you deliberately thinking about it? (0 = not at all, 100 = extremely)
MORNING if no intrusions put '0'							
AFTERNOON if no intrusions put '0'							
EVENING if no intrusions put '0'							
NIGHT if no intrusions put '0'							

Appendix 7a: The Recall Memory Questionnaire

The Cued Recall Memory Test.

Please answer these questions about the film you watched last week.
The questions are difficult so don't worry if you're not sure, just put down your best guess.

1. What colour was the car that was on fire in a field, by a tree, at the beginning of the first scene?

2. What part of a body did you sticking out of the upside down car in the first scene?

3. What was in the blanket that the man wearing the cap and long coat was carrying at the end of the first scene?

4. What colour was the t-shirt worn by the middle-aged woman trapped in the mini-bus in scene two?

5. When the woman was finally cut out of the mini-bus and placed on a stretcher, which part/s of her body was cut and bleeding.

6. In scene two, once they got the man out of the car onto the stretcher, what did they do to him?

7. What part of the injured man's body was zoomed in on in scene two?

8. In scene three, a body was still in a car covered by a stripy blanket what body part did you see hanging out from under the blanket?

9. What kind of vehicle had the mangled car from the above question crashed into?

10. In scene four, what colour was the car that had its roof cut off in order to remove the dead?

11. How many doctors in white coats were shown at the scene of the accident in scene four?

12. How many people were put in coffins in scene four?

13. In the final scene, what was the female student receiving medical attention wearing?

14. In the final scene what part of the female student's body was bandaged by the paramedics?

15. Can you remember any other medical procedures that were performed on the injured girl?

Appendix 7b: The Recognition Memory Questionnaire

Recognition Memory Test.

For each statement please indicate whether you believe the event occurred in the film by answering Yes or No.

Scene 1.

a) The baby in the blanket is passed to a paramedic and placed in an ambulance.

b) An upside down car is focused on and a paramedic manipulates a naked leg which is sticking out.

c) A team of fireman race to a car that is on fire and spray foam on it in order to quench the flames.

d) A distraught teenager is led away from the scene by a member of the public.

e) Three members of the public help the emergency personnel carry a body to the side of the road.

Scene 2.

a) A woman being cut out of a crashed vehicle cries out, and appears to lose consciousness

b) When the man with the injured leg is on the stretcher the paramedics shine a light into his eyes.

c) A team of fireman attach metal equipment to the front of the minibus to pull the wreckage away from the woman's legs.

d))A policeman stands watching the wreckage whilst making notes on a clipboard.

e) When the man with the injured leg is on the stretcher the paramedics cut his trousers and reveal a bloody wound.

Scene 3.

a) A body which had been covered by a blanket inside a wrecked car is removed, and placed on the ground, two blankets are then laid over it.

b) Rescue workers put up a yellow and blue police incident tape in order to keep the crowd back from the scene.

c) Before covering a man's body with a blanket, the fireman closes the man's eyes.

Scene 4.

a) Emergency personnel use cutting equipment to remove the body of a man from a beige car who has been crushed in the driver's seat.

b) A fireman struggles to release the trapped woman's seatbelt.

c) A bent car number plate lies on the ground close to coffin the man is placed in.

d) Two men lift up two bodies and bundle them into metal coffins.

Scene 5.

a) A female student is moaning as she is treated in an ambulance. She is naked and electrodes are attached to her chest.

b) A paramedic injects the female student in her right arm, whilst the others attend to her injuries.

c) As her head is bandaged, a relative arrives at the ambulance and is kept to one side by paramedics.

Appendix 8: The Intrusion Description Questionnaire

The Intrusion Description Questionnaire

a) At the beginning of the follow up session ask the participant to select one intrusion from their diary and highlight it on the diary. Ask them to select the one that is most important to them, e.g. the most frequent.

b) Experimenter reads aloud the following: *I am interested in what this intrusion you have experienced as a result of the film appears like to you and what it means to you.*

NOW TRY TO IMAGINE THE INTRUSION. PLEASE CLOSE YOUR EYES.

- Is this intrusion a thought / image (check it's of the film, not just a ruminative thought)
- If you picture your intrusion, is it a like a snapshot or is it like a film sequence?
- Does it look like a detail or a whole scene?

- How vivid does it look? (0-10) =

0	1	2	3	4	5	6	7	8	9	10
0= not at all					5 = somewhat					10 = extremely

if very low, ask them to really focus and imagine it. Re-rate. Then continue
then, using the same scale ask:

- How much does it feel like you're seeing it happen again now? (0-10) =
- How distressing is it? (0-10) =
- How unwelcome / unwanted is this image?, that is, in terms of how much would you have liked to have *not* had it, where 0= not unwelcome i.e. wanted, 10 = extremely unwelcome. (0-10) =
- How fragmented is the intrusion? (0-10) =
- How much does it feel like sensory impressions, that is images, sounds etc? (0-10) =
- How much does it feel like a verbal thought? (0-10) =
- Is there something bad about what is happening in the image? Yes / no

Now please open your eyes. I would like you to write as much as you can to describe your image YOU CAN DO THIS ON COMPUTER . Please write as much as you can.
Please bear in mind the following:

- What is happening in the image?
- Who is in the image?
- What are people doing / saying / thinking / feeling?
- What objects are in the image?

.....
.....
.....
.....
.....
.....

CAN ALSO DO THIS ON COMPUTER:

- When you saw this image for the first time while watching the film, what thoughts went through your mind?

- *What do these things in your image mean to you? that is,*
  - *Does it mean anything about people in the film? no or.....*
  - *Does it mean anything about you, yourself? no or.....*
  - *Does it mean anything about other people you know? no or.....*
  - *Does it mean anything about other people in general? no or.....*
  - *Does it mean anything about the world in general? no or.....*

- *Does this intrusion remind you of anything else you have experienced? Yes / no*
  Please describe

- Can you hear anything in your image? If so what.....

- Are you in the image? Yes / no

- I am now going to ask you some questions about specific emotions you may or may not be feeling WHILE SEEING THIS IMAGE:

Please answer on a scale where 0 = not at all, and 10 = extremely

1. Please indicate how happy you currently feel (0 - 10)
2. Please indicate how anxious you currently feel (0 - 10)
3. Please indicate how depressed you currently feel (0 - 10)
4. Please indicate how angry you currently feel (0 - 10)
5. Please indicate how FEARFUL you currently feel (0 - 10)
6. Please indicate how HORRIFIED you currently feel (0 - 10)
7. Please indicate how HELPLESS you currently feel (0 - 10)
8. Please indicate how DISGUSTED you currently feel (0 - 10)
9. Please indicate how ASHAMED/GUILTY you currently feel (0 - 10)
10. Are there any other emotions you feel?
    - If so, what? How much? (0 - 10)

Appendix 9a: Information form

Volunteer Information Form (CONFIDENTIAL)

* You are invited to participate in this psychology experiment studying effects of trauma. You do not have to take part in this study if you do not want to. If you decide to take part you may withdraw at any time without having to give a reason.

* The purpose of this experiment is to study the role of language in the development of intrusive memories of traumatic information. Specifically, this experiment aims to use a distressing video to explore links between the development of intrusive memories and: (1) Verbal processing at the time of viewing the video; and (2) Emotional response and previous experience of participants (measured via questionnaires and self-rating scale).

* The experiment involves watching a distressing video, containing graphic scenes of the aftermath of road traffic accidents, including seriously injured and dead victims. You may spontaneously think about this after the film and may be distressed by it. Intrusive recollections may take the form of visual images, thoughts or mood changes. In previous research with this film involving over 100 participants no long-standing emotional problems have been reported, but this does not mean there is zero risk to you.

* In the first session you will complete short questionnaires about your emotional state, previous experience of various events and your mood. For the week afterwards you will keep a simple "diary" of any spontaneous intrusions/ memories about the film. You will return on: ...../...../....., at .... o'clock for a follow-up session to give back the diary and answer some questions about the film and any effects it had on you. You will be debriefed and given the opportunity to discuss any aspects of the study you wish to. All your responses will be kept strictly confidential.

* You can contact the experimenter at any point during or after the study if you experience difficulties. The experimenter may contact you to remind you of the follow-up session. If for any reason you do not attend the experimenter may contact you.

* You cannot participate in this experiment if you have had treatment for any previous mental health problem or have taken part in a similar experiment.

* All proposals for research using human subjects are reviewed by an ethics committee before they can proceed. This proposal was reviewed by the joint UCL/UCLH Committees on the Ethics of Human Research.

Study Title: Peri-Traumatic Verbal Encoding and the Development of Intrusive Memories.
Investigators: Dr. Emily Holmes (Clinical Psychologist) and Prof. Chris Brewin (Clinical Psychologist), Richard Hennessy (Trainee Clinical Psychologist).
Investigators' Contact Address and Tel. No.:s: Sub-Department of Clinical Health Psychology, UCL, Gower Street, WC1E 6BT. 020 7679 1258

Appendix 9b: Consent form

CONFIDENTIAL
Volunteer Consent Form

* Have you read the information sheet about the study?	YES / NO
* Have you had an opportunity to ask questions and discuss the study?	YES / NO
* Have you received satisfactory answers to all your questions?	YES / NO
* Have you received enough information about this study?	YES / NO
* Who have you spoken to about this study?	YES / NO
*Do you understand that you are free to withdraw form this study at any time without giving a reason for withdrawing?	YES / NO
* Do you agree to take part in this study?	YES / NO

Volunteer's Name: .....

Volunteer's Tel. No.: .....

Signed: .....

Investigator's Name: .....

Signed: .....

Date: .....

Date of Follow-up: .....

Study Title: Peri-Traumatic Verbal Encoding and the Development of Intrusive Memories.
Investigators: Dr. Emily Holmes (Clinical Psychologist) and Prof. Chris Brewin (Clinical Psychologist), Richard Hennessy (Trainee Clinical Psychologist) .
Investigators' Contact Address and Tel. No.:s: Sub-Department of Clinical Health Psychology, UCL, Gower Street, WC1E 6BT. 020 7679 1258

Appendix 10: Missing data and outliers

Missing data

Due to apparatus failure:

- Participant 52 (Control) – Attention paid to film, Distress caused by film and post-film DSS question 19.
- Participant 36 (Control) – Attention paid to film and Distress caused by film.

Due to failure in participant compliance:

- Participant 13 (Verbal Distraction) – Failed to return for follow-up but posted intrusion diary back. Missed all follow-up questions.

Due to late introduction of questions into procedure:

- Participants 1 and 2 (Verbal Enhancement), 3 (Verbal distraction) and 4 (Control) missed the questions on how much they thought, talked and avoided thinking about the film during the one-week follow-up period.
- Participants 1, 2, 5 and 8 (Verbal Enhancement), 3, 6 and 9 (Verbal distraction) and 4 and 7 (Control) missed the question on how afraid of blood, injury and the like they were.

Treatment of outliers

Outliers were defined as item scores more than three standard deviations from the mean within the experimental group the participant belonged to. They were changed to a score one unit larger, or smaller, than the next largest, or smallest, value within the distribution. Seven outliers were identified and changed as summarised below:

Table 11. Outliers and adjusted scores.

Participant	Condition	Measure	Outlier value	Adjusted score
48	VD	Pre-film DSS	27	16
3	VD	Pre-film DSS	16	9
6	VD	Pre-film summed emotion	4.9	3.7
10	VE	Diary compliance	8	5
12	C	Diary compliance	5	4
34	VE	Avoided thinking about film	7	5
16	C	Total intrusions	20	12

Appendix 11: Ethical consent correspondence

The University College London Hospitals

The Joint UCL/UCLH Committees on the Ethics of Human Research

Committee Alpha Chairman: Professor A McLean

Please address all correspondence to:
Iwona Nowicka
Research & Development Directorate
UCLH NHS Trust
1st Floor, Vezey Strong Wing
112 Hampstead Road, London NW1 2LT
Tel. 020 7-380 9579 Fax 020 7-380 9937
e-mail: iwona.nowicka@uclh.org

Professor C Brewin
Professor of Clinical Psychology
UCL
Sub-department of Clinical Health Psychology
Gower Street

April 24, 2001

Dear Professor Brewin

Study No: 01/0061 *(Please quote in all correspondence)*
Title: **Peri-traumatic verbal encoding and the development of intrusive memories**

Thank you very much for your letter dated April addressing the points raised by the Committee at their last meeting on 5th April. There are no further objections on ethical grounds and the study can go ahead.

Please note that it is important that you notify the Committee of any adverse events or changes (name of investigator etc) relating to this project. You should also notify the Committee on completion of the project, or indeed if the project is abandoned. **Please remember to quote the above number in any correspondence.**

Yours sincerely

pp Professor André McLean, BM BCh PhD FRC Path
Chairman

cc. Dr E Holmes